Kenai Peninsula Borough School District

Mathematics Curriculum 2018

KENAI PENINSULA BOROUGH SCHOOL DISTRICT

The mission of the KPBSD Mathematics Curriculum is to prepare students to meet and exceed identified state standards and skills in a rigorous, relevant, and responsive environment. Our Math Committee based our curriculum from Alaska State Mathematics Standards and Mathematical Practices. This curriculum ensures continuity of instruction between schools and grades while at the same time providing flexibility for teachers and schools to make site-based decisions to support personalized learning instruction. Learners master these skills in a flexible instructional model, and each teacher will address the specific academic needs of each learner so they are life, college, and career ready upon graduation.

KPBSD Mathematics Curriculum is aligned to the Alaska State Content Standards and developed using the Understanding by Design® Model, a research-based curriculum framework developed by Jay McTighe and Grant Wiggins. This framework offers a planning process and structure to guide curriculum, instruction, and assessment. The Understanding by Design Framework contains two key ideas: 1. Focus on teacher and assessing for understanding and learning transfer, 2. Designing curriculum “backward” from those ends.

Each Math Curriculum Map includes:

- Priority Standards and Unit descriptors: Describes what standards and units of instruction are included in each course.
- Enduring Understandings: The big ideas developed in every course.
- Essential Questions: What students need to know by the end of each course.
- Key Vocabulary and Skills: What students need to know and be able to do by the end of each course.
- Learning Targets: The specific learning targets students will be accountable to learn by the end of each unit contained in each course.

KPBSD Math Curriculum

Committee 2018

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KPBSD MATH CURRICULUM
GLOSSARY

Alaska Content Standards are general statements of what Alaskans want students to know and be able to do as a result of their public school experience. These standards are adopted by the State Board of Education and state what students should be learning in core subject areas.

Backwards Design is a process that educators use to design learning experiences and instructional techniques to achieve specific learning goals. Backward design begins with the objectives of a unit or course—what students are expected to learn and be able to do—and then proceeds “backward” to create lessons that achieve those desired goals.

Big Ideas are ideas that drive teachers’ planning and determine the knowledge and skills that they will need to teach. These ideas are the “heart” of the discipline, are transferrable, and connect to other facts and skills.

Curricula is academic content taught in a school or in a specific course or program; the knowledge and skills students are expected to learn, which includes the learning standards or learning objectives they are expected to meet. The units, the books, materials, videos, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning.

Enduring Understandings are statements summarizing important ideas and core processes that are central to a discipline and have lasting value beyond the classroom. They synthesize what students should understand—not just know or do—as a result of studying a particular content area. Moreover, they articulate what students should “revisit” over the course of their lifetimes in relationship to the content area.

Essential questions are open-ended, thought-provoking questions that lead to the big ideas.

Priority Standards are "*a carefully selected subset of the total list of the grade-specific and course-specific standards within each content area that students must know and be able to do by the end of each school year in order to be prepared for the standards at the next grade level or course. Priority standards represent the assured student competencies that each teacher needs to help every student learn, and demonstrate proficiency in, by the end of the current grade or course*" (Ainsworth, 2013, p. xv).

KPBSD MATH CURRICULUM
GLOSSARY

Standards provide clear and consistent learning goals to help prepare students for college, career, and life. The standards clearly demonstrate what students are expected to learn at each grade level.

Supporting Standards are "*those standards that support, connect to, or enhance the Priority Standards. They are taught within the context of the Priority Standards, but do not receive the same degree of instruction and assessment emphasis as do the Priority Standards. The supporting standards often become the instructional scaffolds to help students understand and attain the more rigorous and comprehensive Priority Standards*" (Ainsworth, 2013, p. xv).

Understanding by Design® (UbD) is a curriculum design model for planning and developing curriculum and instruction. Understanding by Design helps you think about your curriculum not as a textbook or a list of instructional activities, but as an approach to developing your students' understandings through conceptual knowledge and skills.

Mathematical Practices (The Standards for Mathematical Practice) describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.

Selected References

Alaska Content Standards

Understanding by Design Framework

Rigorous Curriculum Design Overview

A Guide to the 8 Mathematics Practice Standards

Engage NY (Eureka Math)

North Carolina Collaborative for Mathematics (NC2ML)

National Council of Teachers of Mathematics

KPBSD MATHEMATICS CURRICULUM
COURSE DESCRIPTIONS

Kindergarten
In Kindergarten, students will focus on two critical areas representing and comparing whole numbers, initially with sets of objects and describing shapes and space. Students will use numbers, including written numerals, to represent quantities and to solve quantitative problems. Students will also learn to describe their physical world exploring geometric ideas and vocabulary.

1st Grade
In 1st Grade, students will focus on four critical areas. First, students will develop an understanding of addition, subtraction, and strategies for addition and subtraction within 20 and whole number relationships and place value, including grouping in tens and ones. They will also begin to understand linear measurement and measuring lengths as iterating length units, and reasoning about attributes of, and composing and decomposing geometric shapes.

2nd Grade
In 2nd Grade, students will focus on four critical areas. Students will extend their understanding of the base-ten system and continue to develop fluency with addition and subtraction within 100. They will recognize the need for standard units of measure and use tools such as rulers, to understand that linear measure involve an iteration of units. By building and drawing, students will analyze two and three-dimensional shapes and reason about decomposing and combining shapes to make other shapes. Finally, students will develop a foundation for understanding area, volume, congruence, similarity, and symmetry.

3rd Grade
In 3rd Grade, students will focus on four critical areas. First, students will develop understanding of multiplication and division and strategies for multiplication and division within 100 and begin to develop their understanding of fractions, especially unit fractions (fractions with numerator 1). They will continue to build their understanding of the structure of rectangular arrays and of area and describe and analyze two-dimensional shapes.

4th Grade
In 4th Grade, students will focus on three critical areas. First, students will develop their understanding and fluency with multi-digit multiplication, and dividing to find quotients involving multi-digit dividends. They will build their understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers. Finally, they will analyze and classify geometric figures based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

5th Grade
In 5th Grade, students will focus on three critical areas. Students will continue developing fluency with addition and subtraction of fractions, and develop an understanding of the multiplication and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions). They will extend division to two-digit divisors, integrating decimal fractions into the place value system. Finally, they will explore operations with decimals to hundredths, and build fluency with whole number and decimal operations and explore the concept of volume.

KPBSD MATHEMATICS CURRICULUM
COURSE DESCRIPTIONS

6th Grade

In 6th Grade, students will focus on four critical areas. Students will connect ratio and rate to whole number multiplication and division and use concepts of ratio and rate to solve problems. They will solidify their understanding of division of fractions and extend the notion of number to the system of rational numbers, which also includes negative numbers and writing, interpreting, and using expressions and equations. Finally, students will begin developing an understanding of statistical thinking.

7th Grade

In 7th Grade, students will focus on four critical areas. First, students will develop their understanding of and applying proportional relationships and operations with rational numbers and working with expressions and linear equations. They will solve problems involving scale drawings and informal geometric constructions, and work with two- and three-dimensional shapes to solve problems involving area, surface area, and volume. They will draw inferences about populations based on samples.

8th Grade

In 8th Grade, students will focus on three critical areas. Students will formulate and reason about expressions and equations, including modeling an association in bivariate data with a linear equations, and solving linear equations and systems of linear equations. Students will begin grappling with the concept of a function and using functions to describe quantitative relationships. Finally, they will analyze two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and begin applying the Pythagorean Theorem.

Foundations of Algebra and Geometry

The purpose of Foundations of Algebra & Geometry is to extend the mathematics that students learned in the middle grades. The overall structure continues the model of learning mathematics as a whole so that students experience mathematics as a coherent, useful, and logical subject that emphasizes using mathematics to solve problem situations. Students will blend their study of number and quantity measurements, equations and inequalities, linear and exponential functions, geometric congruence and reasoning, and statistical data. This course is a pre-algebra course.

Algebra I

Access to higher mathematics is essential and Algebra I is an important entry point for the pathway to success by extending students' understanding and application of skills concepts and language of algebra. Students will learn to reason symbolically. Students will learn mathematical concepts for working with rational numbers, various expressions, analyzing and solving linear equations & inequalities, data analysis, probability, statistics, and polynomials.

Geometry

Geometry is the second course in a traditional mathematics sequence. Students will build mathematical reasoning through mathematical proof, and improve algebraic thinking by embedding algebra in geometry problems. Students will study transformations and right triangle trigonometry. Students will used inductive and deductive thinking skills to solve real word problems.

KPBSD MATHEMATICS CURRICULUM
COURSE DESCRIPTIONS

Algebra II

Algebra II is the third course of a traditional mathematics pathway. Students will work with linear, quadratic, and exponential functions, and extend their repertoire of functions to include polynomial, rational, and radical functions. They will work closely with expressions that define functions, and continue to expand and hone their abilities to model situation and solve equations. **Students must have a strong foundation in solving equations and systems prior to moving into quadratic functions. Some teachers spend a week or so reinforcing Algebra concepts before moving into Quadratics. Transformations are included in all units pertaining to functions.*

Integrated Math for Trade

Integrated Math for Trades equips students with a solid foundation in the math needed for a variety of technical and vocational trades, such as allied health, electrical trades, plumbing, construction, and many more. The math concepts are presented completely within the context of practical on-the-job applications.

Statstics

Studying Statistics provides tools for describing variability in data and for making informed decisions. Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics is a highly applicable subject for students considering any post-secondary education (business, engineering, nursing, sciences, etc.). The challenge comes in meeting students where they are when then enter the course. The pace and depth of this course may vary depending on the skills and knowledge of the students. (*Algebra 1 and Geometry are a pre-requisite*).

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 1 – BUILDING A MATHEMATICAL COMMUNITY THROUGH EXPLORING ATTRIBUTES

Desired Results

Priority Standards

K.MD.3. Classify objects into given categories (attributes). Count the number of objects in each category (limit category counts to be less than or equal to 10).

K.G.1. Describe objects in the environment using names of shapes and describe their relative positions (e.g., *above*, *below*, *beside*, *in front of*, *behind*, *next to)*.

Supporting Standards

K.MD.1. Describe measurable attributes of objects (e.g., length or weight). Match measuring tools to attribute (e.g., ruler to length). Describe several measurable attributes of a single object.

K.MD.2. Make comparisons between two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

K.OA.6. Recognize, identify, and continue simple patterns of color, shape, and size.

Transfer

Students will be able to independently use their learning to…
Build a community of mathematical problem solvers and discover similarities and differences between objects in their environment.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Objects have attributes that allow them to be classified.
- Specific words are used to describe the relative positions of objects.
- Objects can be counted and identified.
- Patterns repeat.
- Numbers represent a quantity.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I explore my world through comparing and classifying?
- How do I use patterns to predict what will happen next?
- How do I describe shapes, their attributes, and their positions?

Acquisition

Students will know…

- Objects can be described, measured, and classified in different ways.
- Objects in our environment can be described using names of shapes.
- Patterns are identified based on color, shape, and size.
- When counting, each number said represents an object.
- That all objects have a position in space related to one another.

Students will be skilled at…

- I can name and tell about shapes I see around me.
- I can count the things that I put into groups and then sort them by how many.
- I can look at two objects and describe similarities and differences.
- I can classify objects by their attributes.
- I can tell the position of different shapes.
- I can identify and continue patterns.
- I can count objects in a set.

Evidence	
Vocabulary • Attributes • Compare • Measurable • Difference • Objects • More • Less • Describe • Square • Circle • Triangle • Rectangle • Hexagon • Cube • Cone • Classify • Cylinder • Sphere • Above • Below • In front of • Behind • Next to • Shapes • Environment • Position • Set	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 2 – NUMBERS TO 10

Desired Results

Priority Standards

Count to tell the number of objects.

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a) When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.
b) Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
c) Understand that each successive number name refers to a quantity that is one larger.

Supporting Standards

K.CC.2. Count forward beginning from a given number within the known sequence.

K.CC.3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0 - 20 (with 0 representing a count of no objects).

Transfer

Students will be able to independently use their learning to…
Understand the relationship between numbers and quantities.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The last number name said tells the number of objects counted.
- The number of objects is the same regardless of their arrangement or the order in which they were counted.
- That each successive number name refers to a quantity that is one larger.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does counting help me in my everyday life?
- How do numbers relate and compare to one another?
- How do I show a quantity?

Acquisition

Students will know…

- Number names.
- What a rote number sequence is.
- Each number is matched to an object counted.

Students will be skilled at…

- I can say number names and count in sequence.
- I can count a sequence from a number other than 1.
- I can write the number of objects I count.

Evidence	
<u>Vocabulary</u> • Rote • Counting on • Object • Strategy • How many • Greater than • Less than • Or equal to • Compare • Groups • Matching • Numeral	**<u>Mathematical Practices (Bolded practices are priority for this unit)</u>** • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 3 – COMPARING QUANTITIES & COUNTING

Desired Results

Priority Standards

K.CC.3. Write numbers 0 to 20. Represent a number of objects with a written numeral 0 to 20 (with 0 representing a count of no objects).

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a) When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.
b) Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
c) Understand that each successive number name refers to a quantity that is one larger.

Supporting Standards

K.CC.1. Count to 100 by ones and by tens.

K.CC.5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects.

K.CC.6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group (e.g., by using matching, counting, or estimating strategies).

K.CC.7. Compare and order two numbers between 1 and 10 presented as written numerals.

Transfer

Students will be able to independently use their learning to…
Count and compare quantities in real-world settings.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The number of objects is the same regardless of their arrangement or the order in which they were counted.
- That each successive number name refers to a quantity that is one larger.
- There is a relationship between numbers and counting.
- Each object that is counted stands for one and only one number.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does counting help me in my everyday life?
- How do numbers relate and compare to one another?

Acquisition

Students will know…

- A group of counted objects can be represented with a written numeral.
- The concept of one to one correspondence.
- The number of objects is the same regardless of their arrangement or the order in which they were counted.
- The number of objects in one group can be greater than, less than, or equal to the number of objects in another group.

Students will be skilled at…

- I can write numbers 0-20.
- I can describe the relationships between numbers and counting.
- I can count to answer “how many”.
- I can count sets of 0-20.
- I can compare sets of objects 0-10.
- I can use zero to represent no objects.
- I can count by ones and know that the next number I say is one more.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priority for this unit)
• Objects • Numbers • Greater than • More • Next • Count • Pairing • Group • Number name • Arrangement • Same • Sequence • Array • Measure • Length • Weight • Attributes • Environment	• Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 4 – FOUNDATIONS OF PLACE VALUE – EXPLORING NUMBERS 11-20

Desired Results

Priority Standards

K.NBT.1 Compose and decompose numbers from 11-19 into ten ones and some further ones (e.g., by using objects and drawings) and record each composition and decomposition by a drawing or equation (e.g., 18 = 10+8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

K.CC.3. Write numbers 0 to 20. Represent a number of objects with a written numeral 0 to 20 (with 0 representing a count of no objects).

Supporting Standards

K.CC.1. Count to 100 by ones and by tens.

Transfer

Students will be able to independently use their learning to…
Use place value to write and place numbers.

Meaning

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Students will understand that… • Numbers follow a pattern. • The base ten number system is based on groups of ten. • The value of a digit in the base ten number system is determined by its place value position.	Students will keep considering… • How does a digit's placement determine its value? • How can I express numbers beyond 10?

Acquisition

Students will know… • Digits are 0 to 9. • The highest digit that any place can hold is nine. • Objects/drawings can show how many tens and ones are in a numbers to 20. • Numbers to 20 compose and decompose using tens and ones.	Students will be skilled at… • I can write numbers from 0 to 20. • I can count objects and write the number. • I can use zero to represent no objects. • I can model with manipulatives how many tens and ones are in a number. • I can use a drawing to show how many tens and ones are in a number.

Evidence	
Vocabulary • Compose • Decompose • Drawing • Numbers • Tens • Ones	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 5 – COMPOSING AND DECOMPOSING NUMBERS TO 10

Desired Results

Priority Standards

K.OA.3. Decompose numbers less than or equal to 10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). *For example, 5 = 2 + 3 and 5 = 4 + 1*.

K.OA.4. For any number from 1- 4, find the number that makes 5 when added to the given number and, for any number from 1- 9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings, or 10 frames) and record the answer with a drawing or equation.

Transfer

Students will be able to independently use their learning to…
Use symbols to represent numbers, unknowns, and operations in the real-world.

Meaning

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Students will understand that… • Numbers, within 10, can be put together and taken apart in different ways and be recorded using equations or drawings.	Students will keep considering… • How many ways can I compose and decompose numbers to 10?

Acquisition

Students will know… • There are many ways to make ten. • How many more it takes to get 10, when starting from a number 1-9.	Students will be skilled at… • I can decompose numbers from 0-10 in more than one way. • I can find the number that makes 5 or 10 when added to a given number. • I can use models to decompose numbers.

Evidence

Vocabulary

- Compose
- Decompose
- Represent
- Drawings
- Equal
- More
- Less
- Fewer
- All together
- Total

Mathematical Practices (Bolded practices are priority for this unit)

- Make sense of problems and persevere in solving them.
- **Reason abstractly and quantitatively.**
- Construct viable arguments and critique the reasoning of others.
- **Model with mathematics.**
- **Use appropriate tools strategically.**
- **Attend to precision.**
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 6 – EXPLORING PARTS AND WHOLES WITH ADDITION AND SUBTRACTION

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="5">Priority Standards
K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.
Supporting Standards
K.OA.2. Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).
K.OA.4. For any number from 1- 4, find the number that makes 5 when added to the given number and, for any number from 1- 9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.
K.OA.5. Fluently add and subtract numbers up to 5.</td><td colspan="2">Transfer
Students will be able to independently use their learning to…
Build a community of mathematical problem solvers and discover similarities and differences between objects in their environment.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Addition is putting together and adding to, and understand that subtraction is taking apart and taking from.
• Real-world problems can be solved using addition and subtraction.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How can I represent addition and subtraction?
• How do addition and subtraction help me solve real-world problems?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• There is a correlation between number and quantities.
• Addition and subtraction can be modeled or expressed with an equation.
• Numbers, within 10, can be put together and taken apart in different ways and recorded using equations or models.
• Two quantities can be compared to find how much more/less one quantity is than the other is one interpretation of subtraction.</td><td>Students will be skilled at…
• I can add numbers to 10.
• I can subtract numbers to 10.
• I can solve problems.
• I can fluently recall addition and subtraction problems up to 5.</td></tr>
</table>

Evidence	
Vocabulary • Compose • Decompose • Add • Addition • Put together • Plus • Subtract • Subtraction • Take apart • Minus • Equation • Equal • Total • Five frame • Ten frame • Same as	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
UNIT 7 – IDENTIFYING, DESCRIBING, CLASSIFYING, AND COMPOSING SHAPES

Desired Results

Priority Standards

K.G.2. Name shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres) regardless of their orientation or overall size.
K.G.3. Identify shapes as two-dimensional (flat) or three-dimensional (solid).
K.G.4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices), and other attributes (e.g., having sides of equal lengths).
K.G.5. Build shapes (e.g., using sticks and clay) and draw shapes.
K.G.6. Put together two-dimensional shapes to form larger shapes (e.g., join two triangles with full sides touching to make a rectangle).

Transfer

Students will be able to independently use their learning to…
Identify, describe, classify, and compose shapes based on their attributes.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Shapes have attributes and characteristics that define them.
- Shapes are all around us in the world.
- Real world objects have a shape or are composed of shapes.
- Objects in our environment can be described using names of shapes.
- Shapes do not change regardless of orientation or size.
- Small shapes can be put together to form larger shapes.

ESSENTIAL QUESTIONS

Students will keep considering…

- What shapes do I see in the world around me?
- How do I compare two objects?
- How can I use smaller shapes to make a new shape?

Acquisition

Students will know…

- Shapes have names that do not change despite size or orientation.
- Shapes can be described by their positions.
- Shapes are 2D or 3D.
- Shapes can be compared.
- Small shapes can be put together to make larger shapes.

Students will be skilled at…

- I can identify my shapes.
- I can correctly name a shape no matter what size it is or how it is turned.
- I can tell if a shape is two-dimensional or three-dimensional.
- I can compare different shapes.
- I can build and draw shapes that model the shapes I see around me.
- I can put small shapes together to form larger shapes.

Evidence	
Vocabulary • Square • Circle • Triangle • Hexagon • Rectangle • Cube • Cone • Cylinder • Sphere • 2-dimensional • 3-dimensional • Analyze • Compare • Orientation • Size	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • Attend to precision. • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
WORK WITH TIME AND MONEY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
K.MD.4. Name in sequence the days of the week.
K.MD.5. Tell time to the hour using both analog and digital clocks.
K.MD.6. Identify coins by name.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Time and money have specific attributes that help us organize our world.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Coins have specific names.
• Minutes, hours, and days are units that can be used to estimate and order time durations.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How does time help me organize my world?
• What is the purpose of money in my world?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• The days of the week are organized in a specific order.
• The short hand on an analog clock tells us the hour; the long hand shows us the minutes.
• The numbers on the left of the colon on the digital clock tells us the hour; the numbers on the right tell us the minutes.
• US coins can be differentiated by size, color, ridges, and images on the face.</td><td>Students will be skilled at…
• I can tell the days of the week in order.
• I can tell time to the hour using analog and digital clocks.
• I can identify a penny, nickel, dime, and quarter.</td></tr>
</table>

Evidence	
Vocabulary • Time • Analog clock • Digital clock • Penny • Nickel • Dime • Quarter • Day • Week • Sunday • Monday • Tuesday • Wednesday • Thursday • Friday • Saturday	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • Attend to precision. • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
KINDERGARTEN
Year at a Glance

This document provides a birds-eye view of the Kindergarten math “curriculum map.” Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the Kindergarten “curriculum map.”

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Time/Money**
Title	Building a Mathematical Community through Exploring Attributes	Numbers to 10	Comparing Quantities & Counting	Foundations of Place Value - Exploring Numbers 11-20	Composing and Decomposing Numbers to 10	Exploring Parts and Wholes with Addition and Subtraction	Identifying, Describing, Classifying, and Composing Shapes	Work with Time and Money
Duration	2-3 weeks	5-6 weeks	3-4 weeks	3-5 weeks	4-6 weeks	4-6 weeks	3-4 weeks	1-2 weeks
Content Standards	K.MD.3 K.G.1 K.MD.1 K.MD.2 K.OA.6	K.CC.4 K.CC.2 K.CC.3	K.CC.3 K.CC.4 K.CC.1 K.CC.5 K.CC.6 K.CC.7	K.NBT.1 K.CC.3 K.CC.1	K.OA.3 K.OA.4	K.OA.1 K.OA.2 K.OA.4 K.OA.5	K.G.2 K.G.3 K.G.4 K.G.5 K.G.6	K.MD.4 K.MD.5 K.MD.6
Practice Standards								

KPBSD MATH CURRICULUM
1st GRADE
UNIT 1 –USING NUMBERS TO EXPLORE OUR MATHEMATICAL COMMUNITY

Desired Results

Priority Standards

1.OA.9. Identify, continue, and label patterns (e.g., aabb, abab). Create patterns using numbers, shapes, sizes, rhythms, or colors.

Supporting Standards

1.CC.1. Skip count by 2s and 5s.
1.CC.2. Use ordinal numbers correctly when identifying object position (e.g., first, second, third, etc.).
1.CC.3. Order numbers from 1 - 100. Demonstrate ability in counting forward and backward.
1.CC.6. Estimate how many and how much in a given set to 20 and then verify estimate by counting.
1.NBT.1. Count to 120. In this range, read, write, and order numerals and represent a number of objects with a written numeral.

Transfer

Students will be able to independently use their learning to…
Build a community of mathematical problem solvers and explore how numbers are used in their world.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Numbers help us to understand and order our surroundings.
- Patterns help us organize and predict events in our world.
- Skip counting helps us count more efficiently.
- Counting verifies our estimation.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use numbers to make sense of my surroundings?
- What are different ways I can count efficiently?
- Why do I estimate?

Acquisition

Students will know…

- How to count to 120.
- How to write and order numbers to 120.
- How to count forward & backwards 1-100.
- How to estimate in a given set to 20 and count to verify the answer.

Students will be skilled at…

- I can count to 120.
- I can recognize number patterns.
- I can skip count by 2's and 5's.
- I can use ordinal numbers to identify an objects position correctly.
- I can count forward to 100 and backward from 100.
- I can create, identify, and label patterns.
- I can estimate a number within a set of 20 and count to verify.

Evidence	
Vocabulary • Number • Numeral • Quantity • Identify • Count on • Represent • One-to-one correspondence • Sequential	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM

1st GRADE

UNIT 2 –BUILDING A CONCEPTUAL UNDERSTANDING OF ADDITION AND SUBTRACTION

Desired Results

Priority Standards

1.OA.1. Use addition and subtraction strategies to solve word problems (using numbers up to 20), involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, using a number line (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

1.OA.6. Add and subtract using numbers up to 20, demonstrating fluency for addition and subtraction up to 10. Use strategies such as:

- Counting on.
- Making ten (8 + 6 = 8 + 2 + 4 = 10 + 4 = 14).
- Decomposing a number leading to a ten (13 - 4 = 13 - 3 - 1 = 10 - 1 = 9).
- Using the relationship between addition and subtraction, such as fact families, (8 + 4 = 12 and 12 - 8 = 4).
- Creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

Supporting Standards

1.OA.3. Apply properties of operations as strategies to add and subtract. (Students need not know the name of the property.)

Transfer

Students will be able to independently use their learning to…
Add and subtract to solve real-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There is a relationship between addition and subtraction.
- There are various strategies (properties of operation) that can be used to solve addition and subtraction problems.
- Numbers represent a value and symbols represent an operation.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are strategies I can use to solve addition and subtraction problems?
- How are addition and subtraction related?
- How do I determine if equations are true or false?

Acquisition

Students will know…

- Addition means combining to find the sum.
- Subtraction means taking away to find the difference.
- An equal sign represents balance on both sides of the equation, not “the answer is.”
- Properties of operations are strategies to add and subtract problems within 20.
- Addition and subtraction strategies.
- Addition and subtraction problems up to 10 fluently.
- There is a correlation between number and quantities.
- Addition and subtraction strategies to determine if an equation is true or false.

Students will be skilled at…

- I can add numbers up to 20 in many different ways.
- I can subtract numbers up to 20 in many different ways.
- I can use strategies to solve word problems.
- I can write an equation using the correct symbols to solve problems up to 20.
- I can fluently solve addition up to 10.
- I can fluently solve subtraction up to 10.
- I can determine whether an addition or subtraction number sentence is true or false.
- I can explain how the two sides of an equation are equal.

For example: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known (Commutative property of addition). To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12 (Associative property of addition). Demonstrate that when adding zero to any number, the quantity does not change (Identity property of addition). **1.OA.5.** Relate counting to addition and subtraction (e.g., by counting on 2 to add 2). **1.OA.7.** Understand the meaning of the equal sign (e.g., read equal sign as "same as") and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false?6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2).* **1.OA.8.** Determine the unknown whole number in an addition or subtraction equation. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 6 + 6 = ?, 5 = ? - 3.*		

Evidence	
Vocabulary • Add (+) • Subtract (-) • Solve • Compare • Sum • Difference • Equal (=) symbol • Strategies • Addition • Subtraction • Fluency • Balanced equation • Number sentence • True and false • Equation • Determine • Unknown • Whole number • Relating	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
1st GRADE
UNIT 3 – USING PLACE VALUE TO COMPARE NUMBERS

Desired Results

Priority Standards

1.OA.1. Use addition and subtraction strategies to solve word problems (using numbers up to 20), involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, using a number line (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.
1.CC.4. Count a large quantity of objects by grouping into 10s and counting by 10s and 1s to find the quantity.

Supporting Standards

1.NBT.1. Count to 120. In this range, read, write, and order numerals and represent a number of objects with a written numeral.
1.NBT.2. Model and identify place value positions of two digit numbers. Include:

a) 10 can be thought of as a bundle of ten ones, called a "ten".
b) The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
c) The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90, refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

1.NBT.3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, <.
1.CC.5. Use the symbols for greater than, less than, or equal to when comparing two numbers or groups of objects.

Transfer

Students will be able to independently use their learning to…
Use place value to compare and order numbers.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The base ten number system is based on groups of ten.
- The value of a digit in the base ten number system is determined by its place value position.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does a digit's placement determine its value?

Acquisition

Students will know…

- Digits are 0 to 9.
- The highest digit that any place can hold is nine.
- 100's, 10's and 1's can be represented with concrete materials.
- Numbers have place value.
- The meaning of greater than, less than, and equal when comparing numbers.
- Numbers are compared beginning with the highest place value.

Students will be skilled at…

- I can identify the ones digit, tens digit in a two-digit number.
- I can identify the value of each digit.
- I can use manipulatives or a picture to show the ones and tens in a two-digit number.
- I can compare two-digit numbers by looking at the tens and ones digits.
- I can use the symbols >, <, and = to compare 3-digit numbers.
- I can write numbers using place value.

KPBSD MATH CURRICULUM

1st GRADE

UNIT 3 – USING PLACE VALUE TO COMPARE NUMBERS

Evidence	
<u>Vocabulary</u> • Ones • Tens • Hundreds • Place value • Less than • Greater than • Equal to • Digit • Symbol • Compare	**<u>Mathematical Practices (Bolded practices are priority for this unit)</u>** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
1st GRADE
UNIT 4 – UNDERSTANDING MEASUREMENT AND DATA AS A CONTEXT TO COMPARE NUMBERS

Desired Results

Priority Standards

1.MD.1. Measure and compare three objects using standard or non-standard units.

1.MD.7. Organize, represent, and interpret data with up to three categories. Ask and answer comparison and quantity questions about the data.

Supporting Standards

1.MD.2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

1.CC.5. Use the symbols for greater than, less than, or equal to when comparing two numbers or groups of objects.

1.OA.2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20 (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

1.NBT.3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, <.

Transfer

Students will be able to independently use their learning to…
Compare information by collecting and analyzing data and measurements.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Measurement is a process of comparing units to the object being measured.
- Different units can be used to measure length.
- Data can be represented in a visual model.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can measurements be used to solve problems?
- How can the collection, organization, interpretation, and display of data be used to answer questions?
- How does the length of the unit of measure affect the number of units needed to measure an object's length?

Acquisition

Students will know…

- Data can be created, collected, and analyzed.
- Objects can be compared.
- The length of an object is the number of same-size units that span its length with no gaps end to end.
- Objects can be compared and ordered according to length.
- Nonstandard units can be used to estimate and measure length.

Students will be skilled at…

- I can order three objects by length.
- I can compare the lengths of the two objects by using a third object.
- I can express how many units long an object is.
- I can organize, represent, and interpret data with up to three categories.

Evidence	
Vocabulary • Measure • Length • Standard • Non-standard • End-to-end • Overlaps • Gaps • Picture graph • Bar graph • Data • Tally mark • Table • Chart	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
1st GRADE
UNIT 5 – OPERATING WITH PLACE VALUE

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
1.NBT.4. Add using numbers up to 100 including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10. Use:
• Concrete models or drawings and strategies based on place value.
• Properties of operations.
• And/or relationship between addition and subtraction.
Relate the strategy to a written method and explain the reasoning used. Demonstrate in adding two-digit numbers, tens and tens are added, ones and ones are added and sometimes it is necessary to compose a ten from ten ones.
1.NBT.6. Subtract multiples of 10 up to 100. Use:
• Concrete models or drawings.
• Strategies based on place value.
• Properties of operations.
• And/or the relationship between addition and subtraction.
Relate the strategy to a written method and explain the reasoning used.
1.OA.1. Use addition and subtraction strategies to solve word problems (using numbers up to 20), involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, using a number line (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Use place value to solve real-world problems.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Our number system is based on groups of ten.
• The value of a digit in our number system is determined by its place value position.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• Why does place value matter when adding and subtracting?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Digits are 0 through 9.
• The highest digit that any place can hold is nine.
• How to add two-digit numbers.
• Numbers have place value.
• A variety of strategies can be used to solve addition and subtraction problems.
• Equations represent problems in a numerical form.</td><td>Students will be skilled at…
• I can use objects or drawings and explain how I solved a 2-digit addition problem.
• I can mentally add 10 to any 1- or 2-digit number.
• I can mentally subtract 10 from any 2-digit number.
• I can write numbers using place value.
• I can explain why I used a strategy to solve a problem.
• I can determine if an equation is true or false.
• I can add two numbers in any order to get the same sum.
• I can accurately align numbers according to place value to add and subtract.</td></tr>
</table>

Supporting Standards		
1.CC.4. Count a large quantity of objects by grouping into 10s and counting by 10s and 1s to find the quantity. **1.NBT.5.** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **1.OA.3.** Apply properties of operations as strategies to add and subtract. (Students need not know the name of the property.) *For example, If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known (Commutative property of addition). To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12 (Associative property of addition). Demonstrate that when adding zero to any number, the quantity does not change (Identity property of addition).* **1.OA.7.** Understand the meaning of the equal sign (e.g., read equal sign as "same as") and determine if equations involving addition and subtraction are true or false. *For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2).*		

Evidence	
Vocabulary • Subtraction • Addition • Place value • Multiples of 10 • Number sentence • True • False • Sum • Difference • Add (+) • Subtract (-) • Equal Symbol (=) • Solve • Fact Families • Compare	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM

1st GRADE

UNIT 6 – DISTINGUISHING, COMPOSING, AND PARTITIONING SHAPES

Desired Results

Priority Standards

1.G.3. Partition circles and rectangles into two and four equal shares. Describe the shares using the words halves, fourths, and quarters and phrases half of, fourth of, and quarter of. Describe the whole as two of or four of the shares. Understand for these examples that decomposing (break apart) into more equal shares creates smaller shares.

Supporting Standards

1.G.1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes. Identify shapes that have non-defining attributes (e.g., color, orientation, overall size). Build and draw shapes given specified attributes.

1.G.2. Compose (put together) two-dimensional or three-dimensional shapes to create a larger, composite shape, and compose new shapes from the composite shape.

Transfer

Students will be able to independently use their learning to…
Identify, describe, classify and compose shapes based on their attributes.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Shapes have attributes and characteristics that define them.
- Composite shapes are formed by combining shapes based on attributes.
- A shape can be decomposed by partitioning.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is the difference between defining and non defining attributes?
- How can a shape be divided into equal parts?
- How can I break a shape into smaller shapes?
- How can I use smaller shapes to make a new shape?
- What is the difference between a 2-dimensional and 3-dimensional shape?

Acquisition

Students will know…

- Shapes may or may not have non-defining attributes.
- 2D or 3D shapes can be used to make composite shapes.
- Shapes can be broken apart into other shapes.
- Shapes can be divided into smaller, equal parts.

Students will be skilled at…

- I can identify the attributes of shapes.
- I can build shapes using specific attributes.
- I can compose shapes using smaller 2D and 3D shapes.
- I can use manipulatives to make shapes.
- I can name the equal shares of a shape.
- I can break apart a circle or rectangle into smaller shares that are equal.

Evidence	
Vocabulary • Defining attributes • Non-defining attributes • Similarities • Differences • Build • Draw • Compare • Sort • 2-D shapes • 3-D shapes • Composite shapes • Equal • Circle • Rectangle • Shares • Halves • Fourths • Quarters • Wholes • Decompose • Divide	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
1st GRADE
UNIT 7 – TELLING TIME TO THE HALF HOUR

Desired Results

Priority Standards
1.MD.3. Tell and write time in half hours using both analog and digital clocks.
1.MD.4. Read a calendar distinguishing yesterday, today, and tomorrow. Read and write a date.

Supporting Standards
1.CC.1. Skip count by 2s and 5s.

Transfer
Students will be able to independently use their learning to…
Read time and use it to answer questions about their world.

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…
- Minutes, hours, and days are units that can be used to estimate and order time durations.
- Reading a calendar helps us tell a longer measurement of time.
- Writing dates help us organize our information.

ESSENTIAL QUESTIONS
Students will keep considering…
- Why do I need to tell time?
- What are ways time is represented?
- What are the different ways to estimate time?

Acquisition
Students will know…
- Minutes and hours are represented by the hands on an analog clock or the numbers on a digital clock.
- The relationship between the hour and minutes.
- A calendar is used to tell time.
- The different ways to write the date.

Students will be skilled at…
- I can tell and write time in hours and half-hours using analog and digital clocks.
- I can read the date and identify the month, day, and year.
- I can write the date.
- I can read a calendar and tell today, yesterday, and tomorrow.

Evidence	
Vocabulary • Hour • Minute • Second • Half hour • Clock face • Minute hand • Hour hand • Second hand • Analog • Digital	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
1st GRADE
UNIT 8 – DEVELOPING FLEXIBILITY WITH NUMBERS

Desired Results

Priority Standards

1.OA.1. Use addition and subtraction strategies to solve word problems (using numbers up to 20), involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, using a number line (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

1.OA.6. Add and subtract using numbers up to 20, demonstrating fluency for addition and subtraction up to 10. Use strategies such as:

- Counting on.
- Making ten (8 + 6 = 8 + 2 + 4 = 10 + 4 = 14).
- Decomposing a number leading to a ten (13 - 4 = 13 - 3 - 1 = 10 - 1 = 9).
- Using the relationship between addition and subtraction, such as fact families, (8 + 4 = 12 and 12 - 8 = 4).
- Creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

Supporting Standards

1.OA.2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20 (e.g., by using

Transfer

Students will be able to independently use their learning to…
Use addition and subtraction to solve real-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Real-world problems can be solved using addition and subtraction.
- There are various strategies (properties of operation) that can be used to solve addition and subtraction problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are strategies I can use to solve addition and subtraction problems?
- What symbols do I use to write problems?
- How can I express unknown values?

Acquisition

Students will know…

- Equations for addition or subtraction word problems can have unknown values in different positions.
- Explain how equations represent an addition or subtraction word problem.
- Solve word problems with unknown numbers in different positions.
- Know strategies to find sums and differences.
- Addition and subtraction word problems can be represented using objects and drawings.

Students will be skilled at…

- I can use models to explain addition and subtraction.
- I can draw pictures to show addition and subtraction.
- I can write number sentences to show addition and subtraction.
- I can solve addition problems to 20 in many different ways.
- I can solve subtraction problems to 20 in many different ways.
- I can use a variety of mental math strategies to solve addition and subtraction problems.

objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem. **1.OA.3.** Apply properties of operations as strategies to add and subtract. (Students need not know the name of the property.) *For example: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known (Commutative property of addition). To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12 (Associative property of addition). Demonstrate that when adding zero to any number, the quantity does not change (Identity property of addition).* **1.OA.4.** Understand subtraction as an unknown-addend problem. *For example, subtract 10 - 8 by finding the number that makes 10 when added to 8.* **1.OA.8.** Determine the unknown whole number in an addition or subtraction equation. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 6 + 6 = ?, 5 = ? - 3.*		

Evidence	
<u>**Vocabulary**</u> • Sum • Equal • Symbol • Unknown • Addend • Equation • Addition • Subtraction • Fluency • Strategies	<u>**Mathematical Practices (Bolded practices are priority for this unit)**</u> • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
1^{st} GRADE
MONEY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
1.MD.5. Recognize and read money symbols including $ and ¢.
1.MD.6. Identify values of coins (e.g., nickel = 5 cents, quarter = 25 cents). Identify equivalent values of coins up to $1 (e.g., 5 pennies = 1 nickel, 5 nickels = 1 quarter).
1.CC.1. Skip count by 2s and 5s.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Correctly identifying US coins helps us manage our finances.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Coins have specific values.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How can I represent the value of money?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• The values of quarters, dimes, nickels, pennies, and dollars.
• The appropriate way to show dollars and cents using the $ and ¢ symbols.</td><td>Students will be skilled at…
• I can identify pennies, nickels, dimes, and quarters.
• I know the value of pennies, nickels, dimes, and quarters.
• I can count the value of pennies, nickels, dimes, and quarters.
• I can recognize that ¢ represents cents and $ represents dollars.
• I can put various coins together to create equivalent values.</td></tr>
</table>

<table>
<tr><th colspan="2">Evidence</th></tr>
<tr><td><u>Vocabulary</u>
• Number
• Numeral
• Quantity
• Identify
• Count on
• Represent
• One-to-one correspondence
• Sequential</td><td><u>Mathematical Practices (Bolded practices are priority for this unit)</u>
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Construct viable arguments and critique the reasoning of others.
• Model with mathematics.
• Use appropriate tools strategically.
• Attend to precision.
• Look for and make use of structure.
• Look for and express regularity in repeated reasoning.</td></tr>
</table>

KPBSD MATH CURRICULUM
1^{st} GRADE
Year at a Glance

This document provides a birds-eye view of the First Grade math "curriculum map." Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the First Grade "curriculum map."

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Money**
Title	Using Numbers to Explore Our Mathematical Community	Building a Conceptual Understanding of Addition and Subtraction	Using Place Value to Compare Numbers	Understanding Measurement and Data as a Context to Compare Numbers	Operating with Place Value	Distinguishing, Composing, and Partitioning Shapes	Telling Time to the Half Hour	Developing Flexibility with Numbers	Money
Duration	3-4 Weeks	3-4 Weeks	4-6 Weeks	3-4 Weeks	4-6 Weeks	3 Weeks	3 Weeks	3 Weeks	1-2 Week
Content Standards	1.OA.9 1.CC.1 1.CC.2 1.CC.3 1.CC.6 1.NBT.1	1.OA.1 1.OA.6 1.OA.2 1.OA.3 1.OA.5 1.OA.7 1.OA.8	1.OA.1 1.CC.4 1.CC.5 1.NBT.1 1.NBT.2 1.NBT.3	1.MD.1 1.MD.7 1.CC.5 1.OA.2 1.MD.2 1.NBT.3	1.NBT.4 1.NBT.6 1.OA.1 1.CC.4 1.NBT.5 1.OA.3 1.OA.7	1.G.3 1.G.1 1.G.2	1.MD.3 1.MD.4 1.CC.1	1.OA.1 1.OA.6 1.OA.8 1.OA.2 1.OA.3 1.OA.4	MD.6 MD.5 1.CC.1
Practice Standards									

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 1 – BUILDING A MATHEMATICAL COMMUNITY – ADDING AND SUBTRACTING WITHIN 20

Desired Results

Priority Standards

2.OA.2. Fluently add and subtract using numbers up to 20 using mental strategies. Know from memory all sums of two one-digit numbers.

Supporting Standards

2.OA.3. Determine whether a group of objects (up to 20) is odd or even (e.g., by pairing objects and comparing, counting by 2s). Model an even number as two equal groups of objects and then write an equation as a sum of two equal addends.

2.MD.6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1,2, …, and represent whole-number sums and differences within 100 on a number line diagram.

Transfer

Students will be able to independently use their learning to…
Build a community of mathematical problem solvers and develop conceptual understanding of addition and subtraction.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Being a member of a positive classroom community boosts memory, promotes deeper reasoning, fosters language development and supports the development of social skills.
- There are many strategies to assist with problem solving and mental computation.
- Mental strategies are more efficient than counting.
- When using a number line the distance between the numbers is what is being “counted” (iteration) rather than counting the tick marks.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I contribute to a positive and respectful math community?
- How can I add and subtract to twenty using mental math strategies?
- How do I determine if a number is odd or even and demonstrate it?

Acquisition

Students will know…

- That fluency is flexible, efficient, and accurate thinking using multiple strategies.
- Even numbers can be shared fairly into two equal groups.
- Odd numbers will have one left over when sharing the number into two equal groups.
- A number line diagram represents whole numbers as lengths within it.

Students will be skilled at…

- I can fluently add and subtract numbers up to 20 using mental math strategies.
- I can write an equation express an even number as a sum of two equal addends.
- I can demonstrate partitioning in relation to length.
- I can build a number line diagram and represent whole numbers as lengths within it.
- I can pair objects and then count them by 2’s to explore concepts of even and odd.

KPBSD MATH CURRICULUM

2nd GRADE

UNIT 1 – BUILDING A MATHEMATICAL COMMUNITY – ADDING AND SUBTRACTING WITHIN 20

Evidence	
Vocabulary • Fact family • Doubles • Left overs • Remainder • Odd • Even	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 2 – ADDING AND SUBTRACTING WITHIN 100

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="5">Priority Standards
2.OA.1. Use addition and subtraction strategies to estimate, then solve one- and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.
2.NBT.2. Count up to 1000, skip-count by 5s, 10s, and 100s.
2.NBT.8. Mentally add 10 or 100 to a given number 100-900 and mentally subtract 10 or 100 from a given number.
Supporting Standards
2.NBT.5. Fluently add and subtract using numbers up to 100.
Use:
● Strategies based on place value.
● Properties of operations.
● And/or the relationship between addition and subtraction.
2.NBT.6. Add up to four two-digit numbers using strategies based on place value and properties of operations.
2.NBT.9. Explain or illustrate the processes of addition or subtraction and their relationship using place value and the properties of operations.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve real-world problems using addition or subtraction.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• The value of a digit in our number system is determined by its place value position.
• There is a relationship between addition and subtraction. (Fact families).
• A variety of strategies can be used to solve addition and subtraction problems.
• Regrouping is redistributing place value.
• Base ten blocks represent place value and place value is how much a number is worth.
• Vertically-arranged number sentences need to be aligned by place value.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do I regroup?
• When do I regroup?
• What strategies can I use to add and subtract within 100?
• How are addition and subtraction related?
• How can estimation be used to check my thinking?</td></tr>
<tr><td colspan="2">Acquisition
</td></tr>
<tr><td></td><td>Students will know…
• Fact families show relationships between adding and subtracting.
• Decomposing and composing 10s help solve problems.
• The properties of different operations.
• There are a variety of strategies to solve addition and subtraction problems.
• Place value can be used to solve mental math problems.
• Estimation can be used to check the reasonableness of an answer.</td><td>Students will be skilled at…
• I can add and subtract numbers to 100 quickly and accurately.
• I can add and/or subtract to solve one-step word problems using objects, drawings, and equations.
• I can add and/or subtract to solve two-step word problems using objects, drawings, and equations.
• I can model regrouping using manipulatives.
• I can show how the properties are related.</td></tr>
</table>

2.MD.6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1,2, …, and represent whole-number sums and differences within 100 on a number line diagram.		• I can add 10 to any number up to 100 in my head without counting. • I can subtract 10 from any number within 100 in my head without counting. • I can use a number line diagram to represent a sum or difference within 100. • I can estimate to check if my answer is reasonable.

Evidence

Vocabulary • Skip count • Repeated pattern • Fact families • Place value • Regrouping • Properties of operations • Expanded form • Addition and subtraction strategies • Fluency • Add • Subtract	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 3 – SKIP COUNTING IN MULTIPLE CONTEXTS

Desired Results

Priority Standards

2.OA.4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns. Write an equation to express the total as repeated addition (e.g., array of 4 by 5 would be 5 + 5 + 5 + 5 = 20).
2.NBT.2. Count up to 1000, skip-count by 5s, 10s, and 100s.
2.MD.7. Tell and write time to the nearest five minutes using a.m. and p.m. from analog and digital clocks.

Supporting Standards

2.OA.5. Identify, continue, and label number patterns (e.g., aabb, abab). Describe a rule that determines and continues a sequence or pattern.

Transfer

Students will be able to independently use their learning to…
Recognize patterns and connections in math.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- A rectangular array is any arrangement of things in rows and columns. Rectangular arrays (with repeated addition) is a building block for multiplication.
- Skip counting by 5s and telling time to the nearest five minutes on an analog clock are connected.
- The pattern created when skip counting helps solve problems more efficiently.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use models to solve problems?
- How are skip counting and telling time related?
- How do I describe a rule that determines and continues a number pattern?

Acquisition

Students will know…

- Equations can be used to express the total as a sum of equal addends modeled with an array.
- Skip counting by 5's, 10's, and 100's to 1000.
- How to tell time on both analog and digital clocks to the nearest five minutes.
- Number patterns are used as a strategy to solve problems.

Students will be skilled at…

- I can create a model array using various objects.
- I can skip count by 5's, 10's, and 100's to 1000.
- I can tell time (both clocks) to the nearest 5 minutes.
- I can identify, continue, and label number patterns.

KPBSD MATH CURRICULUM
2^{nd} GRADE
UNIT 3 – SKIP COUNTING IN MULTIPLE CONTEXTS

Evidence	
Vocabulary • Row • Column • Skip counting • Array • Hour • Minute • Clock • Digital clock • Analog clock	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM

2^{nd} GRADE

UNIT 4 – UNDERSTANDING PLACE VALUE TO READ, WRITE, AND COMPARE NUMBERS

Desired Results

Priority Standards

2.NBT.1. Model and identify place value positions of three digit numbers.
Include:

a. 100 can be thought of as a bundle of ten tens - called a "hundred".
b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

2.NBT.2. Count up to 1000, skip-count by 5s, 10s, and 100s.

Supporting Standards

2.NBT.3. Read, write, order up to 1000 using base-ten numerals, number names, and expanded form.
2.NBT.4. Compare two three-digit numbers based on the meanings of the hundreds, tens, and ones digits, using >, =, < symbols to record the results.
2.NBT.9. Explain or illustrate the processes of addition or subtraction and their relationship using place value and the properties of operations.

Transfer

Students will be able to independently use their learning to…
Use place value to read, write, compare, and order numbers.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Our number system is based on groups of ten.
- The value of a digit in our number system is determined by its place value position.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does a digit's place affect its order?

Acquisition

Students will know…

- The highest digit that any place can hold is nine.
- Concrete materials can represent 100's, 10's, and 1's.
- Numbers have place value.
- Numbers can be written in expanded and word form.
- The meaning of greater than, less than, and equal when comparing numbers.
- Each digit within a number has an independent value, that when added, creates the number's overall value.
- Numbers are compared beginning with the highest place value.

Students will be skilled at…

- I can identify the ones digit, tens digit, and hundreds digit in a three-digit number.
- I can identify the value of each digit.
- I can use manipulatives or a picture to show the ones, tens, and hundreds in a three-digit number.
- I can compare 3-digit numbers by looking at the hundreds, tens, and ones digits.
- I can read numbers up to 1,000 in standard form, word, form, and expanded form.
- I can write numbers up to 1,000 in expanded form, standard form, and word form.
- I can use the symbols >, <, and = to compare 3-digit numbers.

Evidence	
Vocabulary • Place value • Value • Digit • Ones • Tens • Hundreds • Greater than • Less than • Equal to	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 5 – ADDING AND SUBTRACTING WITHIN 1000

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
2.OA.1. Use addition and subtraction strategies to estimate, then solve one- and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart and comparing, with unknowns in all positions (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.
2.NBT.2. Count up to 1000, skip-count by 5s, 10s, and 100s.
2.NBT.7. Add and subtract using numbers up to 1000.
Use:
• Concrete models or drawings and strategies based on place value.
• Properties of operations.
• And/or relationship between addition and subtraction.
Relate the strategy to a written method and explain the reasoning used.
Demonstrate in adding or subtracting three-digit numbers, hundreds and hundreds are added or subtracted, tens and tens are added or subtracted, ones and ones are added or subtracted and sometimes it is necessary to compose a ten from ten ones or a hundred from ten tens.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve real-world problems using addition or subtraction.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Numbers in the 10s and 100s place values can be composed and decomposed to solve addition and subtraction problems within 1000.
• There is a relationship between addition and subtraction. (Fact families).
• A variety of strategies can be used to solve addition and subtraction problems.
• Regrouping is redistributing place value.
• Base ten blocks represent place value and place value is how much a number is worth.
• Vertically-arranged number sentences need to be aligned by place value.
• Each digit in a three-digit number has a specific place value.
• The ability to add and subtract by 10 and 100 mentally is essential to efficient problem solving.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do I regroup?
• When do I regroup?
• What strategies can I use to add and subtract within 1000?
• How are addition and subtraction related?
• How can estimation be used to check my thinking?</td></tr>
</table>

<table>
<tr><td rowspan="2">2.NBT.8. Mentally add 10 or 100 to a given number 100-900 and mentally subtract 10 or 100 from a given number.
Supporting Standards
2.NBT.6. Add up to four two-digit numbers using strategies based on place value and properties of operations.
2.NBT.9. Explain or illustrate the processes of addition or subtraction and their relationship using place value and the properties of operations.</td><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
Fact families show relationships between adding and subtracting.
Decomposing and composing 10s and 100s help solve problems.
The properties of different operations.
There are a variety of strategies to solve addition and subtraction problems.
Place value can be used to solve mental math problems (e.g. making groups of 10).
Estimation can be used to check the reasonableness of an answer.
Inverse operations can be used to solve for an unknown number.
Adding and subtracting by 10s and 100s has a predictable pattern that can be found by skip counting.</td><td>Students will be skilled at…
I can show the relationship between addition and subtraction properties.
I can add and subtract numbers to 1000 in many ways using a strategy, model, or drawing that makes sense to me.
I can use place value understanding to regroup when adding or subtracting if I need to.
I can record and explain my thinking.
I can add up to 4 two-digit numbers using many strategies.
I can add 10 or 100 to any number from 100-900 in my head without counting.
I can subtract 10 or 100 from any number from 100-900 in my head without counting.
I can show, draw, or explain the strategies I use to solve addition and subtraction problems.
I can estimate to check if my answer is reasonable.
I can explain how to find an unknown number.
I can add and/or subtract to solve two-step word problems using objects, drawings, and equations.</td></tr>
</table>

Evidence	
Vocabulary • Basic facts • Place value • Properties of operations • Regrouping • Fact families • Fluently • Strategies • Expanded form • Digit • Add • Concrete • Decompose numbers • Compose numbers • Skip count • Mental math • Estimate	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM

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UNIT 6 – LINEAR MEASUREMENT

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
2.MD.3. Estimate, measure, and draw lengths using whole units of inches, feet, yards, centimeters, and meters.
2.MD.4. Measure to compare lengths of two objects, expressing the difference in terms of a standard length unit.
2.MD.5. Solve addition and subtraction word problems using numbers up to 100 involving length that are given in the same units (e.g., by using drawings of rulers). Write an equation with a symbol for the unknown to represent the problem.
Supporting Standards
2.MD.1. Measure the length of an object by selecting and using standard tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2.MD.2. Measure the length of an object twice using different length units for the two measurements. Describe how the two measurements relate to the size of the unit chosen.
2.MD.6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1,2, …, and represent whole-number sums and differences within 100 on a number line diagram.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Recognize that objects are measurable and apply that understanding to problem solve.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Attributes are measurable.
• Measurement is a process of comparing a unit to the object being measured.
• Measurement is a consistent duration and distance.
• The length of objects can be measured using customary &/or metric units.
• The same unit of measure needs to be used in order to compare lengths.
• A ruler, yardstick, and a meter stick are special types of number lines that are used for linear measurement.
• What I am measuring determines the unit I use to measure.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How is measurement used in the real-world?
• How can I compare measurements?
• What makes a reasonable estimate?
• Why do I need to be able to estimate a measurement or value?
• Why are there standardized units of measure?
• How can I decide on appropriate units of measurement, and what tools to use?
• How does accuracy affect measurement?</td></tr>
</table>

	Acquisition	
	Students will know… • Lengths of objects can be estimated using personal benchmarks in relation to a standard unit and explain and justify their length estimates. • Addition and subtraction can be used to determine the difference of two objects' lengths or the combination of the length of two objects that do not overlap. • Addition and subtraction (within 100) solve word problems involving lengths that are given in the same units (ie – such as drawings of rulers, etc.). • Whole numbers can be represented as lengths on a number line diagram. The length of any object can be used as a measurement unit for length, but a standard unit is always the same length.	Students will be skilled at… • I can compare lengths of two objects and determine how much longer one object is than the other using a standard unit of measure. • I can measure lengths of objects using appropriate tools. • I can add and subtract within 100 to solve word problems involving lengths using a symbol to represent the unknown number. • I can estimate and measure length using standard units of measurement. • I can create a reasonable estimate that is close to the actual measurement. • I can measure one object using two different units of measurement. • I can compare two different units of measurement of one object. • I can to represent, solve, and justify solutions to addition and subtraction problems within 100.

Evidence	
Vocabulary • Standard Units of Measure • Unit • Length • Centimeter (cm) • Meter • Inch • Foot • Yard • Width • Height	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 7 – DATA AND TWO-STEP PROBLEM SOLVING

Desired Results

Priority Standards

2.MD.9. Collect, record, interpret, represent, and describe data in a table, graph, or line plot.

2.OA.1. Use addition and subtraction strategies to estimate, then solve one- and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

Supporting Standards

2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Transfer

Students will be able to independently use their learning to…
Collect, represent, and analyze data to solve problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Data can be displayed visually and organized in different ways.
- Each type of graph is most appropriate for certain kinds of data.
- Inferences can be made based on data to solve problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are some ways data can be organized?
- How can I decide what type of graph to use once I have collected data?
- How is data used in the real-world?

Acquisition

Students will know…

- Graphs make it easy to compare and understand data.
- Line plots are useful tools for collecting data because they show the number of things along a numeric scale.
- A number line has evenly spaced points corresponding to the numbers.

Students will be skilled at…

- I can collect and display data on a line plot.
- I can draw a picture and/or bar graph to represent a given a set of data.
- I can measure lengths accurately and show the data using a line plot.
- I can interpret data from graphs to solve simple word problems.

Evidence	
Vocabulary • Bar graph • Data • Symbol • Pictograph • Categorical data • Numerical data • Line plot • Picture graph • Scale • Set	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 8 – PROBLEM SOLVING WITH MONEY

Desired Results

Priority Standards
2.MD.8. Solve word problems involving dollar bills and coins using the $ and ¢ symbols appropriately.

Supporting Standards
2.OA.1. Use addition and subtraction strategies to estimate, then solve one- and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions (e.g., by using objects, drawings, and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

Transfer
Students will be able to independently use their learning to…
Use addition and subtraction to solve real-world finance problems.

Meaning

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Students will understand that… • Coins and dollars have specific values. • Estimation can be used to check the reasonableness of an answer.	Students will keep considering… • How can I solve problems involving money? • How can I represent the value of money?

Acquisition

Students will know… • The values of quarters, dimes, nickels, pennies, and dollars. • The appropriate way to show dollars and cents using the $ and ¢ symbols. • Addition and subtraction can solve money problems.	Students will be skilled at… • I can count money to solve word problems. • I can add and subtract to solve word problems involving money. • I can use estimation to check the reasonableness of an answer. • I can write monetary values using the $ and ¢ symbols.

Evidence

Vocabulary
- Dollar
- Penny
- Cent
- Quarter
- Nickel
- Dime
- Symbol

Mathematical Practices (Bolded practices are priority for this unit)
- **Make sense of problems and persevere in solving them.**
- **Reason abstractly and quantitatively.**
- Construct viable arguments and critique the reasoning of others.
- **Model with mathematics.**
- Use appropriate tools strategically.
- **Attend to precision.**
- **Look for and make use of structure.**
- Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
2nd GRADE
UNIT 9 – REASONING WITH SHAPES

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
2.G.1. Identify and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces compared visually, not by measuring. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.
2.G.2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
2.G.3. Partition circles and rectangles into shares, describe the shares using the words halves, thirds, half of, third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Reason about shapes based on their attributes and the equal shares they can be partitioned into.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• A shape’s attributes help identify it.
• A shape can be partitioned into equal shares.
• The inside of a rectangle can be measured.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How can I describe and analyze shapes by examining their attributes?
• When would you need to partition a shape?
• How do I describe the equal shares of a partitioned shape?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Shapes have defining attributes.
• Circles and rectangles can be partitioned to show equal parts of a whole.
• Equal shares of identical wholes need not have the same shape.</td><td>Students will be skilled at…
• I can identify triangles, quadrilaterals, pentagons, hexagons, and cubes.
• I can draw shapes with specific attributes, including faces and angles.
• I can partition a rectangle into rows and columns of equal-sized squares and count them.
• I can partition circles and rectangles into halves, thirds, and fourths.
• I can explain why equal shares of identical wholes may not have the same shape.</td></tr>
</table>

Evidence	
<u>**Vocabulary**</u> • Attributes • Angles • Faces • Triangles • Quadrilaterals • Pentagons • Hexagons • Cubes • Partition • Rows • Columns • Shares • Halves • Thirds • Fourths	<u>**Mathematical Practices (Bolded practices are priority for this unit)**</u> • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
2^{ND} GRADE
Year at a Glance

This document provides a birds-eye view of the Second Grade math “curriculum map.” Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the Second Grade “curriculum map.”

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Title	Building a Mathematical Community - Adding and Subtracting within 20	Adding and Subtracting within 100	Skip Counting in Multiple Contexts	Understanding Place Value to Read, Write, and Compare Numbers	Adding and Subtracting within 1,000	Linear Measurement	Data & Two-Step Problem-Solving	Problem-Solving with Money	Reasoning with Shapes
Duration	3-4 weeks	5-6 weeks	1-2 weeks	4-5 weeks	4-5 weeks	2-3 weeks	1-2 weeks	1-2 weeks	2-3 weeks
Content Standards	2.OA.2 2.OA.3 2.MD.6	2.OA.1 2.NBT.2 2.NBT.8 2.NBT.5 2.NBT.6 2.NBT.9 2.MD.6	2.OA.4 2.NBT.2 2.MD.7 2.OA.5	2.NBT.1 2.NBT.2 2.NBT.3 2.NBT.4 2.NBT.9	2.OA.1 2.NBT.2 2.NBT.7 2.NBT.8 2.NBT.6 2.NBT.9	2.MD.3 2.MD.4 2.MD.5 2.MD.1 2.MD.2 2.MD.6	2.MD.9 2.OA.1 2.MD.10	2.MD.8 2.OA.1	2.G.1 2.G.2 2.G.3
Practice Standards									

KPBSD MATH CURRICULUM

3rd GRADE

UNIT 1 – BUILDING A MATHEMATICAL COMMUNITY THROUGH THE UNDERSTANDING OF EQUAL GROUPS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
3.OA.1. Interpret products of whole numbers (e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each). For example, show objects in rectangular arrays or describe a context in which a total number of objects can be expressed as 5 × 7.
3.OA.2. Interpret whole number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). For example, deconstruct rectangular arrays or describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.
3.OA.3. Use multiplication and division numbers up to 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).
3.OA.9. Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Build a community of mathematical problem solvers and develop conceptual understanding of multiplication and division.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Objects of equal groups can be arranged to find the product.
• An expression can be put into context (3x5 is the same as three groups of five).
• There is a relationship between real-world problems (that deal with equal groups, arrays, and measurement quantities) and multiplication and division.
• Mathematical situations can be represented with a model.
• Patterns are created and extended.
• There is a relationship between properties of operations (example: multiplication is repeated addition).</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do multiplication and division solve real-world problems? (eg: word problems and performance tasks)
• What are ways recognizing patterns help me solve problems?
• How do I build a community of mathematical problem solvers?
• In what ways is an array related to equal groups?
• How do the properties of multiplication help me understand patterns?
• How is multiplication related to division?
• What are ways I illustrate and explain multiplication and division problems?</td></tr>
</table>

KPBSD MATH CURRICULUM
3^{rd} GRADE
UNIT 1 – BUILDING A MATHEMATICAL COMMUNITY THROUGH THE UNDERSTANDING OF EQUAL GROUPS

	Acquisition	
	Students will know… • Strategies to model story problems using arrays and repeated addition. • The concept of division that involve unknown number groups or size of the group. • The relationship between multiplication and division. • Multiplication facts with 2, 5, and 10 as a factor. • Ways to communicate and share their reasoning and solutions.	Students will be skilled at… • I can arrange objects (blocks, arrays, pictures, number lines, chips, cubes, and so on) into equal groups and understand the product. • I can write an equation about the equal groups I made. • I can make a model showing the equation I made. • I can describe a context for a number expression. • I can start with a set of objects and divide into equal shares. • I can write an equation about the equal groups I made. • I can make a model showing the equation I made. • I can solve multiplication and division word problems using different strategies like models, arrays, drawings, or equations. • I can use a symbol for an unknown amount when I write an equation. • I can see patterns in a group of numbers. • I can explain patterns using properties of operations (addition, subtraction, multiplication, division).

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priority for this unit)
• Equal groups • Factors • Product • Quotient • Expression • Equations • Symbols • Measurement quantities • Arrays • Multiplication • Division • Arithmetic pattern • Properties of operations • Addition • Subtraction • Even and odd • Compose and decompose numbers	• **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • **Look for and express regularity in repeated reasoning.**

Learning Plan

Cluster 1

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 2 – PROBLEM SOLVING WITH DATA

Desired Results

Priority Standards

3.MD.4. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. *For example draw a bar graph in which each square in the bar graph might represent 5 pets.*

Supporting Standards

3.MD.6. Explain the classification of data from real-world problems shown in graphical representations. Use the terms minimum and maximum. (Local Standard)

3.OA.8. Solve and create two-step word problems using any of the four operations. Represent these problems using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

3.NBT.2. Use strategies and/or algorithms to fluently add and subtract with numbers up to 1000, demonstrating understanding of place value, properties of operations, and/or the relationship between addition and subtraction.

Transfer

Students will be able to independently use their learning to…
Collect, represent, and analyze data to answer interpretive questions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Data can be represented in bar, picture, and line graphs & plots.
- Data can be used to solve problems.

ESSENTIAL QUESTIONS

Students will keep considering…
- How do I ask questions that involve categories and collect data about those questions?
- What are ways I can represent the data in picture or bar graphs?
- How do I interpret data displayed in a picture or bar graphs?
- How do I use addition, subtraction, and multiplication to solve one and two-step "how many more" and "how many less" problems?

Acquisition

Students will know…
- Strategies to represent and interpret scaled picture and bar graphs.
- Ways to collect data by asking a question that yields data.
- Data can be represented in graphs.
- Graphs help us interpret and analyze data.
- Strategies to solve one and two-step "how many more" and "how many less" problems using information from these graphs.

Students will be skilled at…
- I can draw a scaled picture graph to represent data.
- I can draw a scaled bar graph to represent data.
- I can draw a line graph and plot.
- I can solve problems using the graph data.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priorities for this unit)
• Data • Bar Graph • Picture Graph • Scale	• **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 3 – ADDITION AND SUBTRACTION STORIES

Desired Results

Priority Standards

3.OA.8. Solve and create two-step word problems using any of the *four operations**. Represent these problems using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

3.NBT.2. Use strategies and/or algorithms to fluently add and subtract with numbers up to 1000, demonstrating understanding of place value, properties of operations, and/or the relationship between addition and subtraction.

**This unit focuses on addition and subtraction only.*

Supporting Standards

3.NBT.1. Use place value understanding to round whole numbers to the nearest 10 or 100.

Transfer

Students will be able to independently use their learning to…
Identify real-world problems and use addition and subtraction to solve them.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There are many strategies for solving addition and subtraction problems.
- Numbers can be added or subtracted according to place value.
- There is a relationship between addition and subtraction and it can be used to solve problems.
- Estimating and rounding are efficient strategies to check answers.

ESSENTIAL QUESTIONS

Students will keep considering…

- What strategies enable me to solve problems?
- How do I use place value and the properties of operations to perform multi digit arithmetic?

Acquisition

Students will know…

- Strategies to formulate the equation(s) that matches the word problem.
- Variables are inserted to represent an unknown number.
- Strategies to solve the equation(s).
- Mental math can be used to check the reasonableness of answers.

Students will be skilled at…

- I can add numbers to 1000 in many ways using a strategy that makes sense to me.
- I can subtract numbers from 1000 in many ways using a strategy that make sense to me.
- I can solve word problems with two-steps using addition, subtraction.
- I can use a letter to stand for a number I don't know.
- I can check if my answer is reasonable by using mental math.
- I can check if my answer is reasonable by estimating or rounding.

Evidence	
Vocabulary • Equations • Mental computation • Estimation • Strategy • Reasonable/reasonableness • Rounding • Place value • Digits	**Mathematical Practices (Bolded practices are priorities for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.
Learning Plan	
Cluster 3	

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 4 – MAKING SENSE OF MULTIPLICATION AND DIVISION

Desired Results

Priority Standards

3.OA.1. Interpret products of whole numbers (e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each). *For example, show objects in rectangular arrays or describe a context in which a total number of objects can be expressed as 5 × 7.*
3.OA.2. Interpret whole-number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). *For example, deconstruct rectangular arrays or describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
3.OA.3. Use multiplication and division numbers up to 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem).
3.OA.4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = ? ÷ 3, 6 x 6 = ?*
3.OA.7. Fluently multiply and divide numbers up to 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 ×5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
3.OA.8. Solve and create two-step word problems using any of the four operations*. Represent these problems

Transfer

Students will be able to independently use their learning to…
Develop a conceptual understanding of multiplication and division to achieve automaticity and solve real-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Objects of equal groups can be arranged to find the product.
- Multiplication and division are related.
- Division is grouping into equal sets.
- Division is an unknown factor problem.
- Word problems can be represented by a mathematical equation.
- Pictures and symbols can represent unknown numbers.
- Mathematical situations can be represented with a model.
- Patterns are created and extended.
- There is a relationship between properties of operations. (example: multiplication is repeated addition)

ESSENTIAL QUESTIONS

Students will keep considering…
- What are ways multiplication and division are related?
- How do I use multiplication and division to solve problems?
- How can I use the properties of multiplication?
- What strategies can I use to memorize facts?

Acquisition

Students will know…
- Multiplication and division (equal groups) can be modeled in a variety of ways.
- Division can be used to find the number of objects in each group (partitive division, size of the groups unknown) or to find the

Students will be skilled at…
- I can arrange objects into equal groups to represent multiplication and division.
- I can make a model to go with the multiplication and/or division equations I have written. And vice versa.

using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. **This unit focuses on multiplication and division only* **3.OA.9.** Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.* **3.NBT.3.** Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 x 80, 10 x 60) using strategies based on place value and properties of operations. **Supporting Standards** **3.OA.5.** Make, test, support, draw conclusions and justify conjectures about properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) • Commutative property of multiplication: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. • Associative property of multiplication: 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. • Distributive property: Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. • Inverse property (relationship) of multiplication and division. **3.OA.6.** Understand division as an unknown factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.	number of groups (measurement division, number of groups unknown). • Patterns of multiplication on a hundreds board or a multiplication table. • Share their thinking by communicating their reasoning and sharing their solutions. • An equation is a balance of numbers on both sides of the equal sign. • Letters and symbols can represent an unknown quantity in an equation. • Estimating and rounding are efficient strategies to check answers.	• I can solve multiplication and division word problems using different strategies like models, arrays, drawings, or equations. • I can use a symbol for an unknown amount when I write an equation. • I can find the unknown factor of division using different strategies. • I can solve multiplication and division problems using fact families *(For example: I can solve 45 ÷ 5 = 9 because I know that 9 x 5 = 45).* • I can mentally solve multiplication and division facts from 0-10. • I can solve word problems with two-steps using multiplication and division. • I can check my answers with inverse operations. • I can identify and explain patterns in a group of numbers. • I can apply properties of multiplication (communicative, associative, distributive) to solve multiplication and division problems involving single-digit factors.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priorities for this unit)
• Equation • Fact families • Unknown quantity (variable) • Rounding • Estimating • Patterns • Equal groups • Arrays • Factors • Products • Symbols • Measurement quantities • Properties of multiplication • Multiplication table • Equal shares • Quotient • Division • Dividends • Divisor	• **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning**.

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 5 – REASON WITH SHAPES AND THEIR ATTRIBUTES

Desired Results

Priority Standards

3.G.1. Categorize shapes by different attribute classifications and recognize that shared attributes can define a larger category. Generalize to create examples or non-examples.

3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as ¼ of the area of shape.

Supporting Standards

3.NF.1. Understand a fraction of 1/b (e.g., ¼) as a quantity formed by 1 part when a whole is partitioned into b (e.g., 4) equal parts; understand a fraction a/b (e.g., 2/4) as the quantity formed by a (e.g., 2) parts of size 1/b. (e.g., ¼).

Transfer

Students will be able to independently use their learning to…
Classify and categorize shapes based on attributes.
Recognize that fractions are parts of a whole.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Shapes get their names based on their common attributes.
- Shapes share some attributes.
- A shape's attributes determine which category it belongs to.
- Even though shapes have different names, they may have attributes that are the same.
- All closed figures can be identified based on the number of their sides.
- Shapes can be partitioned into parts with equal areas.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are ways I classify and categorize shapes?
- What are attributes and how do they help me recognize and classify shapes?
- How do I partition shapes into parts with equal areas?

Acquisition

Students will know…

- Characteristics of triangles and quadrilaterals.
- Strategies to decompose quadrilaterals.
- Examples and non-examples of a variety of quadrilaterals including rhombuses, rectangles, squares, parallelograms, and trapezoids.
- Ways to communicate and share reasoning and solutions.

Students will be skilled at…

- I can recognize and categorize shapes based on their attributes.
- I can draw examples and non-examples of geometric shapes.
- I can partition shapes into equal parts.
- I can express the area of each equal part of a shape as a fraction.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priorities for this unit)
• Rhombus • Rectangle • Quadrilateral • Square • Circle • Triangle • Hexagon • Pentagon • Octagon • Attributes • Category • Subcategory	• Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 6 – APPLYING OPERATIONS TO AREA AND PERIMETER

Desired Results

Priority Standards

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

3.MD.9. Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. For example, after tiling rectangles, develop a rule for finding the area of any rectangle.
b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real-world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use area models (rectangular arrays) to represent the distributive property in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c.
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems. For example, the area of a 7 by 8 rectangle can be determined by decomposing it into a 7 by 3 rectangle and a 7 by 5 rectangle.

Transfer

Students will be able to independently use their learning to…
Conceptually describe area and perimeter and apply the concepts to real-world scenarios.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Multiplication and addition are related operations.
- The area model is a representation of multiplication and multiplication problems.
- Tiles and the area model of a rectangle can be used to represent the distributive property of multiplication.
- A rectangle can be decomposed into smaller rectangles. The areas of the smaller rectangles can be added together to find the area of the larger rectangle.

ESSENTIAL QUESTIONS

Students will keep considering…

- What does area mean?
- What does perimeter mean?
- How do I measure area of geometric shapes?
- How do I measure perimeter of geometric shapes?

Acquisition

Students will know…

- Area is the amount of space inside a two-dimensional figure.
- Length times the width results in the total number of squares needed to tile a given rectangle.
- Perimeter can be found by adding the side lengths together.
- Area can be found by adding the square units or by multiplying.
- Area can be found by covering and counting with tiles or by multiplying side lengths.

Students will be skilled at…

- I can find the area of a rectangle by covering and counting with tiles.
- I can find the area of a rectangle by multiplying the side lengths.
- I can use the area model to represent multiplication problems.
- I can use the area model to show the distributive property.
- I can break apart a rectangle into smaller rectangles and add their areas to find the area of the entire rectangle.

Supporting Standards **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.** **3.MD.7.** Recognize area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit is said to have "one square unit" and can be used to measure area. b. Demonstrate that a plane figure which can be covered without gaps or overlaps by *n* (e.g., 6) unit squares is said to have an area of *n* (e.g., 6) square units. **3.MD.8.** Measure areas by tiling with unit squares (square centimeters, square meters, square inches, square feet, and improvised units). **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.** **3.MD.10.** Solve real-world and mathematical problems involving perimeters of polygons, including: • finding the perimeter given the side lengths, • finding an unknown side length, • exhibiting rectangles with the same perimeter and different areas, • exhibiting rectangles with the same area and different perimeters.		• I can measure the area of a plane figure in square units. • I can use square units to cover the space inside a plane figure without leaving gaps or overlapping. • I can solve real-world problems using perimeters of polygons. • I can find unknown side lengths and the perimeter of polygons. • I can show rectangles that have the same area but different perimeters. • I can show rectangles that have the same perimeter but different areas. • I can solve real-world problems concerning area.

Evidence	
Vocabulary • Multiplication • Product • Area • Perimeter • Rectangle • Side • Length • Area • Model • Tiling • Distributive property of multiplication • Decompose • Overlapping • Non-overlapping • Polygon	**Mathematical Practices (Bolded practices are priorities for this unit)** • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics. • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 7 – UNDERSTANDING FRACTIONS AS PARTS OF A WHOLE

Desired Results

3.NF.2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

a. Represent a fraction 1/b (e.g., 1/4) on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b (e.g., 4) equal parts. Recognize that each part has size 1/b (e.g., 1/4) and that the endpoint of the part based at 0 locates the number 1/b (e.g., 1/4) on the number line.
b. Represent a fraction a/b (e.g., 2/8) on a number line diagram or ruler by marking off a lengths 1/b (e.g., 1/8) from 0. Recognize that the resulting interval has size a/b (e.g., 2/8) and that its endpoint locates the number a/b (e.g., 2/8) on the number line.

3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent if they are the same size (modeled) or the same point on a number line.
b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent (e.g., by using a visual fraction model).
c. Express and model whole numbers as fractions, and recognize and construct fractions that are equivalent to whole numbers. For example: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.
d. Compare two fractions with the same numerator or the same denominator by reasoning about their

Transfer

Students will be able to independently use their learning to…
Develop a conceptual understanding of creating and representing fractions by partitioning a whole into equal parts.

Meaning

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
Students will understand that… • Explain that a unit fraction is one part of a whole. • Represent and identify unit fractions using area and length models.	Students will keep considering… • What is a fraction? • How are fractions of the same whole compared? • How are fractions used in my daily life?

Acquisition

Students will know… • The meaning of fractions and the ways fractions are represented, with the following denominators: halves, fourths, and eighths; thirds and sixths. • Area models are used to represent fractions as parts of a whole. • The size of a fractional part is relative to the size of the whole. • Strategies to communicate and share their reasoning and solutions.	Students will be skilled at… • I can show equal parts of a whole with a fraction in many different ways. • I can create and choose pictures that represent a given fraction. • I can create and choose a fraction from a given picture. • I can explain the difference between a numerator and a denominator. • I can construct a visual representation of a fraction.

size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model).		

Evidence

Vocabulary	**Mathematical Practices (Bolded practices are priorities for this unit)**
• Numerator • Denominator • Whole • Part • Fraction • Fraction bar • Equal • Equivalent	• Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM

3rd GRADE

UNIT 8 – USING TOOLS TO ESTIMATE AND MEASURE

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">3.MD.3. Select an appropriate unit of English, metric, or non-standard measurement to estimate the length, time*, weight, or temperature (Local Standard)
*Time is addressed in unit 9.
3.MD.2. Estimate and measure liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm^3 and finding the geometric volume of a container.)
Add, subtract, multiply, or divide to solve and create one-step word problems involving masses or volumes that are given in the same units (e.g., by using drawings, such as a beaker with a measurement scale, to represent the problem). (Excludes multiplicative comparison problems [problems involving notions of "times as much."])
3.MD.5. Measure and record lengths using rulers marked with halves and fourths of an inch. Make a line plot with the data, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve problems involving measurement and estimation of liquid volumes, masses, length, and temperature units.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Mass and volume can be estimated.
• Mass and volume can be measured.
• Addition, subtraction, multiplication, and division can be used to solve problems involving mass and volume.
• ½ and ¼ inch lengths can be measured with a ruler and recorded on a line plot.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do I choose the appropriate unit of measure for length, weight, mass, volume, or temperature?
• How do I use the appropriate tool to measure length, weight, mass, volume, or temperature?
• How do I use addition, subtraction, multiplication, and division to solve and create one-step story problems?
• How do I estimate a measurement?
• How do I record measurements?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• Ways to estimate.
• Which appropriate unit to select to measure length, weight, or temperature.
• The four operations can be used to solve and create one-step mass or volume word problems.
• Line plots help represent measurement.</td><td>Students will be skilled at…
• I can measure and estimate liquid volumes using standard units.
• I can measure and estimate masses of objects using standard units.
• I can use addition, subtraction, multiplication, and division strategies to solve word problems involving measurement.
• I can choose an appropriate unit of measure to estimate length, mass, volume, weight, and temperature.</td></tr>
</table>

		• I can measure lengths with a ruler to the nearest ½ and ¼ inch and make a line plot with those measurements.

Evidence

Vocabulary	**Mathematical Practices (Bolded practices are priorities for this unit)**
• Mass • Volume • Weight • Inches • Estimate • Measure • Line plot • Gram • Kilogram • Liter • Standard units • Degrees • Celcius • Farenheit	• Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • **Construct viable arguments and critique the reasoning of others.** • Model with mathematics. • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 9 – UNDERSTANDING TIME

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">3.MD.1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes or hours (e.g., by representing the problem on a number line diagram or clock).</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Use elapsed time in a relevant, real-world context.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Time can be measured in minutes.
• Addition and subtraction strategies may be used to solve problems involving time.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do I tell and write time to the nearest minute?
• How can I find elapsed time to the nearest minute?
• How can I change from one unit to another unit when measuring time?
• How can I use addition & subtraction to calculate elapsed time?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Strategies to tell and write time to the nearest minute.
• Strategies to solve word problems involving addition and subtraction of time intervals.</td><td>Students will be skilled at…
• I can tell and write time to the nearest minute.
• I can solve word problems involving addition and subtraction of time in minutes.
• I can represent time problems using addition and subtraction strategies.
• I can measure time intervals in minutes and/or hours.</td></tr>
</table>

KPBSD MATH CURRICULUM
3rd GRADE
UNIT 9 – UNDERSTANDING TIME

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priorities for this unit)
• Nearest minute • Time intervals • Analog • Digital • Hour hand • Minute hand • Hours • Minutes • Half hour • Quarter hour • Half past • Quarter past • Quarter til • Elapsed time	• **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

Learning Plan

Cluster 2

KPBSD MATH CURRICULUM
3^{RD} GRADE
Year at a Glance

This document provides a birds-eye view of the Third Grade math "curriculum map." Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the Third Grade "curriculum map."

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**
Title	Building Mathematical Community through Understanding Equal Groups	Problem Solving with Data	Addition and Subtraction Stories	Making Sense of Multiplication and Division	Reason with Shapes and Their Attributes	Applying Operations to Area and Perimeter	Understanding Fractions as Parts of a Whole	Using Tools to Estimate and Measure	Understanding Time
Duration	3-4 weeks	1-2 weeks	4-5 weeks	5-6 weeks	1-2 weeks	2-3 weeks	4-5 weeks	2-3 weeks	1-2 weeks
Content Standards	3.OA.1 3.OA.2 3.OA.3 3.OS.9	3.MD.4 3.MD.6 3.OA.8 3.NBT.2	3.NBT.2 3.OA.8 3.NBT.1	3.OA.1 3.OA.2 3.OA.3 3.OA.4 3.OA.5 3.OA.6 3.OA.7 3.OA.8 3.OA.9 3.NBT.3	G.1 G.2 NF.1	MD.7 MD.8 MD.9 MD.10	3.NF.1 3.NF.2 3.NF.3	3.MD.2 3.MD.3 3.MD.5	3.MD.1
Practice Standards	1,3,4,8	1,3,4	1,2,3,4,6	1,2,3,4,7,8	2,4,5,6	5,6	2,3,4,5	3,5,6,7,8	1,2,4,6

KPBSD MATH CURRICULUM
4th GRADE
UNIT 1 –BUILDING A MATHEMATICAL COMMUNITY THROUGH DATA

Desired Results

Priority Standards

4.MD.6. Explain the classification of data from real-world problems shown in graphical representations including the use of terms range and mode with a given set of data. (Local Standard)

Supporting Standards

4.NBT.4. Fluently add and subtract multi-digit whole numbers using any algorithm. Verify the reasonableness of the results.

Transfer

Students will be able to independently use their learning to…
Build a community of mathematical problem solvers through collecting and interpreting data for real-world use.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Graphical representations can be used to organize and interpret data.
- Numerical and categorical data can help me learn about my world.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are ways I display numerical vs. categorical data?
- What does a quality survey look like?
- How does data help me better understand my world?

Acquisition

Students will know…

- Numerical or categorical data can be collected by asking relevant questions.
- Different ways to represent data.
- Which types of survey questions yield categorical or numerical data.
- Range and mode help us to interpret data.

Students will be skilled at…

- I can determine the appropriate method for collecting data.
- I can make a line plot.
- I can make inferences and draw conclusions about data.
- I can solve problems by using information on a line plot.
- I can use various methods to display data.
- I can interpret data through various graphical representations.
- I can calculate range and mode.

Evidence	
Vocabulary • Survey • Reliable • Relevant • Frequency • Line plot • Bar graph • Frequency table • Mode • Range • Numerical data • Categorical data	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
4^{TH} GRADE
UNIT 2 – EXPLORE MULTIPLICATIVE COMPARISON, AREA AND PERIMETER, FACTORS, AND MULTIPLES

Desired Results

Priority Standards

4.OA.4. Find all factor pairs for a whole number in the range 1–100. Explain the correlation/differences between multiples and factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Supporting Standards

4.MD.3. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

4.OA.1. Interpret a multiplication equation as a comparison (e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 groups of 7 and 7 groups of 5). (Commutative property) Represent verbal statements of multiplicative comparisons as multiplication equations.

4.OA.2. Multiply or divide to solve word problems involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem or missing numbers in an array). Distinguish multiplicative comparison from additive comparison.

4.OA.6. Extend patterns that use addition, subtraction, multiplication, division, or symbols, up to 10 terms, represented by models (function

Transfer

Students will be able to independently use their learning to…
Identify and solve real-world problems using multiplication & division facts and/or properties.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There are multiple ways to solve problems using multiplication properties.
- Reasonableness can be assessed through estimation strategies.
- The difference between prime and composite numbers.
- Solving problems may require more than one calculation in a specific order.
- Multiples are infinite while factors are not.
- Area and perimeter are determined through multiplication strategies.
- The commutative property can be used in multiplication.

ESSENTIAL QUESTIONS

Students will keep considering…

- When solving word problems, what strategies can I use to identify whether I add, subtract, multiply, or divide?
- How do multiplication, factors, and multiples help me solve problems including area and perimeter?

Acquisition

Students will know…

- Any whole number is a product of each of its factors.
- The difference between prime and composite numbers.
- Arrays can help us better understand area and perimeter.
- There are various ways to model multiplication and division.

Students will be skilled at…

- I can use multiplication to determine the area and perimeter of real-world mathematical problems.
- I can determine the factors of natural numbers from 1- 100.
- I can determine the multiples of any given one-digit number.
- I can determine whether a number is prime or composite.

machines), tables, sequences, or in problem situations. (Local Standard)	• Strategies to create and identify patterns in multiplication and division. • Using mental computation and estimation strategies including rounding help us assess the reasonableness of answers. • Whole numbers are factors of their product.	• I can use the commutative property to evaluate multiplication equations. • I can solve multi-step word problems. • I can explain the differences between multiples and factors. • I can create and identify multiplication and division problems. • I can use estimation strategies in my problem solving to assess reasonableness along the way.
Evidence		
Vocabulary • Factor • Product • Quotient • Multiples • Prime • Composite • Variable	**Mathematical Practices (Bolded practices are priorities for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**	

KPBSD MATH CURRICULUM
4TH GRADE
UNIT 3 – USE PLACE VALUE STRATEGIES TO ADD AND SUBTRACT WHOLE NUMBERS

Desired Results

Priority Standards

4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*

4.NBT.2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on the value of the digits in each place using >, =, and < symbols to record the results of comparisons.

4.OA.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

4.NBT.4. Fluently add and subtract multi-digit whole numbers using any algorithm. Verify the reasonableness of the results.

Supporting Standards

4.NBT.3. Use place value understanding to round multi-digit whole numbers to any place using a variety of estimation methods; be able to describe, compare, and contrast solutions.

4.OA.5. Generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule. Identify apparent features of the pattern

Transfer

Students will be able to independently use their learning to…
Use the base ten system to understand mathematical operations to solve real-world problems

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Each digit has a specific place value.
- Algorithms help solve problems.
- Estimation helps solve problems and check for reasonableness.
- There is more than one way to add and subtract numbers.
- Unknown values are represented by variables.
- Variables can be found by using the inverse operation.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can inverse operations help me solve for a given variable?
- How do I use place value to add and subtract?

Acquisition

Students will know…

- Numbers can be represented in various forms (expanded form, standard form, and word form).
- Each digit in a multi-digit number has ten times the value of the digit directly on the right and 1/10 of the value of the digit directly on the left.
- There are a variety of ways to compare numbers.
- There are a variety of strategies used to add and subtract numbers.
- The Commutative and Associative Properties of Addition can be used to solve problems.

Students will be skilled at…

- I can identify the value of each digit in a multi-digit whole number up to one million.
- I can describe the structure of the base ten number system.
- I can read, write, and compare multi-digit whole numbers using >, =, < symbols.
- I can write and explain the expanded, word, and standard form of multi-digit numbers.
- I can add and subtract multi-digit numbers.
- I can add or subtract to solve multi-step word problems.
- I can check my answers using an inverse operation.

that were not explicit in the rule itself. Be able to express the pattern in algebraic terms. *For* example*, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*	• Mental math, fact families, and estimation help solve problems and check for reasonableness. • Variables represent an unknown quantity. • The standard addition and subtraction algorithms for multi-digit numbers break the calculation into simpler calculations using place value starting with the ones, then the tens…	• I can use estimation strategies in my problem solving to assess reasonableness along the way. • I can generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule.

Evidence

Vocabulary

- Whole number
- Place value
- Multi-digit numbers
- Compare
- Base-ten
- Expanded form
- Standard form
- Word form
- Equivalent
- Greater than
- Less than
- Equal to
- Round
- Inverse
- Variable

Mathematical Practices (Bolded practices are priorities for this unit)

- **Make sense of problems and persevere in solving them.**
- **Reason abstractly and quantitatively.**
- **Construct viable arguments and critique the reasoning of others.**
- **Model with mathematics.**
- Use appropriate tools strategically.
- **Attend to precision.**
- **Look for and make use of structure.**
- **Look for and express regularity in repeated reasoning.**

LEARNING PLAN

Cluster 1

KPBSD MATH CURRICULUM
4TH GRADE
UNIT 4 – DEVELOP MULTIPLICATION/DIVISION STRATEGIES

Desired Results		
Priority Standards	**Transfer**	
4.NBT.5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. **4.NBT.6**. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. **4.OA.3.** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. **4.MD.3**. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. For example*, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*	Students will be able to independently use their learning to… Apply multiplication and division skills to real-world situations.	
	Meaning	
	ENDURING UNDERSTANDINGS Students will understand that… • There are a variety of strategies used to multiply and divide numbers. • There is a relationship between multiplication and division. • Multiplication or division can be used to find the area if one factor is unknown.	**ESSENTIAL QUESTIONS** Students will keep considering… • How does place value help me multiply and divide? • What is the relationship between multiplication and division? • In what real-world situations can area and perimeter be applied?
	Acquisition	
	Students will know… • The Properties of Operations. • There are a variety of strategies to solve multiplication and division problems. • The formula for calculating area is A = l x w. • Perimeter can be calculated by adding the length of each side.	Students will be skilled at… • I can multiply a number up to four digits by a one-digit number and explain the process. • I can multiply a two-digit number by a two-digit number and explain the process. • I can solve multiplication and division problems in more than one way. • I can use models to explain how I produced a product or quotient. • I can solve division problems with up to four-digit dividends and one-digit divisors. • I can solve multiplication and division problems with variables. • I can explain my thinking when solving a multistep problem. • I can find the area and perimeter of rectangles by using formulas.

Supporting Standards **4.NBT.1**. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* **4.OA.1.** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 groups of 7 and 7 groups of 5 (Commutative property). Represent verbal statements of multiplicative comparisons as multiplication equations. **4.OA.5**. Generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Be able to express the pattern in algebraic terms. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*		• I can use mental math and estimation to solve problems and check for reasonableness. • I can generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priorities for this unit)
• Place value • repeated addition • distributive property • digit • product • factor/factors • strategy • array • equation • area • whole number • quotient • remainder • dividend • divisor • array • area model • rectangle • perimeter • formula • dimension • square units • length • width • variables • multiples • multiply • divide	• **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
4th GRADE
UNIT 5 – EXTENDING THE UNDERSTANDING OF FRACTIONS

Desired Results

Priority Standards

4.NF.2. Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2). Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model).

Supporting Standards

4.NF.5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

4.NF.1. Explain why a fraction a/b is equivalent to a fraction $(n \times a)/(n \times b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Transfer

Students will be able to independently use their learning to…
Represent and compare fractions within real-world setting.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Fractions represent parts of a whole.
- There are many ways to represent and model fractions.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use fractions in the real-world?
- How does finding equivalent fractions help me compare and order fractions?

Acquisition

Students will know…

- The denominator represents the number of equal parts that make the whole.
- The numerator represents the selected parts of a whole.
- Comparisons are valid only when the two fractions refer to the same whole.
- Benchmark fractions can be used when making comparisons.
- Fractions can be equivalent even though numerators and denominators aren't the same.
- There are a variety of strategies to compare fractions.
- How fractions are composed and decomposed.

Students will be skilled at…

- I can explain that a fraction is equal to another fraction by using manipulatives/models.
- I can determine if a fraction is greater than, less than, or equal to a benchmark fraction such as 1/2.
- I can use >,<, = symbols to compare two fractions.
- I can create common denominators to compare two fractions.
- I can identify and label fractions as representations of equal parts of a whole or of a set.
- I can compare fractions using manipulatives/models.

Evidence	
Vocabulary • Numerator • Denominator • Fraction • Manipulate • Equivalent • Multiply • Divide • Compare • Greater than • Less than • Fraction bar	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
4th GRADE
UNIT 6 – CONNECT FRACTIONS TO DECIMAL NOTATION

Desired Results

Priority Standards

4.NF.6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

Supporting Standards

4.NF.7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual model).

Transfer

Students will be able to independently use their learning to…
Understand the relationship between decimals and fractions in real-world situations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Fractions and decimals represent parts of a whole.
- Fractions can be written as an equivalent decimal.
- The position of a digit in relation to the decimal point determines its value.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is the relationship between fractions and decimals?
- How does place value help me to represent fractions and decimals?
- What are strategies I can use to compare fractions and decimals?

Acquisition

Students will know…

- Denominator indicates the number of parts of a whole or set.
- Fractions with denominators of 10 and 100 can be represented as decimals of tenths and hundredths.
- There is a relationship between fractions with denominators in powers of ten (tenths and hundredths).
- Comparisons of decimals are only valid when the two decimals refer to the same whole.

Students will be skilled at…

- I can write a fraction with a base ten value as a decimal.
- I can write a decimal as a base ten fraction.
- I can use visuals/models as representations to compare fractions and decimals.
- I can compare fractions and decimals using >, =, or < symbols.
- I can convert a fraction with a denominator of 10 to an equivalent fraction with a denominator of 100.

Evidence	
Vocabulary • Fractions • Denominator • Equivalency • Numerator • Multiples • Place value • Fraction • Decimal • Decimal notation • Tenths • Hundredths • Equivalent • Decimal point	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM

4th GRADE

UNIT 7 –UNDERSTAND OPERATIONS WITH FRACTIONS AND DECIMALS

Desired Results		
Priority Standards	**Transfer**	
4.NF.3. Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*. a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. *b.* Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions (e.g., by using a visual fraction model). *For example: 3/8 = 1/8 + 1/8 + 1/8 ;3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.* c. Add and subtract mixed numbers with like denominators (e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction). d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators (e.g., by using visual fraction models and equations to represent the problem). **4.NF.4.** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. *a.* Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*	Students will be able to independently use their learning to… Understand that fractions and decimals are all around us and are an integral part of the real-world.	
	Meaning	
	ENDURING UNDERSTANDINGS Students will understand that… • A fraction can be decomposed in more than one way. • When adding or subtracting fractions with like denominators, only the numerator is added or subtracted. • Mixed numbers and improper fractions are ways of representing a fraction greater than a unit whole.	**ESSENTIAL QUESTIONS** Students will keep considering… • How are fractions used in problem-solving situations? • How are fractions composed, decomposed, compared, and represented?
	Acquisition	
	Students will know… • Whole numbers can be written as fractions. • Fractions with like denominators can be added or subtracted. • Improper fractions are greater than a whole. • Improper fractions and mixed numbers are interchangeable. • When a whole number is divided into fractions, each fraction is an equal part of the whole.	Students will be skilled at… • I can explain the difference between a whole number and a fraction. • I can solve word problems that include fractions and whole numbers. • I can model and explain that fractions are parts of a whole that can be added or subtracted. • I can compose and decompose fractions and mixed numbers. • I can add and subtract fractions and mixed numbers that have the same denominator. • I can model multiplication through repeated addition of a fraction to make a whole number.

b. Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b).* *c.* Solve word problems involving multiplication of a fraction by a whole number (e.g., by using visual fraction models and equations to represent the problem). Check for the reasonableness of the answer. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* **Supporting Standards** ***4.NF.6.*** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* ***4.MD.5.*** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). *Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*		• I can multiply a fraction by a whole number. • I can use fraction models, equations, and line plots to represent and solve real-world problems.

Evidence	
Vocabulary • Numerator • Denominator • Multiple • Equation • Equivalent • Factor • Whole number • Fraction • Product • Commutative property • Associative property • Improper fraction • Mixed number • Decomposition • Composition fraction	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM

4th GRADE

UNIT 8 – APPLY GEOMETRIC CONCEPTS

Desired Results

Priority Standards

4.G.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular, parallel, and intersecting line segments. Identify these in two-dimensional (plane) figures.

4.MD.8. Measure and draw angles in whole-number degrees using a protractor. Estimate and sketch angles of specified measure.

Supporting Standards

4.G.2. Classify two-dimensional (plane) figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

4.G.3. Recognize a line of symmetry for a two-dimensional (plane) figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

4.MD.7. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand the following concepts of angle measurement:

a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

4.MD.9. Recognize angle measure as additive. When an angle is divided into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of

Transfer

Students will be able to independently use their learning to…

Demonstrate their ability to solve mathematical and real-world problems using measurement and geometric models.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Objects in our world are comprised of points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular, parallel, and intersecting line segments and two-dimensional figures.
- Objects can be classified based on their attributes.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use measurement and geometric models to solve real-world problems?

Acquisition

Students will know…

- Lines, angles, and shapes are named, described, analyzed, and classified based on their attributes.
- Angles are classified and named by their measurement.
- Rays can share common endpoints.
- A circle has 360 degrees.
- A degree represents a fraction of a circle.
- A protractor and other tools can be used to measure angles.
- Angles can be measured, added, and subtracted from each other.
- Lines of symmetry divide an object into matching parts.
- Figures may have zero lines of symmetry.

Students will be skilled at…

- I can draw and identify points, lines, line segments, and rays in two-dimensional figures.
- I can draw and identify angles (acute, obtuse, right) in two-dimensional figures.
- I can draw and identify parallel and perpendicular line segments in two-dimensional figures.
- I can classify and sort shapes based on their attributes.
- I can tell the difference between right triangles and other triangles.
- I can identify a line of symmetry in a variety of figures.
- I can draw a line(s) of symmetry.

the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems (e.g., by using an equation with a symbol for the unknown angle measure).	• Figures may have more than one line of symmetry. • Two-dimensional figures can be decomposed into lines, line segments, rays, acute angles, right angles, obtuse angles, parallel, and perpendicular lines. • An angle can be measured finding the sum of each non-overlapping part of an angle.	• I can identify angles as two rays that share a point. • I can measure an angle in units called degrees. • I can use fractions of a circle to measure an angle. • I can count the number of one-degree turns to measure an angle. • I can use a protractor and other tools to measure and draw angles.

Evidence

Vocabulary	Mathematical Practices (Bolded practices are priority for this unit)
• Acute angle • Acute triangle • Angle • Line • Line of symmetry • Line segment • Obtuse angle • Obtuse triangle • Parallel lines • Perpendicular lines • Point • Ray • Right angle • Right triangle • Symmetry • Two-dimensional figures • Intersecting line • protractor • whole number • degree	• **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
4th GRADE
UNIT 9 –MEASUREMENT

Desired Results

Priority Standards

4.MD.1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4-ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36).*

4.MD.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.MD.3. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

Supporting Standards

4.NF.6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

Transfer

Students will be able to independently use their learning to…
Understand units of measurement and how to apply them to real life scenarios.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Different units of measure are used for different types of measurement (e.g., liters for volume, inches for length).
- Standard units of measure enable us to interpret results or data.
- What I measure influences how I measure.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use tools to measure?
- How can I use measurement to help solve world problems?
- What are systems I use to measure?
- Why do I use standard units to measure?

Acquisition

Students will know…

- Ways to estimate, measure, and convert customary units of length, volume, and mass.
- A formula can be used to find the perimeter and area of rectangles.
- Measurements can be converted within a measurement system (e.g., 1 foot = 12 inches).
- Some measurement units are more appropriate to use than others in a specific context.
- There is a relationship between units of measure within a system (e.g., seconds, minutes, hours).
- A formula can be used to find the perimeter and area of rectangles.
- Multiplication or division can be used to find the area if one factor is unknown.
- Line plots and other tools help solve measurement problems.

Students will be skilled at…

- I can solve problems involving measurement.
- I can use a diagram such as a number line to show measurement.
- I can use the appropriate tool to accurately measure.
- I can use any of the four operations (+,-,x,÷) to solve measurement problems.
- I can convert units of measurement.
- I can find the area and perimeter of rectangles by using a formula.
- I can find the missing length or width of a rectangle using the area formula.

Evidence	
Vocabulary • Rectangle • Area • Perimeter • Formula • Dimension • Square units • Length • Width • Distance • Interval • Time • Volume • Mass • Simple fractions • Decimals • Quantities • Diagrams • Number line • Scale • Meters • Centimeters • Kilograms • Grams • Pound • Ounce • Milliliter • Liter • Second • Minute • Hour • Inch	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • Look for and express regularity in repeated reasoning.

• Foot • Equivalent	

Learning Plan
Consider integrating these concepts and skills into other areas, such as science, art, and social studies.

KPBSD MATH CURRICULUM

4^{th} GRADE

TIME - MINI CLUSTER 3.5

Desired Results

<table>
<tr><td rowspan="6">Priority Standards
4.MD.4. Solve real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time). (L)</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Understand units of measurement (including time) and how to apply them to real-life scenarios.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Time is a unit of measure.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How does time change depending on my location in North America?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• There are 6 time zones in America that correspond to established boundaries.</td><td>Students will be skilled at…
• I can read local time and calculate local time of different time zones.
• I can calculate elapsed time between time zones.
• Tell and write time to the nearest minute and measure time intervals in minutes.
• Solve word problems involving addition and subtraction of time intervals in minutes or hours.</td></tr>
</table>

Evidence

<table>
<tr><td><u>Vocabulary</u>
• Time
• Eastern time zone
• Mountain time zone
• Pacific time zone
• Central zone
• Alaska time zone
• Hawaii/Aluetian time zone</td><td><u>Mathematical Practices (Bolded practices are priority for this unit)</u>
• Make sense of problems and persevere in solving them.
• Reason abstractly and quantitatively.
• Construct viable arguments and critique the reasoning of others.
• Model with mathematics.
• Use appropriate tools strategically.
• Attend to precision.
• Look for and make use of structure.
• Look for and express regularity in repeated reasoning.</td></tr>
</table>

KPBSD MATH CURRICULUM
4th GRADE
Year at a Glance

This document provides a birds-eye view of the Fourth Grade math "curriculum map." Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the Fourth Grade "curriculum map."

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Time
Title	Building a Mathematical Community Through Data	Explore Multiplicative Comparison, Area and Perimeter, Factors, and Multiples	Use Place Value Strategies to Add and Subtract Whole Numbers	Develop Multiplication /Division Strategies	Extending the Understanding of Fractions	Connect Fractions to Decimal Notation	Understand Operations with Fractions and Decimals	Apply Geometric Concepts	Measurement	Time-Zoning Out-A Math/ Social Studies integration
Duration	3-4 weeks	5-6 weeks	1-2 weeks	4-5 weeks	4-5 weeks	2-3 weeks	1-2 weeks	2-3 weeks	2-3 weeks	1-2 weeks
Content Standards	4.MD.6 4.NB.4	4.OA.1 4.OA.2 4. OA.4 4.OA.6 4.MD.3	4.OA.3 4.OA.5 4.NB.1 4.NB.2 4.NB.3 4.NB.4	4.OA.1 4.OA.3 4. OA.5 4.NB.1 4.NB.5 4.NB.6 4.MD.3	4.NF.1 4.NF.2 4.NF.5	4.NF.6 4.NF.7	4.NF.3 4.NF.4 4.NF.6 4.MD.5	4.G.1 4.G.2 4.G.3 4.MD.7 4.MD.8 4.MD.9	4.NF.6 4.MD.1 4.MD.2 4.MD.3	4.MD.4
Practice Standards		1,2,3,4,67,8	1,2,3,4,6,7	1,2,3,4,5,6,7	1,2,4,6,7	2,4,5,6,7, 8	1,2,3,4,6	1,2,3,4,6	1,4,5,6,7	1,2,3,6

KPBSD MATH CURRICULUM
5th GRADE
UNIT 1 – BUILD A MATHEMATICAL COMMUNITY THROUGH REAL DATA

Desired Results

Priority Standards

5.MD.3. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

5.G.2. Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Supporting Standards

5.G.1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.MD.4. Explain the classification of data from real-world problems shown in graphical representations including the use of terms mean and median with a given set of data. (L)

Transfer

Students will be able to independently use their learning to…
Build a community of mathematical problem solvers through collecting and interpreting data for real-world use.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Patterns can be used to form ordered pairs.
- One value affects another in a pattern.
- Data can be collected and displayed.

ESSENTIAL QUESTIONS

Students will keep considering…
- How do I solve problems using data (fractions) represented in a line plot?
- How does math help me better understand my community?

Acquisition

Students will know…
- Strategies to generate number patterns using a given rule.
- How to recognize patterns in coordinate planes.
- Two intersecting number lines form a coordinate plane.
- The relationship between the numbers (terms) in a pattern.
- Strategies to collect, display, and formulate conclusions in regards to data that is presented in fractions of ½, ¼, and ⅛.
- Each point on a coordinate plane has a specific set of ordered pair of numbers.
- The first number in an ordered pair points start at the origin (0,0) and moves horizontally on the x-axis.
- The second number in ordered pair points moves vertically on the y-axis.

Students will be skilled at…
- I can determine whether a survey question will yield categorical or numerical data, or data that changes over time.
- I can graph ordered pairs in the first quadrant of a coordinate plane.
- I can identify and interpret the x and y coordinates to solve problems.
- I can form ordered pairs consisting of corresponding terms from the two patterns.
- I can collect, display, and formulate conclusions for data that is presented in fractions of ½, ¼, and ⅛.
- I can create and label a line plot to display a data set containing fractions.
- I can calculate the mean of a data set containing fractions with unlike denominators.

5.OA.3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*		• I can solve problems by graphing points.

Evidence

Vocabulary	**Mathematical Practices (Bolded practices are priority for this unit)**
• Number line • Perpendicular lines • X-axis • Y-axis • Coordinates • Ordered pair of numbers • Intersection • Line plot • Fractions • Data • Mean (average) • Median • Ordered pairs • Function tables (number patterns) • Coordinate plane (graph) • Quadrants	• **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
5th GRADE
UNIT 2 – USING MODELS TO EXPLORE PROPERTIES OF MULTIPLICATION AND DIVISION

Desired Results

Priority Standards

5.OA.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognizing that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

5.NBT.5. Fluently multiply multi-digit whole numbers using a standard algorithm.

5.NBT.6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, number lines, real life situations, and/or area models.

5.MD.5. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
b. A solid figure that can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

5.MD.7. Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.

a. Estimate and find the volume of a right rectangular prism with whole-number side lengths by packing it

Transfer

Students will be able to independently use their learning to…
Identify and solve real-world problems using multiplication and division.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There are a variety of strategies used to divide numbers.
- There is a relationship between multiplication and division.
- Volume refers to the space taken up by an object itself.
- It is important to follow an order of operations.

ESSENTIAL QUESTIONS

Students will keep considering…

- How are multiplication and division related?
- What strategies can be used to illustrate and explain the calculation of multiplication and division?
- How can I find the volume of cubes and rectangular prisms?

Acquisition

Students will know…

- The order of operations to calculate the correct answer.
- The use of parentheses in numerical expressions can be used to accurately represent real-world problems.
- Equations, rectangular arrays, and area models can be used to find whole number quotients.
- The volume of a solid can be measured in a variety of cubic units.
- Volume can be found in a variety ways.
- Volume of rectangular prisms is additive.

Students will be skilled at…

- I can evaluate numerical expressions by following the order of operations.
- I can interpret real-world problems and write them as numerical expressions.
- I can show my work and explain how I got the answer through equations, rectangular array, and/or an area model.
- I can show how multiplication and division are related.
- I can measure volume using a unit cubes and improvised units.
- I can measure the volume of composite figures.

with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Demonstrate the associative property of multiplication by using the product of three whole numbers to find volumes (length x width x height). b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real-world and mathematical problems. c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems. **Supporting Standards** **5.MD.6.** Estimate and measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units. **5.OA.1.** Use parentheses to construct numerical expressions, and evaluate numerical expressions with these symbols.		• I can distinguish between which cubic measurements to use for a given situation. • I can check my work using the appropriate inverse operation. • I can illustrate and explain division by using equations, rectangular arrays, or area models. • I can use manipulatives to measure the volume of right rectangular prisms. • I can use the volume formulas to determine the volume of right rectangular prisms. • I can decompose solid figures into smaller rectangular prisms. • I can add the volumes of several rectangular prisms to determine the volume of the original figure. • I can estimate and measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units. • I can use parentheses to construct numerical expressions.

Evidence	
Vocabulary • Order of operations • Parentheses ( ) • Brackets [ ] • Braces { } • Expression • Algorithm • Multi-digit Whole Number • Product • Factor • Dividend • Quotient • Divisor • Inverse operation • Rectangular array • Area model • Equation • Volume • Measure • Cubic unit • Cubic in • Cubic ft • Cubic cm • Face • Estimate • Right rectangular prism • Additive	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
5th GRADE
UNIT 3 – USING MODELS TO MULTIPLY AND DIVIDE FRACTIONS

Desired Results

Priority Standards

5.NF.3. Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers (e.g., by using visual fraction models or equations to represent the problem). *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3*.
b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*
c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division

Transfer

Students will be able to independently use their learning to…
Solve real-world problems using multiplication and division of fractions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Fractions lie between two whole numbers.
- Fractions represent division of a whole.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I use problem solving strategies/ideas to multiply fractions and mixed numbers?
- How can I use problem solving strategies/ideas to divide fractions and mixed numbers?

Acquisition

Students will know…

- Multiplication of fractions and mixed numbers help us solve real-world problems.
- Manipulatives and models help to prove and explain solutions.
- Multiplying by a whole number or a mixed number increases the product.
- A quantity can be represented as a mixed number or improper fraction.
- There is a relationship between a mixed number and an improper fraction as one can be converted to the other.

Students will be skilled at…

- I can identify a fraction as division of a whole.
- I can write a quotient as a fraction, whole number, or mixed number.
- I can multiply a fraction or whole number by a fraction.
- I can divide a fraction by a whole number greater than 0.
- I can use models to prove my answers.
- I can find the area of a rectangle using fraction side lengths.
- I can interpret word problems (with fractions) and apply the correct operations to solve.

of whole numbers by unit fractions (e.g., by using visual fraction models and equations to represent the problem). *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* **5.NF.6.** Solve real-world problems involving multiplication of fractions and mixed numbers (e.g., by using visual fraction models or equations to represent the problem). **Supporting Standards** **5.NF.4.** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)* b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.		

Evidence	
Vocabulary • Fraction • Division • Numerator • Denominator • Visual fraction • Model • Whole number • Product • Improper fraction • Proper fraction • Mixed number	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
5th GRADE
UNIT 4 – UNDERSTANDING PLACE VALUE

Desired Results

Priority Standards

5.NBT.3. Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form [e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 (1/10) + 9 (1/100) + 2 (1/1000)].
b. Compare two decimals to thousandths place based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

5.NBT.2. Explain and extend the patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain and extend the patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

Supporting Standards

5.NBT.1. Recognize that in a multi-digit number, a digit in ones place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

5.NBT.4. Use place values understanding to round decimals to any place.

Transfer

Students will be able to independently use their learning to…
Use the base 10 system to solve real-world problems involving decimals.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- How the placement of a digit in our base 10 number system determines the value of that digit.
- Decimals represent a fractional part of a whole number.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does placement of the digit affect its value?
- How does context help in rounding decimals?

Acquisition

Students will know…

- The number system is a base 10 system.
- Exponents are used to represent powers of 10.
- Rounding decimals should be “sensible/reasonable” for the context of the problem.
- Multiplying a whole number by a power of 10 affects the product as repeated addition.

Students will be skilled at…

- I can read, write, and compare decimals to thousandths.
- I can compare two decimals using >,<, or =.
- I can explain patterns I found when multiplying by the power of 10.
- I can explain and relate how the value of a digit changes when a number is multiplied or divided by powers of 10.
- I can use exponents to show powers of 10.
- I can explain and compare the use of powers of 10 and whole number exponents.
- I can round decimals.

Evidence	
Vocabulary • Exponent • Power of 10 • Product • Quotient • Placement • Measurement • Unit • Fractions • Benchmark fractions • Operations of fractions • Line plot • Scale • Fractional names of place value positions	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM
5th GRADE
UNIT 5 – USING MODELS TO ADD AND SUBTRACT DECIMALS AND FRACTIONS

Desired Results

Priority Standards

5.NF.1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd).*

5.NBT.7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between the operations. Relate the strategy to a written method and explain their reasoning in getting their answers.

5.NF.2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators (e.g., by using visual fraction models or equations to represent the problem). Use benchmark fractions and number sense of fractions to estimate mentally and check the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

5.OA.2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation “add 8 and 7, then multiply by 2” as 2 x (8 + 7). Recognizing that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Transfer

Students will be able to independently use their learning to…
Use the base ten system to solve real-world problems involving decimals.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Each digit has a specific place value.
- Algorithms help us solve problems.
- Addition and subtraction are related.
- Estimation helps us solve problems and check for reasonableness.
- There is more than one way to add and subtract numbers (including fractions and decimals).

ESSENTIAL QUESTIONS

Students will keep considering…

- How does placement of the digit affect its value?
- How does context help in rounding decimals?

Acquisition

Students will know…

- There are multiple ways to find common denominators.
- Common denominators makes comparison, addition, and subtraction of fractions possible.
- Multiple strategies may be used to perform operations with decimals to the hundredths.
- Fractions and decimals are all parts of a whole and are two different ways of recording the same number.

Students will be skilled at…

- I can calculate and model the sum and difference of fractions.
- I can create and model equivalent fractions by finding common denominators.
- I can use models, drawings, graph paper, and other strategies to add and subtract decimals.
- I can communicate what strategy was used in the expression or equation and justify why that strategy was appropriate.
- I can read and write numbers with decimal points.

Evidence	
Vocabulary • Numerator • Denominator • Common denominator • Equivalent fractions • Mixed number • Improper fraction • Simplify • Relationship • Decimal • Inverse • Properties of operation (commutative, associative, distributive, identity, zero)	**Mathematical Practices (Bolded practices are priority for this unit)** • Make sense of problems and persevere in solving them. • **Reason abstractly and quantitatively.** • Construct viable arguments and critique the reasoning of others. • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
5th GRADE
UNIT 6 – USING MODELS AND MEASUREMENT TO MULTIPLY AND DIVIDE WHOLE NUMBERS, DECIMALS, AND FRACTIONS

Desired Results

Priority Standards

5.NBT.5. Fluently multiply multi-digit whole numbers using a standard algorithm.

5.NBT.6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, number lines, real life situations, and/or area models.

5.NBT.7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between the operations. Relate the strategy to a written method and explain their reasoning in getting their answers.

5.NF.6. Solve real-world problems involving multiplication of fractions and mixed numbers (e.g., by using visual fraction models or equations to represent the problem).

5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*

Transfer

Students will be able to independently use their learning to…
Solve real-world problems involving the multiplication and division of fractions and decimals.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Each digit has a specific place value.
- Algorithms help us solve problems.
- Multiplication and division are related.
- Estimation helps us solve problems and check for reasonableness.
- There is more than one way to multiply and divide numbers (including fractions and decimals).

ESSENTIAL QUESTIONS

Students will keep considering…

- How do inverse operations help solve for a given variable?
- How do I use place value to multiply and divide?
- What strategies can be used to multiply and divide fractions and decimals?
- How can I represent rational numbers in multiple ways?
- What does it mean when decimals are multiplied, divided, or ordered by 10 or powers of 10?
- How is computation with rational numbers similar or different to whole number computation?
- What does it mean to multiply a number by a fraction?

<table>
<tr><th rowspan="2"></th><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…</td><td>Students will be skilled at…</td></tr>
<tr><td>
b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.
c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions (e.g., by using visual fraction models and equations to represent the problem). For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?
Supporting Standards
5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)
b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional
</td><td>
• The relationship between addition and multiplication.
• Scaling is a form of multiplication.
• The effect of multiplying a number by a fraction greater than 1.
• The effect of multiplying a number by a fraction less than 1.
• There is a relationship between the properties of operations and solutions of division problems.
• There are a variety of strategies used to multiply and divide numbers (including decimals and fraction).
• Equations, rectangular arrays, and area models can be used to find whole number quotients.
• There is a relationship between multiplication and division.
• There is a relationship between division and subtraction.
• The area of a rectangle can be found by multiplying fractions.
</td><td>
• I can fluently multiply multi-digit numbers using the standard algorithm.
• I can solve word problems using multiplication.
• I can divide a multi-digit number by a two-digit number.
• I can show my work and explain how I got the answer through equations, rectangular array, and/or an area model.
• I can check my work using inverse operations.
• I can multiply a fraction or whole number by a fraction.
• I can find the area of a rectangle using fraction side lengths.
• I can find the area of a rectangle by tiling it with unit squares.
• I can convert between mixed numbers and improper fractions.
• I can divide a fraction by a whole number.
• I can divide a whole number by a fraction.
• I can compare scaled shapes and multiply numbers to find a product.
</td></tr>
</table>

side lengths to find areas of rectangles, and represent fraction products as rectangular areas. **5.MD.1**. Identify, estimate measure, and convert equivalent measures within systems English length (inches, feet, yards, miles), weight (ounces, pounds, tons) volume (fluid ounces, cups, pints, quarts, gallons), temperature (Fahrenheit), metric length (millimeters, centimeters, meters, kilometers), volume (milliliters, liters), temperature (Celsius), (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems using appropriate tools. **5.OA.2.** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognizing that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* **5.NF.5**. Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1. (Division of a fraction by a fraction is not a requirement at this grade.)		

Evidence	
Vocabulary • Algorithm • Multi-digit • Whole Number • Product • Factor • Dividend • Quotient • Divisor • Inverse operation • Rectangular array • Area model equations • Place Value • Reciprocal • Equation • Fact family • Unit fraction • Numerator • Denominator • Mixed number • Improper fractions • Area • Rectangle • Decimal • Rational number	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • **Use appropriate tools strategically.** • **Attend to precision.** • **Look for and make use of structure.** • **Look for and express regularity in repeated reasoning.**

KPBSD MATH CURRICULUM

5th GRADE

UNIT 7 – MEASUREMENT WITH AN EMPHASIS ON TIME

Desired Results

Priority Standards

5.MD.1. Identify, estimate measure, and convert equivalent measures within systems English length (inches, feet, yards, miles), weight (ounces, pounds, tons) volume (fluid ounces, cups, pints, quarts, gallons), temperature (Fahrenheit), metric length (millimeters, centimeters, meters, kilometers), volume (milliliters, liters), temperature (Celsius), (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems using appropriate tools.

5.MD.2. Solve real-world problems involving elapsed time between world time zones. (Local Standard)

Transfer

Students will be able to independently use their learning to…

Solve real-world problems involving elapsed time between time zones.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Time is a unit of measure.
- Standard units of measure enable us to interpret results or data.

ESSENTIAL QUESTIONS

Students will keep considering…

- How does time change depending on my location in the world?
- How can I use measurement to help solve real-world problems?

Acquisition

Students will know…

- There are 24 time zones in the world that correspond to established boundaries.
- There is a relationship between units of measure within a system (e.g., seconds, minutes, hours).

Students will be skilled at…

- I can read local time and calculate local time of different time zones.
- I can calculate elapsed time between time zones.
- I can tell and write time to the nearest minute and measure time intervals in minutes.
- I can solve word problems involving addition and subtraction of time intervals in minutes or hours.
- I can convert measurements.
- I can solve problems using different units of measure.

Evidence	
Vocabulary • Elapsed time • Inch • Feet • Yards • Volume • Temperature • Conversion • Millimeter • Liters • Meters • Kilometers • Celsius • Fluid Ounce • Cup • Pint • Pound • Ton • Gallon	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • Model with mathematics. • **Use appropriate tools strategically.** • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
5th GRADE
UNIT 8 – CLASSIFYING QUADRILATERALS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Supporting Standards
5.G.3. Understand that attributes belonging to a category of two-dimensional (plane) figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
5.G.4. Classify two-dimensional (plane) figures in a hierarchy based on attributes and properties.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Describe and classify geometric figures based on their attributes and properties.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Two-dimensional figures are classified by their properties.
• Two-dimensional figures can fit into more than one category.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• Where is geometry found in my everyday world?
• How do attributes help me classify quadrilaterals?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Plane figures can be categorized and classified.
• Quadrilaterals have similarities and differences that can be compared.
• Kites are not classified as parallelograms.
• A square is always a rectangle.
• Attributes are used to categorize two-dimensional figures.</td><td>Students will be skilled at…
• I can classify different types of quadrilaterals.
• I can identify and describe properties of two-dimensional figures more precisely.
• I can identify properties of quadrilaterals.
• I can classify and categorize two-dimensional figures in multiple ways based on their attributes.</td></tr>
</table>

Evidence	
Vocabulary • Classify • Attribute • Quadrilateral • Rectangle • Rhombus • Square • Trapezoid • Two-dimensional figure • Parallel lines • Parallelogram • Perpendicular • Perpendicular lines • Plane	**Mathematical Practices (Bolded practices are priority for this unit)** • **Make sense of problems and persevere in solving them.** • **Reason abstractly and quantitatively.** • **Construct viable arguments and critique the reasoning of others.** • **Model with mathematics.** • Use appropriate tools strategically. • **Attend to precision.** • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

KPBSD MATH CURRICULUM
5th GRADE
Year at a Glance

This document provides a birds-eye view of the Fifth Grade math "curriculum map." Please note, some standards are partially taught in early units and re-visited throughout the year. For complete understanding of content to be taught, please visit the Fifth Grade "curriculum map."

	Unit 1	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**
Title	Build a Mathematical Community Through Real Data	Using Models to Explore Properties of Multiplication and Division	Using Models to Multiply and Divide Fractions	Understanding Place Value	Using Models to Add and Subtract Decimals and Fractions	Using Models and Measurement to Multiply and Divide Whole Numbers, Decimals, and Fractions	Measurement with an Emphasis on Time	Classifying Quadrilaterals
Duration	3-4 weeks	4-5 weeks	3-4 weeks	1-2 weeks	4-5 weeks	5-6 weeks	1-2 weeks	2-3 weeks
Content Standards	5.MD.3 5.MD.4 5.G.1 5.G.2 5.OA.3	5.NBT.5 5.NBT.6 5.MD.5 5.MD.6 5.MD.7 5.OA.1 5.OA.2	5.NF.3 5.NF.4 5.NF.6 5.NF.7	5.NBT.1 5.NBT.2 5.NBT.3 5.NBT.4	5.NF.1 5NF.2 5.NBT.7 5.OA.2	5.MD.1 5.NBT.5 5.NBT.6 5.NBT.7 5.NF.4 5.NF.5 5.NF.6 5.NF.7 5.OA.2	5.MD.1 5.MD.2	5.G.3 5.G.4
Practice Standards	1,2,3,4,8	1,2,4,5,6	1,2,3,4,5,6,7,8	1,4,6,7,8	2,4,6	1,2,3,4,5,6,7,8	1,2,3,5,6	1,2,3,4,6

KPBSD MATH CURRICULUM
6th GRADE
UNIT 1 – RATIONAL NUMBERS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="5">Priority Standards
6.NS.C.5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of in each situation.
6.NS.C.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
a. Recognize opposite signs of numbers as indicating locations on opposite sides of on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., and that is its own opposite.
b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.</td><td colspan="2">Transfer
Students will be able to independently use their learning to…
Apply and extend previous understandings of numbers to the system of rational numbers, compute fluently with multi-digit numbers, and find common factors and multiples.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Signs of numbers in ordered pairs as locations in quadrants of the coordinate plane.
• The absolute value of a rational number as its distance from zero on the number line.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• What are ways we write, interpret, and explain order for rational numbers in real-world contexts?
• How can we solve real-world and math problems by graphing points on a coordinate and use coordinates to find distances between points on a coordinate plane?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Positive and negative numbers are used together to describe quantities having opposite directions or values.
• A rational number as a point on the number line.
• The absolute value of a rational number as its distance from zero on a number line
• How to interpret statements of inequality as statements about the relative position of two numbers on a number line.
• Signs of numbers in ordered pairs indicate locations in quadrants of the coordinate plane.
• The difference between comparisons of absolute value from statements about order.</td><td>Students will be skilled at…
• I can recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognizing that the opposite of the opposite of a number is itself.
• I can recognize that when two ordered pairs differ only by signs, the locations will be reflections across one or both axes.
• I can find and position integers and other rational numbers on a horizontal or vertical number line diagram.
• I can find and position pairs of integers and other rational numbers on a coordinate plane.</td></tr>
</table>

6.NS.C.7. Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. c. Understand the absolute value of a rational number as its distance from on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. d. Distinguish comparisons of absolute value from statements about order. **6.NS.C.8.** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.		• I can interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. • I can write, interpret, and explain statements of order for rational numbers in real-world contexts. • I can interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. • I can distinguish comparisons of absolute value from statements about order. • I can include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Evidence

Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 2 - A Story of Ratios

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

MP.4. Model with mathematics. Students use vertical and horizontal number lines to visualize integers and better understand their connection to whole numbers. They divide number line intervals into sub-intervals of tenths to determine the correct placement of rational numbers. Students may represent a decimal as a fraction or a fraction as a decimal to better understand its relationship to other rational numbers to which it is being compared. To explain the meaning of a quantity in a real-life situation (involving elevation, temperature, or direction), students may draw a diagram and/or number line to illustrate the location of the quantity in relation to zero or an established level that represents zero in that situation.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

MP.7. Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

Vocabulary

- Absolute value
- Integer
- Magnitude
- Negative number
- Opposite
- Positive number quadrant (description)
- Rational number (description)

KPBSD MATH CURRICULUM
6th GRADE
UNIT 2 – ARITHMETIC AND OPERATIONS INCLUDING DIVISION AND FRACTIONS

Desired Results

Priority Standards

6.NS.A.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
6.NS.B.2. Fluently divide multi-digit numbers using the standard algorithm.
6.NS.B.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
6.NS.B.4. Find the greatest common factor of two whole numbers less than or equal to and the least common multiple of two whole numbers less than or equal to. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Transfer

Students will be able to independently use their learning to…
Apply and extend previous understandings of multiplication and division to divide fractions by fractions, compute fluently with multi-digit numbers, and find common factors and multiples to solve read-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Contexts and visual models help make the connection between dividing by a fraction and multiplying by the reciprocal of that fraction.
- There are relationships between numbers and their multiples.
- Properties of operations are used to simplify and fluently compute problems with multi-digit numbers and decimals.

ESSENTIAL QUESTIONS

Students will keep considering…
- How do models and visuals help me divide and multiply fractions?
- How is division related to realistic situations and to the other operations?
- What are ways I use estimation to check that my answer is reasonable?
- What role does place value play in multi-digit decimal operations?

Acquisition

Students will know…
- Operations perform the same function on fractions and decimals as they do on whole numbers.
- The difference between a whole number being divided by a fraction and a fraction being divided by a whole number.
- Standard algorithms improve fluency of addition, subtraction, multiplication, and division with multi-digit numbers and decimals.
- Prime factorization is a method for finding greatest common factors (GCF) and least common multiples (LCM).

Students will be skilled at…
- I can compute quotients of fractions divided by fractions (including mixed numbers).
- I can use visual models such as fraction bars, number lines, and area models to show the quotient of whole numbers and fractions.
- I can use models to show the connection between those models and the multiplication of fractions.
- I can divide a fraction by a whole number.

KPBSD MATH CURRICULUM
6th GRADE
UNIT 2 – ARITHMETIC AND OPERATIONS INCLUDING DIVISION AND FRACTIONS

Evidence	
Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 2 - A Story of Ratios

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students makes sense of and solve real-world and mathematical ratio, rate, and percent problems using representations, such as tape diagrams, ratio tables, and coordinate plane and double number line diagrams.

MP.2. Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

MP.7. Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

MP.8. Look for and express regularity in repeated reasoning. Students determine reasonable answers to problems involving operations with decimals. Estimation skills and compatible numbers are used.

Vocabulary

- Greatest common factor
- Least common multiple
- Multiplicative inverses

KPBSD MATH CURRICULUM
6th GRADE
UNIT 3 – AREA, SURFACE AREA, AND VOLUME PROBLEMS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
6.G.A.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
6.G.A.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
6.G.A.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
6.G.A.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve real-world and mathematical problems involving area, surface area, and volume.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Formulas help measure area and volume of two and three-dimensional shapes.
• There is a process to the development of the formula for the area of a triangle.
• Coordinates that are the same create horizontal or vertical lines.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How do models and visuals help me divide and multiply fractions?
• How is division related to realistic situations and to the other operations?
• What are ways I use estimation to check that my answer is reasonable?
• What role does place value play in multi-digit decimal operations?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Area is the number of squares needed to cover a plane figure.
• The formula for finding the area of a rectangle (multiplying base x height; therefore, the area of the triangle is ½ bh or (b x h)/2.)
• A rectangle can be decomposed into two congruent triangles.
• That the unit cube may have fractional edge lengths. (ie. ½ • ½ • ½)
• Nets can be used to find the surface area of figures.
• That if both x-coordinates are the same (2, - 1) and (2, 4), then a vertical line has been created</td><td>Students will be skilled at…
• I can find area of triangles, special quadrilaterals, and polygons.
• I can compose polygons into rectangles.
• I can decompose polygons into triangles.
• I can apply composing and decomposing to find area within real-world and cultural contexts.
• I can describe the relationship between triangles and rectangles when finding area.
• I can explain how to find the area of a triangle and rectangle.
• I can find the volume of a rectangular prism with fractional edge lengths.</td></tr>
</table>

	and the distance between these coordinates is the distance between -1 and 4, or 5. • That if both the y-coordinates are the same (-5, 4) and (2, 4), then a horizontal line has been created and the distance between these coordinates is the distance between - 5 and 2, or 7.	• I can show relationship of volume when packing it with unit cubes and multiplying edge lengths. • I can apply formulas to find volumes of right rectangular prisms. • I can draw polygons in a coordinate plane given vertices. • I can use coordinates to find the length of a side and finding the length of a side by joining points. • I can represent three-dimensional figures using nets. • I can use nets to find surface area.

Evidence

Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 2 - A Story of Ratios

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students make sense of real world problems that involve area, volume, and surface area. One problem involves multiple steps without breaking the problem into smaller, simpler questions. To solve surface area problems, students have to find the area of different parts of the polygon before calculating the total area.

MP.3. Construct viable arguments and critique the reasoning of others. Students develop different arguments as to why area formulas work for different polygons. Through this development, students may discuss and question their peers' thinking processes. When students draw nets to represent right rectangular prisms, their representations may be different from their peers'. Although more than one answer may be correct, students have an opportunity to defend their answers as well as question their peers. Students may also solve real-world problems using different methods; therefore, they may have to explain their thinking and critique their peers.

MP.4. Model with mathematics. Models are used to demonstrate why the area formulas for different quadrilaterals are accurate. Students use unit cubes to build right rectangular prisms and use these to calculate volume. The unit cubes are used to model that $V = lwh$ and $V = bh$, where b represents the area of the base, and that both are accurate formulas to calculate the volume of a right rectangular prism. Students will use nets to model the process of calculating the surface area of a right rectangular prism.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

Vocabulary

- Altitude and base of a triangle
- Cube
- Hexagon
- Line perpendicular to a plane
- Net
- Parallel planes
- Pentagon
- Right rectangular prism
- Surface of a prism
- Triangular region
- Rectangles
- Special quadrilaterals
- Compose
- Decompose
- Polygons
- Right rectangular prism
- Fractional edge lengths
- Unit cubes
- Volume
- Formulas V = l w h and V = b h
- Polygons
- Coordinate plane
- Coordinates
- Points
- Vertices

KPBSD MATH CURRICULUM

6^{th} GRADE

UNIT 4 – EXPRESSIONS AND EQUATIONS

Desired Results

Priority Standards

6.EE.A.1. Write and evaluate numerical expressions involving whole-number exponents.

6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers.
b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

6.EE.B.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.B.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Transfer

Students will be able to independently use their learning to…
Apply and extend previous understandings of arithmetic to algebraic expressions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Numerical expressions can be written evaluated using whole number exponents.
- Expressions can be written from verbal descriptions using letters and numbers.
- The “order of operations” is important.
- Properties of operations can be used to generate equivalent expressions.
- Solving an equation or inequality is a process of answering questions.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I use patterns to understand mathematics and model situations?
- What is algebra?
- What is the importance of the “order of operations”?
- How do algebraic representations relate and compare to one another?
- What questions do I ask when solving an equation or inequality?

Acquisition

Students will know…

- How to represent and analyze quantitative relationships between dependent and independent variables.
- Order is important in writing subtraction and division problems.
- Two expressions are equivalent when naming the same number.
- Substitution can determine whether a given number in a specified set makes an equation or inequality true.
- A variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

Students will be skilled at…

- I can write numerical expressions using whole-number exponents.
- I can evaluate numerical expressions using whole number exponents.
- I can write and read expressions with letters.
- I can identify and explain parts of an expression using precise language.
- I can evaluate expressions with letters.
- I can evaluate expressions at specific values of their variables.
- I can perform arithmetic operations in conventional problems.
- I can apply the properties of operations.

6.EE.B.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q, and x are all nonnegative rational numbers. **6.EE.B.8.** Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. **6.EE.C.9.** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. **6.NS.2.** Fluently multiply and divide multi-digit whole numbers using the standard algorithm. Express the remainder as a whole number, decimal, or simplified fraction; explain or justify your choice based on the context of the problem.	• That the relationship between two variables begins with the distinction between dependent and independent variables.	• I can generate equivalent expressions. • I can explain why the distributive property works. • I can identify equivalent expressions. • I can explain how expressions are equivalent using precise language. • I can use variables to represent two quantities. • I can write an equation to express the quantity in terms. • I can analyze the relationship between the dependent and independent variables and relating the dependent and independent variables to the equation.

Evidence

Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 2 - A Story of Ratios

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

MP.7. Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

MP.8. Look for and express regularity in repeated reasoning. Students look for regularity in a repeated calculation and express it with a general formula. Students work with variable expressions while focusing more on the patterns that develop than the actual numbers that the variable represents. For example, students move from an expression such as $3 + 3 + 3 + 3 = 4 \cdot 3$ to the general form $m + m + m + m = 4 \cdot m$, or $4m$. Similarly, students move from expressions such as $5 \cdot 5 \cdot 5 \cdot 5 = 5\ 4$ to the general form $m \cdot m \cdot m \cdot m = m4$. These are especially important when moving from the general form back to a specific value for the variable.

Vocabulary

- Equation
- Equivalent expressions
- Exponential notation for whole number exponents
- Expression
- Linear expression
- Number sentence
- Numerical expression
- Solution of an equation
- Truth Values of a number sentence
- Value of a numerical expression
- Variable

KPBSD MATH CURRICULUM
6th GRADE
UNIT 5 – RATIOS AND UNIT RATES

Desired Results

Priority Standards

6.RP.1. Write and describe the relationship in real life context between two quantities using ratio language.

6.RP.2. Understand the concept of a unit rate (*a*/*b* associated with a ratio *a:b* with *b* ≠0, and use rate language in the context of a ratio relationship) and apply it to solve real-world problems (e.g., unit pricing, constant speed).

6.RP.3. Use ratio and rate reasoning to solve real-world and mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).

Transfer

Students will be able to independently use their learning to…

Use their learning to understand ratios and use ratio reasoning to solve problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- A ratio is an ordered pair of numbers which are both not zero.
- A ratio is often used instead of describing the first number as a multiple of the second.
- The relationship between rates, ratios, and fractions.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is a ratio?
- When and how is a ratio used?
- What is the relationship between fractions, decimals, percents, and ratios?
- What are ways I represent relationships between two quantities in real life contexts?

Acquisition

Students will know…

- Order matters when writing a ratio.
- Ratios can be simplified.
- Ratios compare two quantities; the quantities do not need to be the same unit of measure.
- Ratios appear in a variety of different contexts: part-to-whole, part to part, and rates.
- A ratio is often used to describe the relationship between the amount of quantity and the amount of another quantity.
- All ratios associated to a given rate are equivalent because they have the same value.
- Conversion tables contain ratios that can be used to convert units of length, weight, or capacity.

Students will be skilled at…

- I can use precise language and writing notation of ratios (_:_to _).
- I can use and create tables to solve problems.
- I can write and solve equations using the value of a ratio.
- I can precisely identify the associated rate given a ratio.
- I can use tables to compare proportional quantities.
- I can plot pairs of values that represent equivalent ratios on the coordinate plane.
- I can manipulate and transform units appropriately when multiplying or dividing quantities.

	• Percents are related to part-to-whole ratios and rate where the whole is 100.	• I can model and write percents as a fraction over 100 or a decimal to the hundredths place.

Evidence

Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 1 - A Story of Ratios

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students make sense of and solve real-world and mathematical ratio, rate, and percent problems using representations, such as tape diagrams, ratio tables, and coordinate plane and double number line diagrams.

MP.2. Reason abstractly and quantitatively. Students solve problems by analyzing and comparing ratios and unit rates given in tables, equations, and graphs. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance = rate × time.

MP.5. Use appropriate tools strategically. Students become proficient using a variety of representations that are useful in reasoning with rate and ratio problems, such as tape diagrams, double line diagrams, ratio tables, a coordinate plane, and equations. They then use judgment in selecting appropriate tools as they solve ratio and rate problems.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

MP.7. Look for and make use of structure. Students recognize the structure of equivalent ratios in solving word problems using tape diagrams. Students identify the structure of a ratio table and use it to find missing values in the table. Students make use of the structure of division and ratios to model 5 miles/2 hours as a quantity 2.5 mph.

Vocabulary

- Equivalent ratios
- Measurement of a quantity
- Percent
- Quantity (illustration)
- Rate (illustration)
- Ratio
- Ratio relationship
- Type of quantity (illustration)
- Unit of measurement
- Unit rate
- Value of a ratio

KPBSD MATH CURRICULUM
6th GRADE
UNIT 6 – STATISTICS

Desired Results

Priority Standards

6.SP.A.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
6.SP.A.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.SP.A.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.SP.B.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
6.SP.B.5. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observation.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Transfer

Students will be able to independently use their learning to…
Collect, organize, and display data to communicate and make predictions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Variability plays an important role in constructing statistical questions.
- A statistical question is a question that anticipates variability in the data and can help us predict answers.
- Data sets can be displayed in many ways.

ESSENTIAL QUESTIONS

Students will keep considering…
- How can I gather, organize, and display data to communicate and justify results in the real world?
- How can I analyze data to make inferences and/or predictions, based on surveys, experiments, probability, and observational studies?

Acquisition

Students will know…
- A distribution is the arrangement of the values of a data set and can be described using center (median or mean), and spread.
- Data collected can be represented and/or displayed on graphs to show the shape of the distribution of the data.
- The difference between a question and a statistical question.
- Measures of variation are used to describe how the value of a numerical data set varies with a single number.
- Precise mathematical language to describe the results of a statistical question.
- Numerical sets can be displayed in multiple ways.

Students will be skilled at…
- I can recognize and tell the difference between a question and a statistical question.
- I can explain how variability plays a role in statistical questions.
- I can describe the results of a statistical question using precise mathematical language.
- I can recognize the difference between the measure of center and measure of variation.
- I can display data using dot plots, histograms, and box plots.
- I can explain the distribution dependent on which display was used.
- I can summarize numerical data set in multiple ways.

		• I can report the number of observations and describe the nature of an attribute being investigated. • I can identify the measures of center. • I can recognize the variability in a data set. • I can describe overall patterns and deviations within a data set. • I can relate the measure of center and variability to the shape of the distribution and the context.

Evidence

Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S):

Learning Plan

EngageNY Module 6 - A Story of Ratios

Math Practices and Vocabulary

MP 1. Make sense of problems and persevere in solving them. Students make sense of real-world problems that involve area, volume, and surface area. One problem involves multiple steps without breaking the problem into smaller, simpler questions. To solve surface area problems, students have to find the area of different parts of the polygon before calculating the total area.

MP.2. Reason abstractly and quantitatively. Students pose statistical questions and reason about how to collect and interpret data in order to answer these questions. Students use graphs to summarize the data and to answer statistical questions.

MP.3. Construct viable arguments and critique the reasoning of others. Students develop different arguments as to why area formulas work for different polygons. Through this development, students may discuss and question their peers' thinking processes. When students draw nets to represent right rectangular prisms, their representations may be different from their peers. Although more than one answer may be correct, students have an opportunity to defend their answers as well as question their peers. Students may also solve real-world problems using different methods; therefore, they may have to explain their thinking and critique their peers.

MP.4. Model with mathematics. Models are used to demonstrate why the area formulas for different quadrilaterals are accurate. Students use unit cubes to build right rectangular prisms and use these to calculate volume. The unit cubes are used to model that $V = lwh$ and $V = bh$, where b represents the area of the base, and that both are accurate formulas to calculate the volume of a right rectangular prism. Students will use nets to model the process of calculating the surface area of a right rectangular prism.

MP.6. Attend to precision. Students define and distinguish between ratio, the value of a ratio, a unit rate, a rate unit, and a rate. Students use precise language and symbols to describe ratios and rates. Students learn and apply the precise definition of percent.

Vocabulary

- Absolute deviation
- Box plot
- Dot plot
- Frequency
- Interquartile range (iqr)
- Mean
- Mean absolute deviation (mad)
- Median
- Relative frequency
- Relative frequency table
- Variability
- Statistical question
- Set of data
- Distribution
- Center (median or mean) variability (interquartile range and/or mean absolute deviation)
- Spread
- Shape
- Measure of center
- A measure of variation
- Numerical data
- Histogram
- Box plot
- Number line
- Intervals
- Values
- Quartile
- Five-number summary

- Distribution
- Numerical data sets
- Attribute
- Units of measure
- Quantitative measures of center (median and/or mean)

KPBSD MATH CURRICULUM
7TH GRADE
UNIT 1 – RATIONAL NUMBERS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers: represent addition and subtraction on a horizontal or vertical number line diagram.
7.NS.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers and use equivalent representations.
Supporting Standards
7.NS.3. Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Apply the properties of integers to model situations and to apply the order of operations to rational numbers.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• A number line can be used to model addition and subtraction of integers.
• A number added to its opposite equals zero.
• There are rules for adding and subtracting integers.
• Addition facts have related subtraction facts.
• Integer rules can be extended to include rational numbers.
• The order of operations is used to calculate with rational numbers.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• What are ways I can solve real-world and mathematical problems involving the four operations with rational numbers?
• How can I apply the rules of order of operations to rational numbers?
• How can I use a number line to show addition and subtraction of integers?
• How can I use integer and opposite to add to zero?
• In what ways are subtracting and adding opposites the same?
• How can I extend the rules of integers to include rational numbers?</td></tr>
</table>

	Acquisition	
	Students will know… • That a number and its opposite have a sum of zero, including real-world examples. • Adding rational numbers represents distance from zero on a number line. • Subtraction of rational numbers is the addition of the additive inverse. • The properties of operations to add and subtract rational numbers. • The rules for multiplying signed numbers carry over to rational numbers. • Integers can be divided by non-zero divisors, and the quotient is a rational number. • How to apply and name properties of operations used as strategies to multiply and divide. • Rational numbers and decimals can be converted using long division. • Equivalent fractions, decimals, or percents are related.	Students will be skilled at… • I can show that the sum of a number and its opposite equals zero and show real-world situations of this. • I can show that the distance between two rational numbers on a number line is the absolute value of their difference. • I can interpret sums of rational numbers in real-world situations. • I can apply concepts of adding and subtracting rational numbers in real-world settings. • I can show that adding a negative number is the same as subtraction. • I can show that integers can be divided by a divisor (not zero) and that the answer is a rational number. • I can apply and name the properties of operations used as strategies to multiply and divide. • I can use long division to convert from rational numbers to decimals. • I can convert between fractions, decimals, and percents.

Evidence	
Evaluative Criteria	**Assessment Evidence**

	PERFORMANCE TASK(S):
	• Difference of Integers
	  ○ The goal of this task is to subtract integers in a real-world context. It will be very helpful for students to use number lines for this task. In the solution they are drawn vertically to match the context of elevation but accurately labeled horizontal number lines are also appropriate.
	• Operations on the Number Line
	  ○ The purpose of this task is to help solidify students' understanding of signed numbers as points on a number line and to understand the geometric interpretation of adding and subtracting signed numbers.
	• Distances Between Houses
	  ○ The purpose of this task is for students to solve a problem involving distances between objects whose positions are defined relative to a specified location and to see how this kind of situation can be represented with signed numbers.
	• A Day Out
	  ○ In this task, students must analyze the results of a survey in order to plan a school trip.
	• Taxi Cabs
	  ○ In this task, students must use math to find the best way to organize cabs for a large group of people.
	• Cat Food
	  ○ This task challenges a student to use multiplication with fractions and whole numbers to solve multi-step problems. A student must be able to reason about a unit different from one and rounding in the context of a problem-solving situation. A student needs to reason quantitatively and label units. A student needs to use multiplication and division to solve problems. A student must understand the effects of operations with rational numbers.
	• Division
	  ○ When students calculate 100 ÷ 6 using a calculator, the result is 16.6666667 In this task, students will look at problems in which the answer might be 100 ÷ 6. Students must decide whether this is true, and what would be a **sensible** answer to write down.

Learning Plan

EngageNY Module 2

Holt McDougal Lessons 1-1, 1-2, 2-1, 2-2, 2-3, 2-4, 2-6, 2-7, 3-1, 3-2, 3-3, 3-5, 3-6, 3-7, Hands-On Lab: Model Integer Addition, Hands-On Lab: Model Integer Multiplication and Division, Extension: Additive Inverse and Absolute Value, Technology Lab: Explore Order of Operations

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. When problem-solving, students use a variety of techniques to make sense of a situation involving rational numbers. For example, they may draw a number line and use arrows to model and make sense of an integer addition or subtraction problem. Or when converting between forms of rational numbers, students persevere in carrying out the long division algorithm to determine a decimal's repeat pattern. A tape diagram may be constructed as an entry point to make sense of a working backward problem. As students fluently solve word problems using algebraic equations and inverse operations, they consider their steps and determine whether or not they make sense in relationship to the arithmetic reasoning that served as their foundation in earlier grades.

MP.2. Reason abstractly and quantitatively. Students make sense of integer addition and subtraction through the use of an integer card game and diagramming the distances and directions on the number line. They use different properties of operations to add, subtract, multiply, and divide rational numbers, applying the properties to generate equivalent expressions or explain a rule. Students use integer subtraction and absolute value to justify the distance between two numbers on the number line. Algebraic expressions and equations are created to represent relationships. Students know how to use the properties of operations to solve equations. They make zeros and ones when solving an algebraic equation, thereby demonstrating an understanding of how the use of inverse operations ultimately leads to the value of the variable.

MP.4. Model with mathematics. Through the use of number lines, tape diagrams, expressions, and equations, students model relationships between rational numbers. Students relate operations involving integers to contextual examples. For instance, an overdraft fee of $25 that is applied to an account balance of −$73.06 is represented by the expression $-73.06 - 25$ or $-73.06 + (-25)$ using the additive inverse. Students compare their answers and thought processes in the Integer Game and use number line diagrams to ensure accurate reasoning. They deconstruct a difficult word problem by writing an equation, drawing a number line, or drawing a tape diagram to represent quantities. To find a change in elevation, students may draw a picture representing the objects and label their heights to aid in their understanding of the mathematical operation(s) that must be performed.

MP.6. Attend to precision. In performing operations with rational numbers, students understand that the decimal representation reflects the specific place value of each digit. When converting fractions to decimals, they carry out their calculations to specific place values, indicating a terminating or repeating pattern. In stating answers to problems involving signed numbers, students use integer rules and properties of operations to verify that the sign of their answer is correct. For instance, when finding an average temperature for temperatures whose sum is a negative number, students realize that the quotient must be a negative number since the divisor is positive and the dividend is negative.

MP.7. Look for and make use of structure. Students formulate rules for operations with signed numbers by observing patterns. For instance, they notice that adding -7 to a number is the same as subtracting 7 from the number, and thus, they develop a rule for subtraction that relates to adding the inverse of the subtrahend. Students use the concept of absolute value and subtraction to represent the distance between two rational numbers on a number line.

They use patterns related to the properties of operations to justify the rules for multiplying and dividing signed numbers. The order of operations provides the structure by which students evaluate and generate equivalent expressions.

Vocabulary

- Additive identity
- Additive inverse
- Distance formula
- Multiplicative identity
- Repeating decimal
- Terminating decimal
- Absolute Value
- Associative Property (of Multiplication and Addition)
- Commutative Property (of Multiplication and Addition)
- Distributive Property (of Multiplication Over Addition)
- Equation
- Expression
- Integer
- Inverse
- Multiplicative
- Inverse
- Negatives
- Opposites
- Positives
- Rational Numbers

KPBSD MATH CURRICULUM
7th GRADE
UNIT 2 – EXPRESSIONS AND EQUATIONS

Desired Results

Priority Standards

7.EE.1. Apply properties of operations as strategies to add, subtract, factor, expand, and simplify linear expressions with rational coefficients.

7.EE.3. Solve multi-step real-world and mathematical problems posed with positive and negative rational numbers in any form and assess the reasonableness of answers using mental computation and estimation strategies.

7.EE.4. Use variables to represent quantities in real-world or mathematical problems, and construct multi-step equations and inequalities to solve problems by reasoning about the quantities.

Supporting Standards

7.EE.2. Understand that re-writing an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

Transfer

Students will be able to independently use their learning to…
Use properties of operations to generate equivalent expressions and solve real-world and mathematical problems using numerical and algebraic expressions and equations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Expressions are powerful tools for exploring, reasoning, and representing situations.
- An expression may be presented in expanded, factored, and or standard form.
- Variables have many different meanings, depending on context and purpose.
- Variables permit writing expressions whose values are unknown or vary under different circumstances.
- Mental computation and estimation strategies help us assess reasonableness of answers.
- Two or more expressions may be equivalent, even when their symbolic forms differ.
- Substitution may be used to identify equivalent expressions.
- Linear expressions may be added to or subtracted from one another.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I use properties of operations to solve linear expressions with integers, positive/negative fractions, and decimals (rational coefficients)?
- How can I re-write an expression in different forms to explain and reveal how the quantities are related in real-world situations?
- How can I solve multi-step real-world and mathematical problems that include positive and negative rational numbers in any form?
- How can I assess whether or not an answer is reasonable using mental computation and estimation strategies?
- How can I use equations to solve real-world multi-step problems?
- How can I use inequalities to solve real-world multi-step problems?

	Acquisition	
	Students will know… • The properties of operations (add, subtract, fact, or expand linear expressions). • Re-writing an expression in a different form can reveal and explain how the quantities are related. • Problem solving strategies to solve real-world, multi-step problems which include positive and negative rational numbers in whole numbers, fractions, and decimals (any form). • Variables represent quantities. • Inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. • The solution set of an inequality can be graphed.	Students will be skilled at… • I can apply the properties of operations to add, subtract, factor, and expand linear expressions with integers, positive/negative fractions, and decimals. • I can explain and reveal how quantities are related in real-world situations by re-writing an expression in different forms. • I can use problem solving strategies to solve multi-step problems involving positive and negative rational numbers in real-world situations. • I can determine how reasonable my solution is using mental computation and estimation strategies. • I can solve real-world problems using equations like $px + q = r$ and $p(x + q) = r$ using positive/negative integers, fractions and decimals. • I can solve real-world problems using inequalities like $px + q > r$ or $px + q < r$, using positive/negative integers, fractions and decimals. • I can graph the solution of an inequality and explain what it means in terms of the problem.

Evidence

Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S): • Equivalent Expressions? ○ The purpose of this task is to directly address a common misconception held by many students who are learning to solve equations. Because a frequent strategy for solving an equation with fractions is to multiply both sides by a common denominator (so all the coefficients are integers), students often

	forget why this is an "allowable" move in an equation and try to apply the same strategy when they see an expression.
	• Writing Expressions
	  ○ The instructions for the two expressions sound very similar, however, the order in which the different operations are performed and the exact wording make a big difference in the final expression. Students have to pay close attention to the wording: "subtract the result from 1" and "subtract 1 from the result" are very different.
	• Guess My Number
	  ○ This problem asks the students to represent a sequence of operations using an expression and then to write and solve simple equations. The problem is posed as a game and allows the students to visualize mathematical operations.
	• Ticket to Ride
	  ○ The purpose of this instructional task is to illustrate how different, but equivalent, algebraic expressions can reveal different information about a situation represented by those expressions.
	• Toy Trains
	  ○ This task challenges a student to use algebra to represent, analyze, and generalize a variety of functions including linear relationships. A student must be able to relate and compare different forms of representation for a relationship including words, tables, graphs, and writing an equation to describe a functional pattern. A student must be able to use rules of operations to extend a pattern and use its inverse.
	• Speedy Texting
	• Fencing
	  ○ In this task, students must figure out the cost of building fences from fence posts and wooden panels.
	• Sports Equipment Set
	  ○ The purpose of this task is to present students with a context that can naturally be represented with an inequality and to explore the relationship between the context and the mathematical representation of that context.
	• Drill Rig
	  ○ The purpose of this task is to provide a context for multiplying and dividing signed rational numbers, providing a means for understanding why the signs behave the way they do when finding products.

Learning Plan

EngageNY Module 3

Holt McDougal Lessons 1-3, 1-4, 1-5, 2-5, 3-4, 3-8, 6-3, 11-1, 11-2, 11-3, 11-4, 11-5, 11-6, 11-7, Hands-On Lab: Model Two Step Equations, Real-World Connections, Extension: Examine Solution Methods, Lab: Model Integer Equations.

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students make sense of how quantities are related within a given context and formulate algebraic equations to represent this relationship. They use the properties of operations to manipulate the symbols that are used in place of numbers, in particular, pi. In doing so, students reflect upon each step in solving and recognize that these properties hold true since the variable is really just holding the place for a number. Students analyze solutions and connect back to ensure reasonableness within context.

MP.4. Model with mathematics. Throughout the module, students use equations and inequalities as models to solve mathematical and real-world problems. In discovering the relationship between circumference and diameter in a circle, they will use real objects to analyze the relationship and draw conclusions. Students test conclusions with a variety of objects to see if the results hold true, possibly improving the model if it has not served its purpose.

MP.6. Attend to precision. Students are precise in defining variables. They understand that a variable represents one number. They use appropriate vocabulary and terminology when communicating about expressions, equations, and inequalities. They use the definition of equation from Grade 6 to understand how to use the equal sign consistently and appropriately. Circles and related notions about circles are precisely defined in this module.

MP.7. Look for and make use of structure. Students recognize the repeated use of the distributive property as they write equivalent expressions. Students recognize how equations leading to the form $px + q = r$ and $(x + q) = r$ are useful in solving a variety of problems. They see patterns in the way that these equations are solved. Students apply this structure as they understand the similarities and differences in how an inequality of the type $px + q > r$ or $px + q < r$ is solved.

MP.8. Look for and express regularity in repeated reasoning. Students use area models to write products as sums and sums as products and recognize how this model is a way to organize results from repeated use of the distributive property. As students work to solve problems, they maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of solutions as they are represented in contexts that allow for students to know that they found the intended value for a given variable. As they solve problems involving pi, they notice how a problem may be reduced by using a given estimate for pi to make calculations more efficient.

Vocabulary

- Expanded form of expressions
- Factored form expressions
- Circle
- Circular region
- circumference
- Coefficient
- Diameter of a circle
- Interior of a circle
- Pi
- Term

KPBSD MATH CURRICULUM
7th GRADE
UNIT 3 – RATIOS AND PROPORTIONAL RELATIONSHIPS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
7.RP.2. Recognize and represent proportional relationships between quantities. Make basic inferences or logical predictions from proportional relationships.
a. Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).
b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships in real-world situations.
c. Represent proportional relationships by equations and multiple representations such as tables, graphs, diagrams, sequences, and contextual situations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.
d. Understand the concept of unit rate and show it on a coordinate plane. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Analyze proportional relationships and use them to solve real-world and mathematical problems by defining proportional relationships and the constant of proportionality, exploring multiple representations of relationships (tables, graphs, equations, and descriptions), computing unit rates and applying their understanding to identify and creating scale drawings.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units.
• Apply a given scale factor to find missing dimensions of similar figures.
• Proportional relationships are made up of equivalent ratios.
• Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams.
• Represent proportional relationships by equations and multiple representations such as tables, graphs, diagrams, sequences, and contextual situations.
• Understand the concept of unit rate and show it on a coordinate plane.
• Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How can I use ratios of fractions to compute unit rates?
• How can I use a scale factor to find missing dimensions of similar figures?
• How can I decide whether two quantities are in a proportional relationship?
• How can I use tables, graphs, equations, and diagrams to identify unit rates (constants of proportionality)?
• How can proportional relationships for real-world situations be described?
• How can proportional relationships be represented by equations, tables, graphs, diagrams, sequences, and in real-world situations?
• What do the points on a graph of a proportional relationship mean in terms of a specific situation?
• How can scale be used to solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale?</td></tr>
</table>

<table>
<tr><td rowspan="2">7.G.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Supporting Standards

7.RP.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour or apply a given scale factor to find missing dimensions of similar figures.</td><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
Ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units can be computed in unit rates.
A scale factor can be used to find missing dimensions of similar figures.
A statement of equality between two ratios is a proportion.
In a proportion, the ratio of two quantities remains constant as the corresponding values of quantities change.
The point (1, r) on a graph represents unit rate.
The scale gives the ration that compares the measurements of the drawing or model to the measurements of the real object.
Scale drawings and models of geometric figures are used to represent objects that are too large or small to be drawn or built to actual size.
The measurements on a drawing or model are proportional to the measurements on the actual objects.</td><td>Students will be skilled at…
I can use ratios to compute unit rates in like or different units to solve problems. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction {½}/{¼} miles per hour, equivalently 2 miles per hour.
I can find missing dimensions in a similar figure by applying a scale factor.
I can identify if two quantities are in a proportional relationship.
I can analyze two ratios to determine if they are proportional to one another with a variety of strategies. (e.g. using tables, graphs, pictures, etc.)
I can analyze tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships to identify the constant of proportionality.
I can represent proportional relationships by writing equations.
I can explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.
I can solve problems involving scale drawings of geometric figures using scale factor.
I can reproduce a scale drawing that is proportional to a given geometric figure using a different scale.</td></tr>
</table>

Evidence	
Evaluative Criteria	**Assessment Evidence**

	PERFORMANCE TASK(S):
	• Photographs
	  ○ This task challenges a student to reason about geometric relationships in a diagram and use proportions to find missing dimensions of a photograph. A student must develop, analyze, and explain methods for solving problems involving proportional reasoning such as scaling and finding equivalent ratios.
	• Mixing Paints
	  ○ This task challenges a student to use ratios and percents to solve a practical problem. A student must use knowledge of fractions and ratios to solve problems and represent fractions or ratios as percentages. A student must be able to clearly define the whole in different situations in order to represent the relationships numerically.
	• Cat Food
	  ○ This task challenges a student to use multiplication with fractions and whole numbers to solve multi-step problems. A student must be able to reason about a unit different from one and rounding in the context of a problem-solving situation. A student needs to reason quantitatively and label units. A student needs to use multiplication and division to solve problems. A student must understand the effects of operations with rational numbers.
	• Resizing Washington Park
	  ○ The goal of this task is to get students to think critically about the effect that changing from one scaling to another has on an image, and then to physically produce the desired image.
	• Floor Plan
	  ○ The purpose of this task is for students to translate between measurements given in a scale drawing and the corresponding measurements of the object represented by the scale drawing.
	• Map Distance
	  ○ The purpose of this task is for students to translate between information provided on a map that is drawn to scale and the distance between two cities represented on the map.

Learning Plan

EngageNY Module 1

Holt McDougal Lessons 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 5-1, 5-2, 5-3, 5-4, Hands-On Lab: Graph Proportional Relationships, Hands-On Lab: Making Scale Drawings and Models, Hands-On Lab: Use Scale Drawings

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students make sense of and solve multi-step ratio problems, including cases with pairs of rational number entries; they use representations, such as ratio tables, the coordinate plane, and equations, and relate these representations to each other and to the context of the problem. Students depict the meaning of constant of proportionality in proportional relationships, the importance of (0,0) and $(1,r)$ on graphs, and the implications of how scale factors magnify or shrink actual lengths of figures on a scale drawing.

MP.2. Reason abstractly and quantitatively. Students compute unit rates for paired data given in tables to determine if the data represents a proportional relationship. Use of concrete numbers will be analyzed to create and implement equations, including $y=kx$, where k is the constant of proportionality. Students decontextualize a given constant speed situation, representing symbolically the quantities involved with the formula, distance=rate×time. In scale drawings, scale factors will be changed to create additional scale drawings of a given picture.

Vocabulary

- Vocabulary
- Estimate
- Proportion
- Proportional relationship
- Rate
- Rational coefficient
- Rational number
- Scale
- Unit rate
- Scale drawing
- Scale factor
- One-to-one correspondence
- Constant of proportionality

KPBSD MATH CURRICULUM
7^{th} GRADE
UNIT 4 – PERCENTS

Desired Results

Priority Standards

7.RP.3. Use proportional relationships to solve multi-step ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*

7.EE.3. Solve multi-step real-world and mathematical problems posed with positive and negative rational numbers in any form and assess the reasonableness of answers using mental computation and estimation strategies. *For example, If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

Transfer

Students will be able to independently use their learning to…
Deepen their understanding of ratios and proportional relationships by solving a variety of percent problems including converting between fractions, decimals, and percents to further develop a conceptual understanding of percent and using algebraic expressions and equations to solve multi-step percent problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Proportional relationships can be used to solve multi-step ratio and percent problems.
- There is a relationship between a positive or negative number and its opposite.
- Mental computation and estimation strategies help us assess the reasonableness of the answer.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can proportional relationships be used to solve multi-step ratio and percent problems?
- What ways can real-world mathematical multi-step problems with positive and negative numbers be solved?
- What strategies can be used to determine the reasonableness of answers, using mental computation and estimation?

Acquisition

Students will know…

- The use of proportional relationships is also extended to solve percent problems.
- Appropriate ways to convert between numerical forms.

Students will be skilled at…

- I can apply proportional reasoning to solve multi-step ratio and percent problems, including simple interest, tax, markups/markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error.
- I can solve multi-step real-world and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.
- I can apply properties of operations to calculate with numbers in any form.
- I can assess the reasonableness of answers using mental computation and estimation strategies.

Evidence	
Evaluative Criteria	**Assessment Evidence**
	PERFORMANCE TASK(S): • Gotham City Taxis ○ The purpose of this task is to give students an opportunity to solve a multi-step ratio problem that can be approached in many ways. • Who is the Better Batter? ○ The purpose of this task is to give students a real-world context for comparing fractions where it is natural to convert the fractions to decimals or describe the situation in terms of percents. • 25% Sale ○ In a sale, the store reduces all prices by 25% each week. Does this mean that, after 4 weeks, everything in the store will cost $0? If not, why not? • Sale! ○ In this task, students use mathematics to decide which special offers give the biggest and smallest price reductions. • T Shirt Sale ○ A store sells T-shirts at various prices and offers "Any 3 T-shirts for $14.50". Students task is to work out how much people have saved. • Cereal ○ This task challenges a student to use knowledge of proportional reasoning and to use equivalent ratios. A student must be able to convert between representations of rational numbers to compare and order ratios. A student must be able to interpret quantities and the associated units to interpret values in the context of a real-world problem.

Learning Plan

EngageNY Module 4* (partial module)

Holt McDougal Lessons 6-1, 6-2, 6-3, 6-4, Technology Lab: Explore Compound Interest

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students make sense of percent problems by modeling the proportional relationship using an equation, a table, a graph, a double number line diagram, mental math, and factors of 100. When solving a multi-step percent word problem, students use estimation and number sense to determine if their steps and logic lead to a reasonable answer. Students know they can always find 1% of a quantity by dividing it by 100 or multiplying it by 100, and they also know that finding 1% first allows them to then find other percents easily. *For instance, if students are trying to find the amount of money after 4 years in a savings account with an annual interest rate of 1/2 % on an account balance of $300, they use the fact that 1% of 300 equals 300/100 , or $3; thus, 1/2 % of 300 equals 1/2 of $3, or $36.00 multiplied by 4 is $6 interest, and adding $6 to $300 makes the total balance, including interest, equal to $306.*

MP.2. Reason abstractly and quantitatively. Students use proportional reasoning to recognize that when they find a certain percent of a given quantity, the answer must be greater than the given quantity if they found more than 100% of it and less than the given quantity if they found less than 100% of it. Double number line models are used to visually represent proportional reasoning related to percents in problems such as the following: If a father has 70% more money in his savings account than his 25-year-old daughter has in her savings account, and the daughter has $4,500, how much is in the father's account? Students represent this information with a visual model by equating 4,500 to 100% and the father's unknown savings amount to 170% of 4,500. Students represent the amount of money in the father's savings account by writing the expression 170 100 × 4,500, or 1.7(4,500). When working with scale drawings, given an original two-dimensional picture and a scale factor as a percent, students generate a scale drawing so that each corresponding measurement increases or decreases by a certain percentage of measurements of the original figure. Students work backward to create a new scale factor and scale drawing when given a scale factor represented as a percent greater or less than 100%. For instance, given a scale drawing with a scale factor of 25%, students create a new scale drawing with a scale factor of 10%. They relate working backward in their visual model to the following steps: (1) multiplying all lengths in the original scale drawing by 1 0.25 (or dividing by 25%) to get back to their original lengths and then (2) multiplying each original length by 10% to get the new scale drawing.

MP.5. Use appropriate tools strategically. Students solve word problems involving percents using a variety of tools, including equations and double number line models. They choose their model strategically. For instance, given that 75% of a class of learners is represented by 21 students, they recognize that since 75 is 3/4 of 100, and 75 and 21 are both divisible by 3, a double number line diagram can be used to establish intervals of 25's and 7's to show that 100% would correspond to 21 + 7, which equals 28. For percent problems that do not involve benchmark fractions, decimals, or percents, students use math sense and estimation to assess the reasonableness of their answers and computational work. *For instance, if a problem indicates that a bicycle is marked up 18% and is sold at a retail price of $599, students are able to estimate by using rounded values such as 120% and $600 to determine that the solution that represents the wholesale price of the bicycle must be in the realm of 600 ÷ 1.2, or 6,000 ÷ 12, to arrive at an estimate of $500.*

Vocabulary

- Area
- Circumference
- Coefficient of the term
- Complex fraction
- Constant of proportionality
- Discount price
- Equation
- Equivalent ratios
- Expression
- Fee
- Fraction
- Greatest common factor
- Length of a segment
- One-to-one correspondence
- Original price
- Percent
- Perimeter
- Pi
- Proportional relationship

KPBSD MATH CURRICULUM
7th GRADE
UNIT 5 – GEOMETRY

Desired Results

Priority Standards

Draw, construct, and describe geometrical figures and describe the relationships between them. Solve real-world and mathematical problems involving angle measure, area, surface area, and volume.

7.G.6. Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Supporting Standards

7.G.2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes including polygons and circles with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.3. Describe the two-dimensional figures, i.e., cross-section, that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

7.G.4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

7.G.5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Transfer

Students will be able to independently use their learning to…

Explore more challenging aspects of prior knowledge in angles, area, surface area, and volume to build a fluency in these difficult problems and work with constructing triangles and taking slices (or cross-sections) of three-dimensional figures.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The relationships that exist between geometrical figures.
- Procedures can be employed to describe, measure, construct, and draw geometrical figures.

ESSENTIAL QUESTIONS

Students will keep considering…

- What procedures can be employed to draw, construct, and describe geometrical figures?
- What relationships exist between geometrical figures?
- How can angle measures, area, surface area, and volume be used to solve real-world and mathematical problems?

Acquisition

Students will know…

- Types of angles (supplementary, complementary, vertical, adjacent).
- Complements and supplements of a given angle.
- Which conditions create unique triangles, more than one triangle, or no triangle.
- Π pi is a mathematical constant that measures the ration of a circles diameter.
- The formulas for area and circumference of a circle.
- How to find area, given the circumference of a circle.
- How to find circumference, given the area of a circle.

Students will be skilled at…

- I can determine unknown angle measures by writing and solving algebraic equations based on relationships between angles.
- I can analyze given conditions based on the three measures of angles or sides of a triangle to determine when there is a unique triangle, more than one triangle, or no triangle.
- I can construct triangles from three given angle measures to determine when there is a unique triangle, more than one triangle or no triangle using appropriate tools (freehand, rulers, protractors, and technology).
- I can construct triangles from three given side measures to determine when there is a unique

	• The formula for area and volume and the procedure for finding surface area and when to use them in real-world and math problems for two- and three-dimensional objects composed of triangles quadrilaterals, polygons, cubes, and right prisms.	triangle, more than one triangle or no triangle using appropriate tools (freehand, rulers, protractors, and technology). • I can Justify that π (pi) can be derived from the circumference and diameter of a circle. • I can apply circumference or area formulas to solve mathematical and real-world problems. • I can justify the formulas for area and circumference of a circle and how they relate to π. • I can informally derive the relationship between circumference and area of a circle. • I can solve real-world and math problems involving area, surface area and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

Evidence

Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S): • The Geometry of Letters ○ The purpose of this task is for students to analyze the geometry of letters. Letters provide a good opportunity for students to broaden their understanding of what constitutes a two-dimensional geometric figure. • What's the Point? ○ The purpose of this task is to use what students intuitively understand about connecting points or "dots" with lines to generate a discussion about what points are and how they should be represented. • Triangular Frameworks ○ How many different triangles can students make that follow a set of rules? • Historic Bicycle ○ In this task, students will figure out some problems about a strange old bicycle. • Pizza Crusts ○ This task challenges a student to calculate area and perimeters of squares and rectangles and find circumference and area of a circle. Students must find dimensions of rectangles that have a given area and work from area to circumference of a pizza.

	• Which is Bigger? ○ This task challenges a student to use knowledge of measurement to find the size of objects in a scale drawing. A student must be able to solve problems with scale factors using proportional reasoning. A student must be able to analyze characteristics and properties of three-dimensional geometric shapes and apply the appropriate techniques, tools, and formulas to determine measurements, such as circumference and height. • Circumference of a Circle ○ The goal of this task is to study the circumferences of different sized circles, both using manipulatives and from the point of view of scaling. • Parallelograms ○ This task challenges a student to use knowledge of measurement to identify and measure height in a triangle and to apply formulas to find area and perimeter of triangles and quadrilaterals. A student must use appropriate techniques, tools and formula to develop arguments regarding geometric ideas about perimeter. • Sports Bag ○ In this task, students must figure out how to cut out the material to make a cylindrical sports bag. • Funsize Cans ○ In this task, students must design a cylindrical drink can that uses the least aluminum for a given volume of drink. • Cube Ninjas! ○ The purpose of this task is to have students explore various cross sections of a cube and use precise language to describe the shape of the resulting faces.

Learning Plan

EngageNY Module 6

Holt McDougal Lessons 8-1, 8-2, 8-3, 8-4, 8-5, 9-1, 9-2, 9-3, 9-4, 9-5, 9-6, Lab: Explore Complementary and Supplementary Angles, Hands-On Lab: Explore Parallel Lines and Transversals, Hands-On Lab: Construct Bisectors and Congruent Angles, Hands-On Lab: Explore Perimeter and Circumference, Hands-On Lab: Explore the Volume of Prisms and Cylinders,Hands-On Lab: Use Nets to Build Prisms and Cylinders, Technology Lab: Construct Triangles with Given Side Lengths, Technology Lab: Explore Transformations, Technology Lab: Construct Triangles with Given Angle Measures, Lab Extension; Cross Sections.

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. This mathematical practice is particularly applicable for this module, as students tackle multi-step problems that require them to tie together knowledge about their current and former topics of study (i.e., a real-world composite area question that also requires proportions and unit conversion). In many cases, students have to make sense of new and different contexts and engage in significant struggle to solve problems.

MP.3. Construct viable arguments and critique the reasoning of others. In Topic B, students examine the conditions that determine a unique triangle, more than one triangle, or no triangle. They have the opportunity to defend and critique the reasoning of their own arguments as well as the arguments of others. In Topic C, students predict what a given slice through a three-dimensional figure yields (i.e., how to slice a three-dimensional figure for a given cross section) and must provide a basis for their predictions.

MP.5. Use appropriate tools strategically. In Topic B, students learn how to strategically use a protractor, ruler, and compass to build triangles according to provided conditions. An example of this is when students are asked to build a triangle provided three side lengths. Proper use of the tools helps them understand the conditions by which three side lengths determine one triangle or no triangle. Students have opportunities to reflect on the appropriateness of a tool for a particular task.

MP.7. Look for and make use of structure. Students must examine combinations of angle facts within a given diagram in Topic A to create an equation that correctly models the angle relationships. If the unknown angle problem is a verbal problem, such as an example that asks for the measurements of three angles on a line where the values of the measurements are consecutive numbers, students have to create an equation without a visual aid and rely on the inherent structure of the angle fact. In Topics D and E, students find area, surface area, and volume of composite figures based on the structure of two- and three-dimensional figures.

Vocabulary

- Acute triangle
- Adjacent angle
- Area (circle, regular polygon, quadrilateral, triangle)
- Circumference
- Complementary angles
- Cube
- Equilateral triangle
- Geometric figure
- Isosceles triangle
- Obtuse triangle
- Plane sections
- Polygon
- Prism

- Protractor
- Pyramid
- Quadrilateral
- Right prism
- Right rectangular pyramid
- Right triangle
- Supplementary angles
- Surface area
- Surface area (cube, right prism)
- Triangle
- Vertical angle
- Volume
- Volume (cube, right prism)

KPBSD MATH CURRICULUM
7th GRADE
UNIT 6 – STATISTICS AND PROBABILITY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.
7.SP.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.
7.SP.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.
7.SP.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
a. Understand that, just as with simple events, the probability of a compound event is the fraction</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Interpret probabilities, compute probabilities in simple settings, and estimate probabilities empirically and compare data distributions of two or more populations.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
Random sampling can be used to draw inferences about a population.
One can draw informal comparative inferences about two populations.
Chance processes exist and one can develop, use, and evaluate probability models using them.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
How can random sampling be used to draw inferences about a population?
How can I learn more about two populations by drawing informal comparative inferences?
What are chance processes?
How can chance processes be used to develop, use, and evaluate probability models?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
Statistics terms such as population, sample, sample size, random sampling, generalizations, valid, biased, and unbiased.
Sampling techniques such as convenience, random, systematic, and voluntary.
Generalizations about a population from a sample are valid only if the sample is representative of that population.
Identify an appropriate sample size.
Measures of central tendency (mean, median, and mode) in a data distribution.
Measures of variation including upper quartile, lower quartile, upper extreme maximum, lower extreme-minimum, range, interquartile range,</td><td>Students will be skilled at…
I can apply statistics to gain information about a population from a sample of the population.
I can generalize that random sampling tends to produce representative samples and support valid inferences.
I can analyze & interpreting data from a random sample to draw inferences about a population with an unknown characteristic of interest.
I can generate multiple samples (or simulated samples) of the same size to determine the variation in estimates or predictions by comparing and contrasting the samples.</td></tr>
</table>

of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* **Supporting Standards** **7.SP.1.** Understand that statistics can be used to gain information about a population by examining a reasonably sized sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **7.SP.5.** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.6.** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative	and mean absolute deviation (i.e., box-and whisker plots, line plots, dot plots, etc.). • Measures of central tendency (mean, median, and mode) and measures of variability (range, quartile, etc.). • Probability is expressed as a number between 0 and 1. • A Probability of ½ is equally likely to happen. • A Probability moves closer to 1 it is increasingly likely to happen. • A probability moves closer to 0 it is decreasingly likely to happen. • Relative frequency (experimental probability) is the number of times an outcome occurs divided by the total number of times the experiment is completed. • Models can be used to determine the probability of events. • Methods such as organized lists, tables, and tree diagrams can represent sample spaces for compound events. • The probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. • Simulations can be used to generate frequencies for compound events.	• I can compare two numerical data distributions on a graph by visually comparing data displays, and assessing the degree of visual overlap. • I can compare the differences in the measure of central tendency in two numerical data distributions by measuring the difference between the centers and expressing it as a multiple of a measure of variability. • I can analyze and interpreting data using measures of central tendency and variability. • I can draw informal comparative inferences about two populations from random samples. • I can draw conclusions to determine that a greater likelihood occurs as the number of favorable outcomes approaches the total number of outcomes. • I can determine the relationship between experimental and theoretical probabilities by using the law of large numbers. • I can predict the relative frequency (experimental probability) of an event based on the (theoretical) probability. • I can develop a uniform probability model and use it to determine the probability of each outcome/event. • I can develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. • I can analyze a probability model and justify why it is uniform or explain the discrepancy if it is not. • I can find probabilities of compound events using organized lists, tables, tree diagrams, etc. and analyze the outcomes.

frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* **7.SP.7.** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. *a.* Design a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* b. Design a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*		• I can choose the appropriate method such as organized lists, tables and tree diagrams to represent sample spaces for compound events.

Evidence

Evaluative Criteria	Assessment Evidence

	PERFORMANCE TASK(S):
	• Baseball Players
	  ○ Students will use knowledge of mean, median, mode, and range to calculate problems about baseball players.
	• Ducklings
	  ○ This task challenges a student to use their understanding of statistical methods to display, analyze, and interpret different data sets. A student must be able to display data in a frequency table and

	analyze data using measures of center: mean, median, and mode. A student must be able to construct an argument about why an added piece of data affects the measures of center.
	• College Athletes
	  ○ In this task, students are able to conjecture about the differences in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.
	• Offensive Linemen
	  ○ In this task, students are able to conjecture about the differences and similarities in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.
	• Mr. Brigg's Class Likes Math
	  ○ This task challenges students to show samples that are not representative of the population.
	• Fair Game?
	  ○ This task challenges a student to use understanding of probabilities to represent the sample space for simple and compound events. A student must use information about probabilities to estimate probability of future events and construct an argument about the fairness of a game.
	• Counters
	  ○ This task challenges a student to use knowledge of part/whole relationships and operations with fractions to find the total objects in a set. A student must be able to use probabilities and likelihoods to find and organize all the possible events for a situation. A student must be able to determine the theoretical and experimental outcomes to make predictions about events and use this information to construct an argument about a fair game and how to change the game to give a desired outcome.
	• Heads or Tails?
	  ○ This task asks students to think about how the distribution of observed outcomes from a chance experiment might differ from the theoretical distribution and to use observed data to estimate a probability.
	• Rolling Dice
	  ○ Students pool the results of many repetitions of the random phenomenon (rolling dice) and compare their results to the theoretical expectation they develop by considering all possible outcomes of rolling two dice. This gives them a concrete example of what we mean by long-term relative frequency.
	• Tossing Cylinders

	○ The purpose of this task is to provide students with the opportunity to determine experimental probabilities by collecting data. • Lottery ○ In this task, students must use math to decide whether a lottery idea will make money. • Spinner Bingo ○ In this task, students must use math to figure out the best way to play a number bingo game. • Memory Game ○ In this task, students use probability to find a good strategy for winning a memory game. • Charity Fair ○ Ann is in charge of a "Lucky Dip" game to raise money for charities. In this task, students use the rules of probability to advise Ann on how to improve the game so that it raises more money. • Red, Green or Blue? ○ The purpose of this task is for students to find the probability of compound events using organized lists, tables, or tree diagrams. • Sitting Across from Each Other ○ The purpose of this task is for students to compute the theoretical probability of a seating configuration.

Learning Plan

EngageNY Module 5

Holt McDougal Lessons 7-1, 7-2, 7-3, 10-1, 10-2, 10-3, 10-4, 10-5, 10-6, 10-7, 10-8, 10-9, Lab; Explore Box-and-Whisker Plots, Lab; Exploring Samples, Lab; Using Random Samples, Lab; Simulations, Lab; Experimental and Theoretical Probability, Hands-On Lab: Develop a Probability Model.

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students reason quantitatively by posing statistical questions about variables and the relationship between variables. Students reason abstractly about chance experiments by analyzing possible outcomes and designing simulations to estimate probabilities.

MP.3. Construct viable arguments and critique the reasoning of others. Students construct viable arguments by using sample data to explore conjectures about a population. Students critique the reasoning of other students as part of poster or similar presentations.

MP.4. Model with mathematics. Students use probability models to describe outcomes of chance experiments. They evaluate probability models by calculating the theoretical probabilities of chance events and by comparing these probabilities to observed relative frequencies.

MP.5. Use appropriate tools strategically. Students use simulation to approximate probabilities. Students use appropriate technology to calculate measures of center and variability. Students use graphical displays to visually represent distributions.

MP.6. Attend to precision. Students interpret and communicate conclusions in context based on graphical and numerical data summaries. Students make appropriate use of statistical terminology.

Vocabulary

- Compound events
- Data
- Degree of visual overlap
- Event
- Frequency
- Graph
- Inferences
- Likely event
- Mean absolute deviation
- Measure of center
- Measure of variation
- Population
- Prediction
- Probability
- Random sample
- Relative frequency
- Sample space
- Simulation
- Spread
- Statistical variability
- Statistics
- Tree diagrams
- Unlikely event

KPBSD MATH CURRICULUM
8TH GRADE
UNIT 1 – INTEGER EXPONENTS AND THE SCIENTIFIC NOTATION

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="4">Priority Standards
8.EE.4. Perform operations with numbers expressed in scientific notation, including problems where both standard notation and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.
Supporting Standards
8.EE.1. Apply the properties (product, quotient, power, zero, negative exponents, and rational exponents) of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
8.EE.3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Make sense of, compare, generate and evaluate large numbers in real-world settings.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
If the exponent increases by 1, the value increases by 10.
The laws of exponents and the basic knowledge of positive integer exponents.
Scientific notation and its uses to perform operations.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
How can I use the properties of integer exponents to make equivalent numerical expressions?
How are zero and negative exponents defined and used?
How are the laws of exponents applied and used to estimate and compare very large and very small numbers?
How can scientific notation be used to express very large and very small quantities?
In what ways can scientific notation be used to perform operations?
How can very large and very small real-world quantities be expressed and compared using exponents?</td></tr>
</table>

	Acquisition	
	Students will know… • Operations using numbers expressed in scientific notations. • Scientific notation to express very large and very small quantities. • The properties of integer exponents to generate equivalent numerical expressions. • Properties of integer exponents to produce equivalent numerical expressions. • Expressing numbers as a single-digit times an integer power of 10. • Scientific notation is used to estimate very large and/or very small quantities.	Students will be skilled at… • I can interpret scientific notation that has been generated by technology. • I can choose appropriate units of measure when using scientific notation. • I can compare quantities to express how much larger one is compared to the other.

Evidence

Evaluative Criteria	Assessment Evidence

	PERFORMANCE TASK(S):
	• 100 People
	  o Students use ratios and scientific notation to calculate and express different aspects of the world population.
	• A Million Dollars
	  o Students multiply and divide using scientific notation and integers.
	• Giant Burgers
	  o Students analyze a situation and multiply numbers in scientific notation.
	• Multiple Solutions
	  o Students use the properties of integer exponents.

Learning Plan

EngageNY Module 1

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students use concrete numbers to explore the properties of numbers in exponential form and then prove that the properties are true for all positive bases and all integer exponents using symbolic representations for bases and exponents. As lessons progress, students use symbols to represent integer exponents and make sense of those quantities in problem situations. Students refer to symbolic notation in order to contextualize the requirements and limitations of given statements (e.g., letting *m,n* represent positive integers, letting *a,b* represent all integers, both with respect to the properties of exponents).

MP.3. Construct viable arguments and critique the reasoning of others. Students reason through the acceptability of definitions and proofs (e.g., the definitions of x0 and x-b for all integers b and positive integers x). New definitions, as well as proofs, require students to analyze situations and break them into cases. Further, students examine the implications of these definitions and proofs on existing properties of integer exponents. Students keep the goal of a logical argument in mind while attending to details that develop during the reasoning process.

MP.6. Attend to precision. Beginning with the first lesson on exponential notation, students are required to attend to the definitions provided throughout the lessons and the limitations of symbolic statements, making sure to express what they mean clearly. Students are provided a hypothesis, such as $x<y$, for positive integers x, y, and then are asked to evaluate whether a statement, like $-2 < 5$, contradicts this hypothesis.

MP.7. Look for and make use of structure. Students understand and make analogies to the distributive law as they develop properties of exponents.

MP.8. Look for and express regularity in repeated reasoning. While evaluating the cases developed for the proofs of laws of exponents, students identify when a statement must be proved or if it has already been proven. Students see the use of the laws of exponents in application problems and notice the patterns that are developed in problems.

Vocabulary

- Exponents
- Factor
- Integer exponent
- Proportion
- Proportional relationship
- Pythagorean Theorem
- Scientific notation

KPBSD MATH CURRICULUM
8TH GRADE
UNIT 2 – THE CONCEPT OF CONGRUENCE

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="3">

Priority Standards

8.G.5. Justify using informal arguments to establish facts about
- the angle sum of triangles (sum of the interior angles of a triangle is 180º),
- measures of exterior angles of triangles,
- angles created when parallel lines are cut by a transversal (e.g., alternate interior angles), and
- angle-angle criterion for similarity of triangles.

8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Supporting Standards

8.G.1. Through experimentation, verify the properties of rotations, reflections, and translations (transformations) to figures on a coordinate plane).
a. Lines are taken to lines, and line segments to line segments of the same length.
b. Angles are taken to angles of the same measure.
c. Parallel lines are taken to parallel lines.

8.G.2. Demonstrate understanding of congruence by applying a sequence of translations, reflections, and rotations on two-dimensional figures. Given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.6. Explain the Pythagorean Theorem and its converse.

</td><td colspan="2">

Transfer

Students will be able to independently use their learning to…
Apply previous learning to developing their understanding of the concept of congruence.

</td></tr>
<tr><td colspan="2">**Meaning**</td></tr>
<tr><td>

ENDURING UNDERSTANDINGS

Students will understand that…
- Congruence can be defined through a series of translations, reflections, and rotations in the plane.
- The definitions and properties of basic rigid motions can be verified experimentally and by reasoning.
- The basic properties of individual rigid motions can be sequenced in various combinations.
- Congruence is a sequence of basic rigid motions.
- The Pythagorean Theorem can be used to solve basic problems.

</td><td>

ESSENTIAL QUESTIONS

Students will keep considering…
- What are the properties of congruence?
- Which theorems or properties can be used with various figures?
- Which rigid motions can be sequenced to produce a congruent figure?
- How can the Pythagorean Theorem be used to solve problems?

</td></tr>
</table>

<table>
<tr><th rowspan="2"></th><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
The definition of similar triangles.
The definition and ways to identify transversals.
Strategies to recognize transformed geometric figures on the coordinate plane as the product of reflections, rotations, and translations.
Angles are created when a parallel line is cut by a transversal.
When and why geometric figures that have been transformed on the coordinate plane are congruent or similar.
Ways to identify the relationships among pairs of alternate interior, alternate exterior, and corresponding angles formed by two parallel lines cut by a transversal.
Methods to solve authentic problems based on geometric transformations; on parallel lines cut by a transversal.
Pythagorean Theorem and Converse.
Parts of a right triangle.
Symbols and definition for Congruency.</td><td>Students will be skilled at…
I can justify that the sum of interior angles equals 180.
I can justify that the exterior angle of a triangle is equal to the sum of the two remote interior angles.
I can use Angle-Angle Criterion to prove similarity among triangles.
I can solve basic mathematical Pythagorean Theorem problems and it converse to find missing lengths of sides of triangles in two- and three-dimensions.
I can apply Pythagorean Theorem in solving real-world problems dealing with two- and three-dimensional shapes.
I can use physical models, transparencies, or geometry software to verify the properties of rotations, reflections, and translations (i.e., Lines are taken to lines and line segments to line segments of the same length, angles are taken to angles of the same measure, & parallel lines are taken to parallel lines).
I can apply the concept of congruency to write congruent statements.
I can reason that a 2-deminsional figure is congruent to another if the second can be obtained by a sequence of rotations, reflections, translation.
I can describe the sequence of rotations, reflections, translations that exhibits the congruence between 2-deminsional figures using words.</td></tr>
</table>

Evidence

Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S): • Patterns in Prauge ○ Students calculate the area and perimeter of a complex shape using the Pythagorean Theorem.

Learning Plan

EngageNY Module 2

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. This module is rich with notation that requires students to decontextualize and contextualize throughout. Students work with figures and their transformed images using symbolic representations and need to attend to the meaning of the symbolic notation to contextualize problems. Students use facts learned about rigid motions in order to make sense of problems involving congruence.

MP.3. Construct viable arguments and critique the reasoning of others. Throughout this module, students construct arguments around the properties of rigid motions. Students make assumptions about parallel and perpendicular lines and use properties of rigid motions to directly or indirectly prove their assumptions. Students use definitions to describe a sequence of rigid motions to prove or disprove congruence. Students build a logical progression of statements to show relationships between angles of parallel lines cut by a transversal, the angle sum of triangles, and properties of polygons like rectangles and parallelograms.

MP.5. Use appropriate tools strategically. This module relies on students' fundamental understanding of rigid motions. As a means to this end, students use a variety of tools but none as important as an overhead transparency. Students verify experimentally the properties of rigid motions using physical models and transparencies. Students use transparencies when learning about translation, rotation, reflection, and congruence in general. Students determine when they need to use the transparency as a tool to justify conjectures or when critiquing the reasoning of others.

MP.6. Attend to precision. This module begins with precise definitions related to transformations and statements about transformations being distance- and angle-preserving. Students are expected to attend to the precision of these definitions and statements consistently and appropriately as they communicate with others. Students describe sequences of motions precisely and carefully label diagrams so that there is clarity about figures and their transformed images. Students attend to precision in their verbal and written descriptions of rays, segments, points, angles, and transformations in general.

Vocabulary

- Adjacent angles
- Alternate exterior angles
- Alternate interior angles
- Vertical angles
- Complementary angles
- Congruent
- Pythagorean Theorem
- Reflection
- Right triangle
- Rotation
- Supplementary angles
- Translation
- Transversal

KPBSD MATH CURRICULUM
8^{th} GRADE
UNIT 3 –SIMILARITY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
8.G.4. Demonstrate understanding of similarity, by applying a sequence of translations, reflections, rotations, and dilations on two-dimensional figures. Describe a sequence that exhibits the similarity between them.
8.G.5. Justify using informal arguments to establish facts about
the angle sum of triangles (sum of the interior angles of a triangle is 180º),
measures of exterior angles of triangles,
angles created when parallel lines are cut by a transversal (e.g., alternate interior angles), and
angle-angle criterion for similarity of triangles.
8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
Supporting Standards
8.G.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.6. Explain the Pythagorean Theorem and its converse.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Construct a more complex definition of similarity that can be applied to more advanced situations.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
Concepts of similarity and dilation can be used to prove the Pythagorean Theorem.
An expanded definition of similarity can be applied to geometric shapes that are not polygons, such as ellipses and circles.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
How can information arguments be used to establish facts?
How can the Pythagorean Theorem be used to determine unknown quantities?
What is similarity?
How can I determine if triangles are similar?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
Similar figures as corresponding angles are congruent and corresponding sides are proportional.
The symbol and definition for similar triangles.
Define and identify transversals.
Angles are created when a parallel line is cut by transversal.
The Pythagorean Theorem and its converse.</td><td>Students will be skilled at…
I can apply the concept of similarity to write similarity statements.
I can reason that a two-dimensional figure is similar to another if the second can be obtained by a sequence of rotations, reflections, translation, or dilation.
I can describe the sequence of rotations, reflections, translations, or dilations that exhibits the similarity between two-dimensional figures using words and/or symbols.
I can solve basic mathematical Pythagorean Theorem problems and it converse to find missing lengths of sides of triangles in two- and three-dimensions.
I can apply Pythagorean Theorem in solving real-world problems dealing with two- and three-dimensional shapes.</td></tr>
</table>

Evidence

Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S): • Aaron's Designs ○ Students use rigid transformations to move a figure on a coordinate plane.

Learning Plan

EngageNY Module 3

Math Practices and Vocabulary

MP.3. Construct viable arguments and critique the reasoning of others. Many times in this module, students are exposed to the reasoned logic of proofs. Students are called on to make conjectures about the effect of dilations on angles, rays, lines, and segments, and then they must evaluate the validity of their claims based on evidence. Students also make conjectures about the effect of dilation on circles, ellipses, and other figures. Students are encouraged to participate in discussions and evaluate the claims of others.

MP.4. Model with mathematics. This module provides an opportunity for students to apply their knowledge of dilation and similarity in real-world applications. Students use shadow lengths and a known height to find the height of trees, the distance across a lake, and the height of a flagpole.

Vocabulary

- Dilation
- Scale drawing
- SImilar
- SImilarity transformation

KPBSD MATH CURRICULUM
8th GRADE
UNIT 4 – LINEAR EQUATIONS

Desired Results

Priority Standards

8.EE.5. Graph linear equations such as *y=mx+b*, interpreting *m* as the slope or rate of change of the graph and *b* as the *y*-intercept or starting value. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

8.EE.8. Analyze and solve systems of linear equations.

a. Show that the solution to a system of two linear equations in two variables is the intersection of the graphs of those equations because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables and estimate solutions by graphing the equations. Simple cases may be done by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*

c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Supporting Standards

Transfer

Students will be able to independently use their learning to…
Draw connections between proportional relationships, lines, and linear equations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Their knowledge of proportional relationships can be extended to lines and linear equations.
- Equations in one and two variables can be transcribed and solved with symbolic notation and properties of equality.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I represent proportional relationships using graphs, equations, and words?
- How can I use graphs to solve systems of two equations?
- How can I predict if a system of two equations has one, none, or infinite solutions?

Acquisition

Students will know…

- The unit rate or the slope can be represented in a graph, table of equation.
- The solution to an equation is the value(s) of the variable which makes the equation true.
- With one solution the variable do not cancel out and only one value makes the equation true.
- With no solution the variables cancel out and constants are not equal, no real numbers makes the equation true.
- With infinite solutions, the variable cancel and constants are equal and any real number makes the equation true.
- Systems of equations.

Students will be skilled at…

- I can compare two different proportional relationships represented in different ways.
- I can interprete the unit rate of proportional relationships as the slope of the graph.
- I can estimate the point(s) of intersection for a system of two equations in two unknowns by graphing the equations.
- I can solve simple cases of systems of two linear equations in two variables by inspection.
- I can describe the point(s) of intersection between two lines as points that satisfy both equations simultaneously.

8.EE.6. Use similar triangles to explain why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*. **8.EE.7.** Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where *a* and *b* are different numbers). b. Solve linear equations with rational coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms.		

Evidence

Evaluative Criteria	**Assessment Evidence**

	PERFORMANCE TASK(S):
	• Bike Ride
	  ○ Students interpret a graph to identify the highest rate of change, maximums, and other features.
	• Journey
	  ○ Students create a graph based on a situation and identify important features.
	• Shelves
	  ○ Students identify linear equations by graph, equation, and situation.
	• Buying Chips and Candy
	  ○ Students use a system of linear equations to solve for variables.
	• Hot Under the Collar

	○ Students analyze two linear equations and the difference between them. • Picking Apples ○ Students use a linear equation to compare values against a graph.

Learning Plan

EngageNY Module 4

Math Practices and Vocabulary

MP.1. Make sense of problems and persevere in solving them. Students analyze given constraints to make conjectures about the form and meaning of a solution to a given situation in one-variable and two-variable linear equations, as well as in simultaneous linear equations. Students are systematically guided to understand the meaning of a linear equation in one variable, the natural occurrence of linear equations in two variables with respect to proportional relationships, and the natural emergence of a system of two linear equations when looking at related, continuous proportional relationships.

MP.2. Reason abstractly and quantitatively. Students de-contextualize and contextualize throughout the module as they represent situations symbolically and make sense of solutions within a context. Students use facts learned about rational numbers in previous grade levels to solve linear equations and systems of linear equations.

MP.3. Construct viable arguments and critique the reasoning of others. Students use assumptions, definitions, and previously established facts throughout the module as they solve linear equations. Students make conjectures about the graph of a linear equation being a line and then proceed to prove this claim. While solving linear equations, they learn that they must first assume that a solution exists and then proceed to solve the equation using properties of equality based on the assumption. Once a solution is found, students justify that it is in fact a solution to the given equation, thereby verifying their initial assumption. This process is repeated for systems of linear equations.

MP.4. Model with mathematics. Throughout the module, students represent real-world situations symbolically. Students identify important quantities from a context and represent the relationship in the form of an equation, a table, and a graph. Students analyze the various representations and draw conclusions and/or make predictions. Once a solution or prediction has been made, students reflect on whether the solution makes sense in the context presented. One example of this is when students determine how many buses are needed for a field trip. Students must interpret their fractional solution and make sense of it as it applies to the real-world.

MP.7. Look for and make use of structure. Students use the structure of an equation to make sense of the information in the equation. *For example, students write equations that represent the constant rate of motion for a person walking. In doing so, they interpret an equation such as $y = 3/5\ x$ as the total distance a person walks, y, in x amount of time, at a rate of 3/5 . Students look for patterns or structure in tables and show that a rate is constant.*

Vocabulary

- Average speed
- Constant speed
- Horizontal line
- Linear equation (description)
- Point-slope equation of a line
- Slope of a line in a cartesian plane
- Slope-intercept equation of a line
- Solution to a system of linear equations (description)
- Standard form of a linear equation
- System of linear equations
- Vertical line
- X-intercept
- Y-intercept
- Coefficient
- Equation
- Like terms
- Linear expression
- Solution
- Term
- Unit rate
- Variable

KPBSD MATH CURRICULUM
8th GRADE
UNIT 5 – EXAMPLES OF FUNCTIONS FROM GEOMETRY

Desired Results

Priority Standards

8.F.2. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

Supporting Standards

8.F.1. Understand that a function is a rule that assigns to each input (the domain) exactly one output (the range). The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. *For example, use the vertical line test to determine functions and non-functions*.

8.F.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*

8.G.9. Identify and apply the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Transfer

Students will be able to independently use their learning to…
Apply their knowledge of functions to solve real-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- A function is necessary for describing geometric concepts and occurrences in everyday life.
- Knowledge of linear equations can apply to linear functions.
- Rate of change is the slope of the graph of a line.
- Linear functions and nonlinear functions can be identified by a graph.
- Previous knowledge of volume can be extended to volume formulas for cones, cylinders, and spheres.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can two functions be represented in a variety of ways?
- What is the slope of a line?
- How can the equation y=mx+b be used?
- How are linear and nonlinear functions similar and different?
- How can I apply previous knowledge to extend to volume for cones, cylinders, and spheres?

Acquisition

Students will know…

- Functions algebraically including slope and y-intercept.
- Functions using graphs, tables, and verbal descriptions.
- Definition of “inspection”.
- Cases in which a system of two equations in two unknowns has no solution.
- Formulas for volume of cones, cylinders, and spheres.
- There are fundamental differences between discrete and continuous rates.

Students will be skilled at…

- I can compare and contrasting two functions with different representations.
- I can draw conclusions based on different representations of functions.
- I can compare the characteristics of linear and nonlinear functions using various representations.
- I can identify cases in which a system of two equations in two unknowns has an infinite number of solutions.
- I can solve a system of two equations (linear) in two unknowns algebraically.

	• The equation y=mx+b is the defining linear function.	• I can solve simple cases of systems of two linear equations in two variables by inspection. • I can recognize that a linear function is graphed as a straight line. • I can recognize the equation y=mx+b is the equation of a function whose graph is a straight line where m is the slope and b is the y-intercept. • I can provide examples of nonlinear functions using multiple representations. • I can identify and define vocabulary: cone, cylinder, sphere, radius, diameter, circumference, area, volume, pi, base, height. • I can compare the volume of cones, cylinders, and spheres. • I can determine and apply appropriate volume formulas in order to solve mathematical and real-world problems for the given shape. • I can find the radii, height, or approximate for π. Given the volume of a cone, cylinder, or sphere.

Evidence

Evaluative Criteria	**Assessment Evidence**

	PERFORMANCE TASK(S):
	• Linear Graphs
	  ○ Students identify, graph, and match linear equations to situations.
	• Baseball Jersey
	  ○ Students use linear equations to solve a system.
	• Meal Out
	  ○ Students use linear equations to solve a system.
	• Party
	  ○ Students define, use, and identify linear equations from a situation and graph.

Learning Plan

EngageNY Module 5

Math Practices and Vocabulary

MP.2. Reason abstractly or quantitatively. Students examine, interpret, and represent functions symbolically. They make sense of quantities and their relationships in problem situations. For example, students make sense of values as they relate to the total cost of items purchased or a phone bill based on usage in a particular time interval. Students use what they know about rate of change to distinguish between linear and nonlinear functions. Further, students contextualize information gained from the comparison of two functions.

MP.6. Attend to precision. Students use notation related to functions, in general, as well as notation related to volume formulas. Students are expected to clearly state the meaning of the symbols used in order to communicate effectively and precisely to others. Students attend to precision when they interpret data generated by functions. They know when claims are false; for example, calculating the height of an object after it falls for −2 seconds. Students also understand that a table of values is an incomplete representation of a continuous function, as an infinite number of values can be found for a function.

MP.8. Look for and express regularity in repeated reasoning. Students use repeated computations to determine equations from graphs or tables. While focused on the details of a specific pair of numbers related to the input and output of a function, students maintain oversight of the process. As students develop equations from graphs or tables, they evaluate the reasonableness of their equation as they ensure that the desired output is a function of the given input.

Vocabulary

- Area
- Linear equation
- Nonlinear equation
- Rate of change
- Solids
- Volume
- Cone
- Cylinder
- Function
- Lateral edge
- Linear function
- Solid sphere

KPBSD MATH CURRICULUM
8th GRADE
UNIT 6 – LINEAR FUNCTIONS

Desired Results

Priority Standards

8.F.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.SP.2. Explain why straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

8.SP.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and y-intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

Supporting Standards

8.F.5. Given a verbal description between two quantities, sketch a graph. Conversely, given a graph, describe a possible real-world example. *For example, graph the position of an accelerating car or tossing a ball in the air.*

8.SP.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative

Transfer

Students will be able to independently use their learning to…
Understand and use bivariate data in preparation for Algebra I work.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- A function assigns exactly one value to each input.
- The relationships of bivariate data can be modeled through using functions.

ESSENTIAL QUESTIONS

Students will keep considering…
- What is a function?
- How can bivariate data be modeled?
- What relationships can be modeled using functions?

Acquisition

Students will know…
- Slope is determined by the constant rate of change.
- The y-intercept is the initial value where x=0.
- Straight lines are used to model relationships between two quantitative variables.
- A linear equation can be used to model situations.
- The equation of a linear model, slope, and intercept in the context of bivariate measurement data.
- A straight line can represent a scatter plot with linear association.

Students will be skilled at…
- I can construct a function to model a linear relationship between two quantities.
- I can relate the rate of change and initial value to real world quantities in a linear function in terms of the situation modeled and in terms of its graph or a table of values.
- I can informally assess the model fit by judging the closeness of the data points to the line.
- I can fit a straight line within the plotted area.
- I can interpret the meaning of the slope and intercept of a linear equation in terms of the situation. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

association, linear association, and nonlinear association. **8.SP.4.** Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects and use relative frequencies to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*		• I can interpret the relationship between x and y values by analyzing a graph. • I can interpret scatter plots for bivariate (two different variables such as distance and time) measurement data to investigate patterns of association between two quantities. • I can interpret the data in the two-way table to recognize patterns. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?* • I can use relative frequencies of the data to describe relationships (positive, negative, or no correlation).

Evidence

Evaluative Criteria	Assessment Evidence

	PERFORMANCE TASK(S):
	• Birds Eggs
	  ○ Students analyze a scatter plot to identify key features.
	• Scatter Diagram
	  ○ Students interpret a scatter plot, add points, and create a trend line.
	• Sugar Prices
	  ○ Students analyze a scatter plot to identify key features.
	• House Prices
	  ○ Students analyze a scatter plot to identify key features and predict new values.
	• Vincent's Graphs
	  ○ Students interpret and draw graphs based on given situations.

Learning Plan

EngageNY Module 6

Math Practices and Vocabulary

MP.2. Reason abstractly and quantitatively. Students reason quantitatively by symbolically representing the verbal description of a relationship between two bivariate variables. They attend to the meaning of data based on the context of problems and the possible linear or nonlinear functions that explain the relationships of the variables.

MP.4. Model with mathematics. Students model relationships between variables using linear and nonlinear functions. They interpret models in the context of the data and reflect on whether or not the models make sense based on slopes, initial values, or the fit to the data.

MP.6. Attend to precision. Students evaluate functions to model a relationship between numerical variables. They evaluate the function by assessing the closeness of the data points to the line. They use care in interpreting the slope and the y-intercept in linear functions.

MP.7. Look for and make use of structure. Students identify pattern or structure in scatter plots. They fit lines to data displayed in a scatter plot and determine the equations of lines based on points or the slope and initial value.

Vocabulary

- Categorical variable
- Intercept or initial value
- Numerical variable
- Slope
- Variable
- Two-way frequency table
- Scatter plot
- Relative frequency
- Bivariate data set
- Association

KPBSD MATH CURRICULUM
8th GRADE
UNIT 7 – INTRODUCTION TO IRRATIONAL NUMBERS USING GEOMETRY

Desired Results

Priority Standards

8.G.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.9. Identify and apply the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

8.EE.2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

Supporting Standards

8.NS.1. Classify real numbers as either rational (the ratio of two integers, a terminating decimal number, or a repeating decimal number) or irrational.

8.NS.2. Order real numbers, using approximations of irrational numbers, locating them on a number line. *For example, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

8.G.6. Explain the Pythagorean Theorem and its converse.

8.G.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Transfer

Students will be able to independently use their learning to…

Explore the concept of irrational numbers by expanding their use of the Pythagorean Theorem.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Irrational numbers are numbers that can be placed in their approximate position on a number line.
- Irrational numbers exist and are different from rational numbers.
- Positive square roots and cube roots of expressions can be found.
- The Pythagorean Theorem can be expanded to solve real-world problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are irrational numbers?
- How can I solve positive square roots and cube roots?
- How can I find a rational approximation of an irrational number?
- How can I apply the Pythagorean Theorem on the coordinate plane and in real-world situations?
- How can I use formulas to solve for volumes of cones, cylinders, and spheres in both real-world and mathematical problems?

Acquisition

Students will know…

- The Pythagorean Theorem and its converse.
- The square root of 2 is irrational.
- The decimal expansion of rational numbers repeats eventually.
- Every number has a decimal expansion.
- The value of expressions involving irrational numbers using rational approximations. *For example, by truncating the decimal expansion of 2, show that 2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Students will be skilled at…

- I can solve basic mathematical Pythagorean Theorem problems and it converse to find missing lengths of sides of triangles in two and three dimensions.
- I can apply Pythagorean Theorem in solving real-world problems dealing with two and three-dimensional shapes.
- I can compare the volume of cones, cylinders, and spheres.
- I can use square root and cube root symbols to represent solutions to equations of the form

	• The difference between rational and irrational numbers. • Formulas for volumes, cone, cylinder, and sphere.	x^2= p and x^3= p, where p is a positive rational number. • I can determine and apply appropriate volume formulas in order to solve mathematical and real-world problems for the given shape. • I can approximate for π, given the volume of a cone, cylinder, or sphere. • I can compare the size of irrational numbers using rational approximations. • I can determine how to create a right triangle from two points on a coordinate graph. • I can use the Pythagorean Theorem to solve for the distance between the two points. • I can evaluate cube roots of small perfect cubes. • I can evaluate square roots of small perfect squares. • I can convert a decimal expansion which repeats eventually into a rational number. • I can approximate irrational numbers as rational numbers. • I can approximately locate irrational numbers on a number line.

Evidence

Evaluative Criteria	Assessment Evidence

	PERFORMANCE TASK(S):
	• Short Tasks - The Number System
	  ○ Students uses their understanding of the number system to solve various problems.
	• Proofs of the Pythagorean Theorem
	  ○ Students are presented with multiple proofs of the Pythagorean Theorem and are asked to anyalze them.
	• Janes TV
	  ○ Students learn how the PythagoreanTheorem applies to classification of a TV and its diagonal and how much area it will take up.
	• Temple Geometry
	  ○ Students explore a Japanese Circle Puzzle and solve using triangle properties.
	• Pythagorean Triples
	  ○ Students investigate the concept of Pythagorean Triples.
	• Circles and Squares
	  ○ Students explore the ratios of circles inscribed in squares.
	• Matchsticks
	  ○ Students determine how many match sticks could fit into a log based on volume.
	• Glasses
	  ○ Students investigate the difference in volume of three different types of glasses.
	• Rugs
	  ○ The task challenges a student to demonstrate understanding of the concepts of irrational numbers, the Pythagorean Theorem and use it to calculate perimeter/circumference.

Learning Plan

EngageNY Module 7

Math Practices and Vocabulary

MP.6. Attend to precision. Students begin attending to precision by recognizing and identifying numbers as rational or irrational. Students know the definition of an irrational number and can represent the number in different ways (e.g., as a root, as a non-repeating decimal block, or as a symbol such as π). Students will attend to precision when clarifying the difference between an exact value of an irrational number compared to the decimal approximation of the irrational number. Students use appropriate symbols and definitions when they work through proofs of the Pythagorean Theorem and its converse. Students know and apply formulas related to volume of cones and truncated cones.

MP.7. Look for and make use of structure. Students learn that a radicand can be re-written as a product and that sometimes one or more of the factors of the product can be simplified to a rational number. Students look for structure in repeating decimals, recognize repeating blocks, and know that every fraction is equal to a repeating decimal. Additionally, students learn to see composite solids as made up of simpler solids. Students interpret numerical expressions as representations of volumes of complex figures.

MP.8. Look for and express regularity in repeated reasoning. While using the long division algorithm to convert fractions to decimals, students recognize that when a sequence of remainders repeats, the decimal form of the number will contain a repeat block. Students recognize that when the decimal expansion of a number does not repeat or terminate, the number is irrational and can be represented with a method of rational approximation using a sequence of rational numbers to get closer and closer to the given number.

Vocabulary

- Cube root
- Perfect square
- Irrational number
- Real number
- Square root
- Rational approximation
- Decimal expansion
- Finite decimals
- Number line
- Rate of change
- Rational number
- Volume

Foundations of Algebra and Geometry Modules

Course Description:

The purpose of Foundations of Algebra & Geometry is to extend the mathematics that students learned in the middle grades. The overall structure continues the model of learning mathematics as a whole so that students experience mathematics as a coherent, useful, and logical subject that emphasizes using mathematics to solve problem situations. Students will blend their study of number and quantity measurements, equations and inequalities, linear and exponential functions, geometric congruence and reasoning, and statistical data. This course is a pre-algebra course.

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 1 – ALGEBRAIC MODELING: VARIABLES AND EXPRESSIONS

Desired Results

Priority Standards

A.SSE.1. Interpret expressions that represent a quantity in terms of its context.

Supporting Standards

G.CO.1. Demonstrates understanding of key geometrical definitions, including angle and line segment. Understand undefined notions of point, line, plane, and distance along a line.

G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.

N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

G.MG.1. Use geometric shapes, their measures, and their properties to describe objects.

S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean, mode) and spread (range).

S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, algebraic expressions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Algebraic expressions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Statistics are an essential tool when interpreting and comparing data sets.
- Arithmetic operations with whole numbers and integers support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using algebraic expressions? What is the best way to interpret expressions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use statistics to interpret and compare data sets?
- How can I use arithmetic operations with whole numbers and integers to support my study of algebra and geometry?

Acquisition

Students will know…

- To use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- Ways algebraic expressions to interpret real-world problems.
- Interpret real-world problems using geometric modeling and formulas.
- Use statistical reasoning to interpret data.
- Operate with whole numbers and integers.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can translate english phrases to algebraic expressions.
- I can use variables and algebraic symbols.
- I can identify and combine like terms.
- I can simplify expressions with absolute value.

		Geometry: • I can define key geometrical terms. • I can find the area of squares, rectangles, parallelograms, and triangles. • I can choose and interpret appropriate units consistently in formulas. • I can measure with accuracy and attend to precision. • I can visualize two-dimensional cross sections of three-dimensional objects. • I can generate a three-dimensional object through two-dimensional rotations. • I can model real world objects using geometric shapes. **Statistics & Probability:** • I can summarize, represent, and interpret data using statistics appropriate to the data distribution (e.g., mean, median, mode, range). • I can interpret differences in shape, center, and spread between two data sets. • I can account for possible effects of extreme data points (i.e., outliers). **Number & Quantity:** • I can use place value with whole numbers. • I can identify multiples and apply divisibility tests. • I can find prime factorizations and least common multiples. • I can simplify expressions using the order of operations. • I can use negatives and opposites of integers. • I can add, subtract, multiply, and divide integers.

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 2 – ALGEBRAIC MODELING: EQUATIONS AND INEQUALITIES

Desired Results

Priority Standards

A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.
A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A.CED.1. Create linear equations and inequalities in one variable and use them to solve problems.

Supporting Standards

G.CO.1. Demonstrates understanding of key geometrical definitions including polygons and their attributes.
G.CO.10. Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°. (Emphasis is on use of inductive reasoning to formula correct conjectures.)
N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.
S.ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, algebraic equations and inequalities, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Algebraic equations are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Graphs and fitted lines are essential tools used to summarize, represent, and interpret data on quantitative variables.
- Arithmetic operations with fractions and decimals support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using algebraic equations? What is the best way to interpret equations in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I summarize, represent, and interpret data on a scatter plot using a graph and fitted line?
- How can I use arithmetic operations with fractions and decimals to support my study of algebra and geometry?

Acquisition

Students will know…

- Use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- Algebraic equations are used to interpret real-world problems.
- Geometric modeling and formulas help us to interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can verify a solution of an equation.
- I can solve equations using the subtraction, addition, division, and multiplication properties of equality.

	• Graphs and fitted lines help us to summarize, represent and interpret data on a scatter plot.	• I can use a general strategy to solve equations with variables and constants on both sides. • I can operate with fractions and decimals. • I can solve equations with fraction and decimal coefficients. • I can translate a written description to an equation and solving it. • I can use equations to solve real-world problems. • I can use the distance, rate, and time formula. • I can solve simple formulas for a specific variable. • I can graph inequalities on the number line. • I can solve inequalities using the subtraction, addition, division, and multiplication properties of inequality. • I can use a general strategy to solve inequalities with variables and constants on both sides. • I can translate a written description to an inequality and solve it. • I can plot points in a rectangular coordinate system. • I can identify points on a graph. **Geometry:** • I can define polygons and describe their attributes. • I can use inductive reasoning to derive the formula for the number of diagonals in a polygon. • I can use inductive reasoning to derive the formula for the interior angle sums of polygons. **Statistics & Probability:** • I can summarize, represent, and interpret data on a scatter plot using a graph and fitted line. **Number & Quantity:** • I can find equivalent fractions and decimals. • I can simplify equivalent fractions.

		• I can add, subtract, multiply, and divide decimals and fractions with like and different denominators. • I can simplify expressions written with a fraction bar. • I can use the order of operations to simplify expressions containing fractions and decimals. • I can evaluate variable expressions with fractions and decimals. • I can translate phrases to expressions with fractions and decimals.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 3 – ALGEBRAIC MODELING: LINEAR FUNCTIONS

Desired Results

Priority Standards

F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercept and slope
F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
A.REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A.CED.2. Create equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
F.BF.1. Write a function that describes a relationship between two quantities.

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, linear functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Linear functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Linear models are essential tools used to summarize, represent, and interpret data on quantitative variables.
- Using graphing and geometry software supports the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using linear functions? What is the best way to interpret linear functions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I compute and interpret a line of best fit using technology to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- The eight Standards of Mathematical Practice help us solve problems in a variety of contexts.
- Linear functions help us to interpret real-world problems.
- Geometric modeling and relationships help us analyze and interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can plot points in a rectangular coordinate system.
- I can identify points on a graph.
- I can verify solutions to an equation in two variables.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context. **Supporting Standards** **F.IF.7.** Graph functions expressed symbolically and show key features of the graph, by using technology. (Graph linear functions and interpret slope and intercepts.) **G.CO.4.** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **G.CO.2.** Represent transformations in the plane using pencil/paper and geometry software. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). **G.CO.5.** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. **G.CO.10.** Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. (Emphasis is on use of inductive reasoning to formula correct conjectures.) **S.ID.7.** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **S.ID.8.** Compute (using technology) and interpret the correlation coefficient of a linear fit.	• Technology can help us compute a line of best fit to summarize, represent and interpret real-world data.	• I can complete a table of solutions to a linear equation. • I can find solutions to a linear equation. • I can recognize the relation between the solutions of an equation its graph. • I can graph a linear equation by plotting points. • I can graph vertical and horizontal lines. • I can identify the x and y intercepts on a graph. • I can find the x and y intercepts from an equation of a line. • I can graph a line using the intercepts. • I can use concrete materials to model slope (e.g., slides, geoboards). • I can use $m = \frac{rise}{run}$ to find the slope of a line from its graph. • I can find the slope of horizontal and vertical lines. • I can use the slope formula to find the slope of a line between two points. • I can graph a line given a point and the slope. • I can solve slope applications. • I can recognize the relation between the graph and the slope-intercept form of an equation of a line. • I can identify the slope and y-intercept from an equation of a line. • I can graph a line using its slope and intercept. • I can choose the most convenient method to graph a line. • I can graph and interpreting applications of slope-intercept. • I can use slopes to identify parallel lines. • I can find the equation of the line given the slope and y-intercept.

		• I can verify solutions to an inequality in two variables. • I can recognize the relation between the solutions of an inequality and its graph. • I can graph linear inequalities. **Geometry:** • I can transform geometric figures on the coordinate plane (e.g., rotating, reflecting, translating, dilating). • I can use inductive reasoning to determine relationships about triangles (e.g., base angles of isosceles triangles are congruent; midsegment of a triangle is parallel to and half the length of third side; medians, altitudes and perpendicular bisectors of triangles intersect at points of concurrency). **Statistics & Probability:** • I can interpret the slope and intercepts of a linear model in the context of real-world data. • I can use technology to compute a line of best fit.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 4 – ALGEBRAIC MODELING: NONLINEAR FUNCTIONS

Desired Results

Priority Standards

F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology.
F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and symmetries.
F.IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically, in tables, or by verbal descriptions.
F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.
  a. Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
  b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
  c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
F.LE.2. Construct linear and exponential functions, including arithmetic and geometric

Transfer

Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, nonlinear functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Nonlinear functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Linear and nonlinear models are essential tools used to summarize, represent, and interpret data.
- Using graphing and geometry software supports the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…
- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using nonlinear functions? What is the best way to interpret nonlinear functions in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use technology to compare and interpret linear and nonlinear models to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…
- The eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- How to use nonlinear functions to interpret real-world problems.
- Compare key features of functions represented in different ways.
- How to use technology to compare linear and nonlinear models to solve problems.

Students will be skilled at…
Standards for Mathematical Practice:
- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:
- I can identify points on a graph.
- I can verify solutions to an equation in two variables.
- I can complete a table of solutions to a nonlinear equation.

sequences, given a graph, a description of a relationship, or input-output table of values. **Supporting Standards** **A.CED.3**. Interpret solutions as viable or nonviable options in a modeling context. **A.REI.10.** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). **F.IF.5.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **G.CO.11.** Using methods of proof including direct, indirect, and counter examples to prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. **N.Q.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N.Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. Use permutations and combinations to compute probabilities of compound events and solve problems (S-CP.9).	• How to use geometric modeling and relationships to interpret real-world problems.	• I can find solutions to a nonlinear equation. • I can recognize the relation between the solutions of an equation its graph. • I can graph a nonlinear equation by plotting points. • I can recognize key features of a nonlinear function (e.g., intercepts, maximums, minimums, symmetries, intervals of increase/decrease). • I can determine key features of a nonlinear function from its graph. • I can interpret key features of nonlinear functions to solve problems. • I can compare key features of linear, quadratic, and exponential models to solve problems. **Geometry:** • I can use inductive reasoning to determine relationships about quadrilaterals (e.g, opposite sides and angles of parallelograms are congruent, diagonals of parallelogram bisect each other, rectangles have congruent diagonals, midsegment of a trapezoid is parallel to the bases and the mean of the lengths of the two bases). • I can discover the area formula for trapezoids. • I can find the area of trapezoids. • I can choose and interpreting appropriate units consistently in formulas. • I can measure with accuracy and attending to precision. **Statistics & Probability:** • I can find permutations and combinations. • I can explain the difference between experimental and theoretical probability.

		• I can explain different methods to find the sample space of an experiment (e.g., organized lists, tree diagrams, and tables).

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM
FOUNDATIONS OF ALGEBRA AND GEOMETRY
UNIT 5 – ALGEBRAIC MODELING: SYSTEMS OF EQUATIONS AND INEQUALITIES

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
A.REI.6. Solve systems of linear equations exactly and approximately, e.g., with graphs or algebraically, focusing on pairs of linear equations in two variables.
A.REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically (Emphasis on graphically).
A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
A.REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
Supporting Standards
G.SRT.2. Given two figures, use the definition of similarity in terms of transformations to explain whether or not they are similar.
G.SRT.3. Use the properties of similarity transformations to establish the AA criterion for</td>
<th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Interpret real-world problems using the eight mathematical practices, systems of equations and inequalities, geometric models, and statistical reasoning.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
• Systems of equations and inequalities are used to model and efficiently solve real-world problems.
• Geometric reasoning are used to model and efficiently solve real-world problems.
• Systems of equations and inequalities are essential tools used to summarize, represent, and interpret data.
• Using graphing and geometry software supports the study of algebra and geometry.</td>
<td>ESSENTIAL QUESTIONS
Students will keep considering…
• How the Standards of Mathematical Practice support solving problems in a variety of contexts?
• How can I solve real-word problems using systems of equations and inequalities? What is the best way to interpret systems of equations and inequalities in terms of context?
• How can I model and solve real-world problems using geometric reasoning?
• How can I use technology to interpret systems of equations and inequalities to solve real-world problems?
• How can I use inductive reasoning to support my study of algebra and geometry?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• How to use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
• How to solve systems of equations and inequalities in different ways (e.g., graphing, tables of values, substitution).
• How to use systems of equations and inequalities to interpret real-world problems.</td>
<td>Students will be skilled at…
Standards for Mathematical Practice:
• I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
Algebra:
• I can determine whether an ordered pair is a solution of a system of equations.
• I can solve a system of linear equations by tables of values.</td></tr>
</table>

two triangles to be similar. **G.CO.6.** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. **G.CO.7.** Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. **G.CO.8.** Explain how the criteria for triangle congruence (ASA, SAS, SSS, AAS, and HL) follow from the definition of congruence in terms of rigid motions. Use permutations and combinations to compute probabilities of compound events and solve problems (S.CP.9).	• How to use technology to interpret systems of equations and inequalities to solve real-world problems. • How to use geometric modeling and relationships to interpret real-world problems.	• I can solve a system of linear equations by graphing. • I can determine the number of solutions of a linear system. • I can translate a real-world problem to a system of equations. • I can solve applications of systems of equations by graphing. • I can solve a system of equations by substitution. • I can solve applications of systems of equations by substitution. • I can determine if an ordered pair is a solution to a system of linear inequalities. • I can solve a system of linear inequalities by graphing. • I can solve applications of systems of inequalities. **Geometry:** • I can use the definition of similarity and transformations to explain whether or not two figures are similar. • I can use inductive reasoning to establish AA criterion for triangle similarity. • I can apply similarity (and proportions) to solve real-world problems. • I can use the definition of congruence and rigid motions to determine whether two figures are congruent. • I can use inductive reasoning to establish triangle congruence criteria for ASA, SAS, SSS, AAS, and HL. • I can apply congruence criteria to solve real-world problems. **Statistics & Probability:**

		• I can find probabilities of disjoint and overlapping events. • I can find probabilities of dependent and independent events. • I can find the probability of compound events.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

KPBSD MATH CURRICULUM

FOUNDATIONS OF ALGEBRA AND GEOMETRY

UNIT 6 – ALGEBRAIC MODELING: POLYNOMIALS AND QUADRATIC FUNCTIONS

Desired Results

Priority Standards

A.SSE.1.a. Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.

A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A.APR.1. Add, subtract, and multiply polynomials.

A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.REI.4.b. Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for $x^2 = 25$) and taking square roots.

G.SRT.8. Use the Pythagorean Theorem to solve right triangles in applied problems.

Supporting Standards

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; maximums and minimums; and symmetries.

F.IF.5. Relate the domain of a function to its

Transfer

Students will be able to independently use their learning to…

Interpret real-world problems using the eight mathematical practices, polynomial functions, geometric models, and statistical reasoning.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The eight Standards of Mathematical Practice support solving problems in a variety of contexts.
- Polynomial functions are used to model and efficiently solve real-world problems.
- Geometric reasoning are used to model and efficiently solve real-world problems.
- Polynomials are essential tools used to summarize, represent and interpret data.
- Using graphing and geometry software support the study of algebra and geometry.
- Arithmetic operations with exponents support the study of algebra and geometry.

ESSENTIAL QUESTIONS

Students will keep considering…

- How the Standards of Mathematical Practice support solving problems in a variety of contexts?
- How can I solve real-word problems using polynomials? What is the best way to interpret polynomials in terms of context?
- How can I model and solve real-world problems using geometric reasoning?
- How can I use technology to interpret polynomials to solve real-world problems?
- How can I use inductive reasoning to support my study of algebra and geometry?

Acquisition

Students will know…

- How to use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.
- How to interpret, factor, and perform arithmetic operations on polynomials.
- How to use polynomials to interpret real-world problems.

Students will be skilled at…

Standards for Mathematical Practice:

- I can use the eight Standards of Mathematical Practice to solve problems in a variety of contexts.

Algebra:

- I can identify polynomials, monomials, binomials, and trinomials.
- I can determine the degree of polynomials.
- I can add and subtract polynomials.

graph and, where applicable, to the quantitative relationship it describes. **N.RN.3.** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. **N.Q.1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. **N.Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. **G.C.5.** Use and apply the concepts of arc length and areas of sectors of circles. Determine or derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector **G.GMD.1.** Explain how to find the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use permutations and combinations to compute probabilities of compound events and solve problems (S-CP.9)	• That technology can be used to interpret polynomials to solve real-world problems. • Geometric modeling and relationships can be used to interpret real-world problems.	• I can evaluate a polynomial for a given value. • I can multiply a polynomial by a monomial. • I can multiply a binomial by a binomial. • I can find the greatest common factor of two or more expressions. • I can factor the greatest common factor from a polynomial. • I can factor quadratics with a leading coefficient of 1. • I can solve quadratic equations using inspection. • I can solve quadratic equations using the Square Root Property. • I can use factoring to solve quadratic equations with a leading coefficient of 1 and set equal to zero. • I can solve applications modeled by quadratic equations. **Geometry:** • I can approximate pi by measuring. • I can discover the circumference and area formulas for circles. • I can find the circumference of circles. • I can determine the arc length of circles • I can solve the area of circles. • I can solve the area of sectors of circles. • I can discover the volume formulas for cubes, rectangular prisms, cylinders, rectangular pyramids and cones. • I can solve the volumes of cubes, rectangular prisms, cylinders, rectangular pyramids, and cones. • I can use the Pythagorean Theorem to solve right triangles in applied problems (Note: If time

		permits, including an understanding of sine, cosine and tangent ratios). • I can choose and interpret appropriate units consistently in formulas. • I can measure with accuracy and attend to precision. **Statistics & Probability:** • I can explain the difference between experimental and theoretical probability as it applies in game situations. • I can apply theoretical probability to win in game situations. **Number & Quantity:** • I can use the definition of a negative exponent. • I can simplify expressions with integer exponents. • I can simplify expressions by applying several properties (e.g., Product & Quotient Properties for Exponents, Power Property for Exponents, Product to a Power Property). • I can convert to and from decimal notation and scientific notation.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Algebra I Module

Unit 1 - Expressions, Linear Equations and Inequalities (Chapter 1)

Unit 2 - Inequalities (Chapter 2)

Unit 3 - Introduction to Functions and Linear Functions (Chapter 3, Chapter 4)

Unit 4 - Systems of Equations and Inequalities (Chapter 5)

Unit 5 - Factoring Polynomials, Quadratic Functions and Equations(Chapter 7, Chapter 8)

Unit 6 - Exponents and Polynomials (Chapter 6)

Unit 7 - Data Analysis (Chapter 10) (as time permits)

Course description

Access to higher mathematics is essential and Algebra I is a course that provide an important entry point for the pathway to success by extending students' understanding and application of skills concepts and language of algebra.

KPBSD MATH CURRICULUM
ALGEBRA I
UNIT 1 – EXPRESSIONS, LINEAR EQUATIONS, AND INEQUALITIES

Desired Results

Priority Standards

A.SSE.1. Interpret expressions that represent a quantity in terms of its context.

a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

A.SSE.2. Use the structure of an expression to identify ways to rewrite it.

A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.

A.REI.3. Solve linear equations in one variable. Solve linear equations with coefficients represented by letters.

A.CED.1. Create equations in one variable and use them to solve problems using Linear functions.

A.CED.4. Rearrange formulas (literal equations) to highlight a quantity of interest, using the same reasoning as in solving equations.

N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Transfer

Students will be able to independently use their learning to…

Choose procedures to solve equations efficiently.

Differentiate between accuracy and precision.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Linear equations and formulas are used in a variety of ways.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are the ways I can use linear equations and formulas to solve problems?

Acquisition

Students will know…

- Definition of an expression.
- How to interpret parts of an expression.
- Properties of equality.
- Distributive property.
- Order of operations.
- Definition of a linear equation in one variable.

Students will be skilled at…

- I can translate between words and algebra.
- I can evaluate algebraic expressions.
- I can solve one-step equations in one variable by using addition or subtraction.
- I can solve one-step equations in one variable by using multiplication or division.
- I can solve equations in one variable that contain more than one operation.
- I can solve equations in one variable that contain variable terms on both sides.
- I can solve a formula for a given variable.
- I can solve an equation in two or more variables for one the variables.
- I can solve equations in one variable that contain absolute-value expressions.
- I can write and use ratios, rates, and unit rates.
- I can write and solve proportions.

		• I can use proportions to solve problems involving geometric figures. • I can use proportions and similar figures to measure objects indirectly.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 1: Sections 1.1 - 1.10
Mathematical practices:

- Section 1.1, Variables and Expressions
  - Make sense of problems and persevere in solving them #10-11, 16, 25-26, 31,36-38,42-43, 54
  - Construct viable arguments and critique the reasoning of others #32, 34
  - Look for and make use of structure #38
- Section 1.2, Solving Equations by Adding or Subtracting
  - Make sense of problems and persevere in solving them #20, 49, 58-60,64-65,70
  - Construct viable arguments and critique the reasoning of others #50, 66-67
  - Model with mathematics #61-63
- Section 1.3, Solving Equations by Multiplying or Dividing
  - Make sense of problems and persevere in solving them #19-20, 45-46, 56-60, 65, 74-75
  - Construct viable arguments and critique the reasoning of others #47, 76
  - Look for and express regularity in repeated reasoning #94

- Section 1.4, Solving Two-step and Multi-step Equations
  - Make sense of problems and persevere in solving them #19, 42, 53, 62–67, 73
  - Construct viable arguments and critique the reasoning of others #68–69
  - Model with mathematics #47–49
- Section 1.5, Solving Equations with Variables on Both Sides
  - Make sense of problems and persevere in solving them #14, 33, 52, 54, 56
  - Reason abstractly and quantitatively #55, 69–71
  - Construct viable arguments and critique the reasoning of others #57
  - Model with mathematics #53, 58
- Section 1.6, Solving for a Variable
  - Make sense of problems and persevere in solving them #2, 8–9, 30–31, 34, 45
  - Reason abstractly and quantitatively #29
  - Construct viable arguments and critique the reasoning of others #32–33
- Section 1.7, Solving Absolute-value Equations
  - Make sense of problems and persevere in solving them #13, 29–34, 42–44
  - Construct viable arguments and critique the reasoning of others #45–46, 51
  - Model with mathematics #35–38
  - Look for and make use of structure #39–41
- Section 1.8, Rates, Ratios, and Proportions
  - Make sense of problems and persevere in solving them #2 –9, 19–25, 38–40, 42–43, 56–58, 63–65
  - Construct viable arguments and critique the reasoning of others #41–42
- Section 1.9, Applications of proportions N.Q.1
  - Model with mathematics #10-11, 22
  - Reason abstractly #23
- Section 1.10, Precision and Accuracy N.Q.2, N.Q.3
  - Attend to precision #3-10, 19-27, 37-51, 66
  - Construct viable arguments and critique the reasoning of others #62-63

Vocabulary		
Accuracy Equation Formula Unit rate	Identity Indirect measurement Literal equation Precision	Proportion Ratio Tolerance

KPBSD MATH CURRICULUM

ALGEBRA I

UNIT 2 – INEQUALITIES

Desired Results

<table>
<tr><td rowspan="6">Priority Standards
A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.
A.REI.3. Solve inequalities in one variable. Solve linear equations with coefficients represented by letters.
A.SSE.1. Interpret expressions that represent a quantity in terms of its context.
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity.
A.CED.1. Create inequalities in one variable and use them to solve problems using Linear functions.
A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing cost constraints in various situations.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve multi-step inequalities.
Write and solve inequalities to solve problems.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Linear inequalities are used to solve a variety of real-world problems.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How are inequalities and equations alike? How are they different?
• How do the words “and” and “or” affect the outcome of an inequality?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• How to identify solutions of inequalities in one variable.</td><td>Students will be skilled at…
• I can write and graph inequalities in one variable.
• I can solve one-step inequalities by using addition and subtraction.
• I can solve one-step inequalities by using multiplication and division.
• I can solve inequalities that contain more than one operation.
• I can solve inequalities that contain variable terms on both sides.
• I can solve compound inequalities in one variable.
• I can graph solution sets of compound inequalities in one variable.</td></tr>
</table>

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Chapter 2: Sections 2.1 - 2.6
Mathematical practices:

- Section 2.1, Graphing and Writing Inequalities:
    - make sense of problems and persevere in solving them #55, 56
    - construct viable arguments and critique the reasoning of others #54, 57, 58, 69
    - model with mathematics #16, 17, 32, 33, 42-45
- Section 2.2, Solving Inequalities by Adding or Subtracting:
    - Make sense of problems and persevere in solving them. #5–6, 11–12, 25, 31, 35
    - Reason abstractly and quantitatively #30
    - Construct viable arguments and critique the reasoning of others. #32–34, 46
    - Model with mathematics #13–15
    - Look for and make use of structure #43–45
- Section 2.3, Solving Inequalities by Multiplying or Dividing:
    - Make sense of problems and persevere in solving them #17, 42, 56, 61–62, 65–66
    - Reason abstractly and quantitatively #75
    - Construct viable arguments and critique the reasoning of others #55, 63–64, 70, 76–77
    - Model with mathematics #51–54
- Section 2.4, Solving Two-Step and Multi-Step Inequalities:
    - Make sense of problems and persevere in solving them #15, 37, 59–61
    - Construct viable arguments and critique the reasoning of others #62–63
- Section 2.5, Solving Inequalities with Variables on Both Sides:

- Make sense of problems and persevere in solving them #7, 26, 49–51,56–57
- Reason abstractly and quantitatively #70–71
- Construct viable arguments and critique the reasoning of others #58–60, 72

- Section 2.6, Solving Compound Inequalities:
    - Make sense of problems and persevere in solving them #2, 15, 28–29, 34–35, 42–43
    - Reason abstractly and quantitatively #30–33, 55–56
    - Construct viable arguments and critique the reasoning of others #44–46

Compound inequality Inequality	Intersection Solution of an inequality	Union

KPBSD MATH CURRICULUM
ALGEBRA I
UNIT 3 – INTRODUCTION TO FUNCTIONS AND LINEAR FUNCTIONS

Desired Results

Priority Standards

F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, The Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥1.*

F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then negative numbers would be an inappropriate domain for the function.

Transfer

Students will be able to independently use their learning to…
Use tables, diagrams, graphs, and equations to describe functions.
Translate among representations of functions.
Use functions to represent, analyze, and solve problems.
Translate among different representations of linear functions.
Find and interpret slopes and intercepts of linear equations that model real-world problems.
Solve real-world problems involving linear equations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Lines on a graph can be represented by a linear function, and linear functions can model real world problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can a real-world relationship be modeled using a two-variable equation, a graph, a table, or a word description?
- What does the slope of a line indicate about the line?
- What information does the equation of a line give me?

<table>
<tr><td rowspan="2">F.IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
F.IF.7a. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
F.IF.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.REI.10 . Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
F.BF.1. Write a function that describes a relationship between two quantities,
a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding</td><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• Function concepts and their applications.
• Characteristics of linear functions.
• Application of linear functions.</td><td>Students will be skilled at…
• I can analyze simple graphs and match with situations.
• I can graph a relationship.
• I can identify functions.
• I can find the domain and range of relations and functions.
• I can identify independent and dependent variables.
• I can write an equation in function notation and evaluate a function for given values.
• I can graph functions given a limited domain.
• I can graph functions given a domain of all real numbers.
• I can create and interpret scatter plots.
• I can use trend lines to make predictions.
• I can recognize and extend an arithmetic sequence.
• I can find a given term of an arithmetic sequence.
• I can identify linear functions and linear equations.
• I can graph linear functions that represent real-world situations and give their domain and range.
• I can find x- and y-intercepts and interpret their meanings in real-world situations.
• I can use x- and y-intercepts to graph lines.
• I can find rates of change and slopes.
• I can relate a constant rate of change to the slope of a line.</td></tr>
</table>

a constant function to a decaying exponential, and relate these functions to the model. c. Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* **F.BF.2.** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. Build new functions from existing functions. **F.BF.3.** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **F.LE.2.** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input-output table of values. **F.LE.5.** Interpret the parameters in a linear or exponential function in terms of a context. **S.ID.6.** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. *b.* Informally assess the fit of a function by plotting and		• I can find the slope by using the slope formula. • I can identify, write, and graph direct variation. • I can write a linear equation in slope-intercept form. • I can graph a line using slope-intercept form. • I can graph a line and write a linear equation using point-slope form. • I can write a linear equation given two points. • I can determine a line of best fit for a set of linear data. • I can determine and interpret the correlation coefficient. • I can identify and graph parallel and perpendicular lines. • I can write equations to describe lines parallel or perpendicular to a given line. • I can graph absolute-value functions. • I can identify characteristics of absolute-value functions and their graphs.

analyzing residuals. *For example, Describe solutions to problems that require interpolation and extrapolation.* c. Fit a linear function for a scatter plot that suggests a linear association. **G.GPE.5.** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).		

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 3: Sections 3.1 - 3.5
Mathematical practices:

- Section 3.1, Graphing Relationships

- Make sense of problems and persevere in solving them #18–19, 22
- Construct viable arguments and critique the reasoning of others #20–21
- Model with mathematics #3–5, 7–12, 14–16, 26–28
- Use appropriate tools strategically #17

- Section 3.2, Relations and Functions
    - Make sense of problems and persevere in solving them #21–26, 29
    - Construct viable arguments and critique the reasoning of others #27–28, 30–31
    - Look for and make use of structure #3–20
- Section 3.3, Writing Functions
    - Make sense of problems and persevere in solving them #12, 23–24, 28, 32, 37
    - Reason abstractly and quantitatively #27, 36
    - Construct viable arguments and critique the reasoning of others #29–31
    - Look for and make use of structure #3–11, 13–22
- Section 3.4, Graphing Functions
    - Make sense of problems and persevere in solving them #12, 27, 55, 63
    - Reason abstractly and quantitatively #56
    - Construct viable arguments and critique the reasoning of others #44, 53, 57
    - Look for and make use of structure #1-11, 13-26, 28-43, 45-53, 62
- Section 3.5, Scatter Plots and Trend Lines
    - Make sense of problems and persevere in solving them #4, 13–14, 21, 24, 27, 32–33
    - Reason abstractly and quantitatively #5–12, 15–20, 22, 25–26, 28
    - Construct viable arguments and critique the reasoning of others #23
- Section 3.6, Arithmetic Sequences
    - Make sense of problems and persevere in solving them #8, 15, 33, 38–39, 41, 47
    - Construct viable arguments and critique the reasoning of others #32, 40
    - Look for and make use of structure #2–7, 9–14, 16–31, 34–37, 45–46

Ch 4: Sections 4.1 - 4.9
Mathematical practices:

- Section 4.1, Identifying Linear Functions
    - Make sense of problems and persevere in solving them #13–14, 25, 50–51, 54, 55, 61–63

  - Construct viable arguments and critique the reasoning of others #52–53, 56, 59
  - Look for and make use of structure #2–12, 15–24, 26–49, 60
- Section 4.2, Using Intercepts
  - Make sense of problems and persevere in solving them #8, 22–23, 30–32, 38
  - Construct viable arguments and critique the reasoning of others #33, 39
  - Use appropriate tools strategically #2–7, 9–12, 13–21, 24–29
  - Look for and make use of structure #34–37, 46
- Section 4.3, Rate of Change and Slope
  - Make sense of problems and persevere in solving them #2–3, 12–13, 20, 22–24, 26–27, 32–33
  - Construct viable arguments and critique the reasoning of others #21, 25
  - Use appropriate tools strategically #4–7, 14–17, 28
  - Attend to precision #27
  - Look for and make use of structure #8–11, 18–19
- Section 4.4, The Slope Formula
  - Make sense of problems and persevere in solving them #22, 25
  - Reason abstractly and quantitatively #6–7, 16–17
  - Construct viable arguments and critique the reasoning of others #21, 23–24
  - Look for and make use of structure #1–5, 8–15, 18–20, 29–37
- Section 4.5, Direct Variation
  - Make sense of problems and persevere in solving them #9, 17, 20–37, 40, 45
  - Construct viable arguments and critique the reasoning of others #18–19, 38–39
  - Look for and make use of structure #2–8, 10–16, 46
- Section 4.6, Slope-Intercept Form
  - Make sense of problems and persevere in solving them #13, 26–27, 36
  - Reason abstractly and quantitatively #43
  - Construct viable arguments and critique the reasoning of others #28–31, 35, 44
  - Look for and make use of structure #32–34, 42
- Section 4.7, Point-Slope Form
  - Make sense of problems and persevere in solving them #16, 34–36, 43, 52–53
  - Reason abstractly and quantitatively #40–42, 56–58

    - Construct viable arguments and critique the reasoning of others #49–51
- Section 4.8, Line of Best Fit
    - Make sense of problems and persevere in solving them #4–6, 8–10, 13–16, 19
    - Reason abstractly and quantitatively #3, 7
    - Construct viable arguments and critique the reasoning of others #11–12
    - Look for and make use of structure #20
- Section 4.9, Slopes of Parallel and Perpendicular Lines
    - Make sense of problems and persevere in solving them #51
    - Construct viable arguments and critique the reasoning of others #4, 7, 12, 16, 48, 50, 55, 58
    - Attend to precision #49
    - Look for and make use of structure #18–21

Vocabulary

Arithmetic sequence	Function	Relation
Common difference	Function notation	Scatter plot
Constant of variation	Independent variable	Sequence
Correlation	Linear function	Slope
Dependent variable	No correlation	Transformation
Direct variation	Parallel lines	X-intercept
Domain	Family of function	Y-intercept

KPBSD MATH CURRICULUM

ALGEBRA I

UNIT 4 – SYSTEMS OF EQUATIONS AND INEQUALITIES

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="5">Priority Standards
A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A.REI.5. Show that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
A.REI.6. Solve systems of linear equations exactly and approximately, e.g., with graphs or algebraically, focusing on pairs of linear equations in two variables.
A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
A.REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.</td><td colspan="2">Transfer
Students will be able to independently use their learning to…
Solve real-world problems involving systems of linear equations and inequalities.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
Systems of linear equations and inequalities can be used to model and solve problems.
Systems of linear equations have different methods to solve the system.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
How are systems of linear equations and inequalities useful in interpreting real-world situations?
How can I graph linear inequalities and systems of linear inequalities?
How do I find an exact or approximate solution to systems of linear equations?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
Concepts and applications of linear systems and inequalities.</td><td>Students will be skilled at…
I can identify solutions of systems of linear equations in two variables.
I can solve systems of linear equations in two variables by graphing.
I can solve systems of linear equations in two variables by substitution.
I can solve systems of linear equations in two variables by elimination.
I can compare and choose an appropriate method for solving systems of linear equations.
I can solve special systems of linear equations in two variables.
I can classify systems of linear equations and determine the number of solutions.</td></tr>
</table>

		• I can graph and solve linear inequalities in two variables. • I can graph and solve systems of linear inequalities in two variables.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 5: Sections 5.1 - 5.6
Mathematical practices:

- Section 5.1, Solving Systems by Graphing
    - Make sense of problems and persevere in solving them #8, 16–18, 23–25, 31–32
    - Construct viable arguments and critique the reasoning of others #26–27
    - Use appropriate tools strategically #19–22
- Section 5.2, Solving Systems by Substitution
    - Make sense of problems and persevere in solving them #7, 17, 24–31, 34, 38
    - Construct viable arguments and critique the reasoning of others #32–33
    - Attend to precision #35
- Section 5.3, Solving Systems by Elimination
    - Make sense of problems and persevere in solving them #10, 20–21, 23, 30–31, 35, 39
    - Construct viable arguments and critique the reasoning of others #22, 32
    - Look for and make use of structure #24–29

- Section 5.4, Solving Special Systems
  - AM Make sense of problems and persevere in solving them #11, 23–27, 30
  - Reason abstractly and quantitatively #28
  - Construct viable arguments and critique the reasoning of others #29, 31–32
  - Look for and make use of structure #35–36
- Section 5.5, Solving Linear Inequalities
  - Make sense of problems and persevere in solving them #9, 19, 22, 27–28, 37, 40
  - Construct viable arguments and critique the reasoning of others #38–39, 41–42
- Section 5.6, Solving Systems of Linear Inequalities
  - Make sense of problems and persevere in solving them #15, 29–30, 38, 40, 42
  - Construct viable arguments and critique the reasoning of others #39, 41, 43
  - Attend to precision #47
  - Look for and make use of structure #48, 50

Vocabulary

Consistent system Dependent system Inconsistent system	Independent system Linear inequality	Solution of a linear inequality System of linear equations

KPBSD MATH CURRICULUM
ALGEBRA I
UNIT 5 – FACTORING POLYNOMIALS, QUADRATIC FUNCTIONS, AND EQUATIONS

Desired Results

Priority Standards

A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y 4 as (x 2) 2 – (y 2) 2 , thus recognizing it as a difference of squares that can be factored as (x 2 – y 2)(x 2 + y 2).

A.SSE3a. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines. For example, x2 + 4x +3 = (x +3)(x +1).

A.REI.4b. Solve quadratic equations in one variable.

a. Solve quadratic equations by inspection (e.g., for x 2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the

Transfer

Students will be able to independently use their learning to…
Factor polynomials.
Apply factoring techniques to solve problems involving area and volume.
Graph quadratic functions.
Solve quadratic equations.
Use quadratic functions and equations to solve real-world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Quadratics and polynomials can be solved by factoring
- Quadratic and polynomial functions can model real world problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I use the rules of polynomials to rewrite an expression in factored form?
- Why do i factor polynomials?
- When might it be a good idea to not factor and use a different method for solving quadratic equations?

Acquisition

Students will know…

- Factoring methods and their application.
- Quadratic functions concepts.
- Methods for solving quadratic functions.
- Applications of quadratic functions.

Students will be skilled at…

- I can write the prime factorization of numbers.
- I can find the GCF of monomials.
- I can factor polynomials by using the greatest common factor.
- I can factor quadratic trinomials.
- I can factor perfect-square trinomials.
- I can factor the difference of two squares.
- I can choose an appropriate method for factoring a polynomial.
- I can combine methods for factoring a polynomial.

graph, and interpret these in terms of a context. *b.* Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y = (1.02)t , y = (0.97)t , y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.* **F.IF.9.** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically, in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*.		• I can identify quadratic functions and determine whether they have a minimum or maximum. • I can graph a quadratic function and give its domain and range. • I can find the zeros of a quadratic function from its graph. • I can find the axis of symmetry and the vertex of a parabola. • I can graph a quadratic function written in standard form. • I can graph and transform quadratic functions. • I can solve quadratic equations by graphing, factoring, and using square roots. • I can solve quadratic equations by using the Quadratic Formula. • I can determine the number of solutions of a quadratic equation by using the discriminant of solutions. • I can graph and solve linear inequalities in two variables. • I can graph and solve systems of linear inequalities in two variables.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 7: Sections 7.1 - 7.6
Mathematical practices:

- Section 7.1, Factors and Greatest Common Factors
  - Make sense of problems and persevere in solving them #16, 31, 38–39, 56, 59
  - Reason abstractly and quantitatively #66–68
  - Construct viable arguments and critique the reasoning of others #36–37
  - Look for and make use of structure #46
- Section 7.2, Factoring by GCF
  - Make sense of problems and persevere in solving them #11, 36, 63, 66, 68, 80
  - Construct viable arguments and critique the reasoning of others #64–65, 67, 69–70
- Section 7.3, Factoring $x^2 + bx + c$
  - Make sense of problems and persevere in solving them #52–53, 60–62, 71
  - Reason abstractly and quantitatively #63–66, 83–85
  - Construct viable arguments and critique the reasoning of others #16, 32, 37, 50, 72
  - Model with mathematics #54–56
  - Attend to precision #51
  - Look for and make use of structure #57–59, 67–70
- Section 7.4, Factoring $ax^2 + bx + c$
  - Make sense of problems and persevere in solving them #68–69, 71
  - Reason abstractly and quantitatively #87–89
  - Construct viable arguments and critique the reasoning of others #65, 70, 76
  - Model with mathematics #52–54, 64
  - Look for and make use of structure #66–67, 72–75
- Section 7.5, Factoring Special Products
  - Make sense of problems and persevere in solving them #42, 48, 59, 64
  - Construct viable arguments and critique the reasoning of others #43, 49, 51
  - Attend to precision #50
  - Look for and express regularity in repeated reasoning #52–54

- Section 7.6, Choosing a Factoring Method
  - Make sense of problems and persevere in solving them # 42, 48, 59, 64
  - Construct viable arguments and critique the reasoning of others #43, 49, 51
  - Attend to precision #50
  - Look for and express regularity in repeated reasoning #52–54

Ch 8: Sections 8.6 - 8.7, 8.9
Mathematical practices:

- Section 8.6, Solving Quadratic Equations by Factoring
  - Make sense of problems and persevere in solving them #19, 32, 40–44, 47, 59–61
  - Construct viable arguments and critique the reasoning of others #39, 45–46
- Section 8.7, Solving Quadratic Equations by Using Square Roots
  - AM Make sense of problems and persevere in solving them #16, 35, 40, 42, 46, 60
  - Reason abstractly and quantitatively #39, 44–45
  - Construct viable arguments and critique the reasoning of others #43, 47, 53
  - Attend to precision #41
- Section 8.9, The Quadratic Formula and the Discriminant
  - Make sense of problems and persevere in solving them. Exercises 23, 39, 53, 56, 60–61
  - Construct viable arguments and critique the reasoning of others #54–55

Vocabulary

Axis of symmetry Greatest common factor Maximum Minimum	Parabola Prime factorization Quadratic equation	Quadratic function Vertex Zero of a function

KPBSD MATH CURRICULUM
ALGEBRA I
UNIT 6 – EXPONENTS AND POLYNOMIALS

Desired Results

Priority Standards

N.RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define 51/3 to be the cube root of 5 because we want (51/3) 3 = 5(1/3) 3 to hold, so (51/3) 3 must equal 5.*

N.RN.2. – KPBSD Added - Rewrite expressions involving radicals and rational exponents using the properties of exponents. *For example, Write equivalent representations that utilize both positive and negative exponents.*

A.APR.1. Add, subtract, and multiply polynomials. Understand that polynomials form a system similar to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.

A.SSE.1b. Interpret expressions that represent a quantity in terms of its context.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r) n as the product of P and a factor not depending on P.

F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

Transfer

Students will be able to independently use their learning to…
Use exponents to describe numbers.
Perform operations with polynomials.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- The polynomial operations of addition, subtraction, and multiplication.
- How to apply properties of exponents to simplify radicals.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I classify polynomials?
- How can I use the polynomial operations of addition, subtraction, and multiplication to change the form of a polynomial?
- How does finding greatest common factors help in factoring polynomials?
- How do the properties of exponents apply to radical expressions?

Acquisition

Students will know…

- Properties of exponents.
- Application of polynomials in real-world situations.

Students will be skilled at…

- I can evaluate expressions containing zero and integer exponents.
- I can simplify expressions containing zero and integer exponents.
- I can evaluate and simplify expressions containing rational exponents
- I can classify polynomials and write polynomials in standard form.
- I can evaluate polynomial expressions.
- I can add and subtract polynomials.
- I can multiply polynomials.
- I can find special products of binomials.

b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **F.LE.3.** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.		

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 6: Sections 6.1 - 6.6
Mathematical practices:

- Section 6.1, Integer Exponents
  - Make sense of problems and persevere in solving them #77, 94
  - Construct viable arguments and critique the reasoning of others #66, 84–85
  - Look for and make use of structure #101
- Section 6.2, Rational Exponents
  - AM Make sense of problems and persevere in solving them #22, 51, 80–81, 85
  - Reason abstractly and quantitatively #97
  - Construct viable arguments and critique the reasoning of other #82–84, 86

- Look for and make use of structure #60–67, 91–96
- Section 6.3, Polynomials
  - Make sense of problems and persevere in solving them #26, 58, 63, 74, 79
  - Reason abstractly and quantitatively #59–62
  - Construct viable arguments and critique the reasoning of others #73, 75
  - Look for and make use of structure #80
- Section 6.4, Adding and Subtracting Polynomials
  - AM Make sense of problems and persevere in solving them #15, 33–34, 43, 53, 56–57
  - Reason abstractly and quantitatively #58–62
  - Construct viable arguments and critique the reasoning of others #44–45, 52
  - Look for and make use of structure #46–51
- Section 6.5, Multiplying Polynomials
  - Make sense of problems and persevere in solving them #25, 62–64, 69, 82, 84, 94
  - Reason abstractly and quantitatively #66–68, 93
  - Construct viable arguments and critique the reasoning of others #83, 85
  - Attend to precision #86
  - Look for and make use of structure #65, 96–97
- Section 6.6, Special Products of Binomials
  - Make sense of problems and persevere in solving them #39–40, 61, 64
  - Construct viable arguments and critique the reasoning of others #62–63, 65–66
  - Look for and make use of structure #53–60, 74

Vocabulary

Binomial Closure Degree of a monomial Degree of a polynomial Element	Leading coefficient Monomial Perfect-square trinomial Polynomial	Set Standard form of a polynomial Subset Trinomial

KPBSD MATH CURRICULUM
ALGEBRA I
UNIT 7 – DATA ANALYSIS

Desired Results

Priority Standards

S.CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
S.ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). *For example, Justify why median price of homes or income is used instead of the mean.*
S.ID.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
S.ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.
S.ID.9. Distinguish between correlation and causation.

Transfer

Students will be able to independently use their learning to…
Organize and display data to answer questions.
Use descriptive statistics to summarize data sets.
Understand experimental probability and theoretical probability.
Use probability to make appropriate predictions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Measures of central tendency (mean, median, and mode) to best describe a data set.
- Statistical events can be described as subsets of a sample space.

ESSENTIAL QUESTIONS

Students will keep considering…
- How do I explain the differences between data sets?
- How can data be represented using dot plots, histograms, and box plots?
- How can data distributions be used appropriately to compare and contrast sets of data?
- How can technology support but not replace our mathematics skills and understanding?
- How can conclusions be made and supported or not be supported?
- How do I decide if data reliable to use?

Acquisition

Students will know…
- Real-world applications of data analysis and probability.

Students will be skilled at…
- I can organize data in tables and graphs.
- I can choose a table or graph to display.
- I can create stem-and-leaf plots.
- I can create frequency tables and histograms.
- I can describe the central tendency of a data set.
- I can create and interpret box-and-whisker plots.

		• I can recognize misleading graphs and statistics. • I can determine the experimental probability of an event. • I can use experimental probability to make predictions. • I can determine the theoretical probabilities of an event. • I can convert between probabilities and odds. • I can find the probability of independent and dependent events.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Ch 10: Sections 10.1 - 10.6
Mathematical practices:

- Section 10.1, Organizing and Displaying Data
  - Reason abstractly and quantitatively #40–42
  - Construct viable arguments and critique the reasoning of others #7, 12, 16, 29, 34, 36
  - Use appropriate tools strategically #29–33
  - Attend to precision #3, 8, 11, 17–18
- Section 10.2, Frequency and Histograms
  - Make sense of problems and persevere in solving them #8–9, 20–21, 24–26, 41–43, 48–49, 51–52, 60

- Reason abstractly and quantitatively #6–7, 18–19, 36–40
- Construct viable arguments and critique the reasoning of others #50, 53
- Model with mathematics #59
- Attend to precision #35

- Section 10.3, Data Distributions
  - Make sense of problems and persevere in solving them #8–9, 20–21, 24–26, 41–43, 48–49, 51–52, 60
  - Reason abstractly and quantitatively #6–7, 18–19, 36–40
  - Construct viable arguments and critique the reasoning of others #50, 53
  - Model with mathematics #59
  - Attend to precision #35
- Section 10.4, Misleading Graphs and Statistics
  - Make sense of problems and persevere in solving them #2–11, 17-18
  - Construct viable arguments and critique the reasoning of others #12–14
- Section 10.5, Experimental Probability
  - Make sense of problems and persevere in solving them #11, 21–23, 28, 32, 37
  - Reason abstractly and quantitatively #26
  - Construct viable arguments and critique the reasoning of others #24–25
  - Attend to precision #27
- Section 10.6, Theoretical Probability
  - Make sense of problems and persevere in solving them #32, 34, 38
  - Construct viable arguments and critique the reasoning of others #29–31, 33

Vocabulary

Dependent events	Independent events	Probability
Experimental probability	Median	Quartile
Frequency	Outlier	Theoretical probability

Geometry Modules

Unit 1 - Foundations and Tools (Chapter 1, Sections 1.1-4)

Unit 2 - Formulas, Coordinates, and Transformational Tools (Ch 1, Sections 1.5-1.6 and Ch9 sections 9.1 - 9.4)

Unit 3 - Logic, Proof, & Geometric Reasoning (Chapter 2)

Unit 4 - Parallel & Perpendicular Lines (Chapter 3)

Unit 5 - Triangle congruence (Chapter 4)

Unit 6 - Properties of Triangles (Chapter 5)

Unit 7 - Polygons & quadrilaterals (Chapter 6)

Unit 8 - Similarity (Chapter 7)

Unit 9 - Right triangles & Trigonometry (Chapter 8)

Unit 10 - Perimeter, Circumference & Area (Chapter 10)

Unit 11 - 3D figures: volume and surface area (Chapter 11)

Unit 12 - Circle (Chapter 12)

Course Description:

Geometry is the second course in a traditional mathematics sequence. Students will build mathematical reasoning through mathematical proof, and improve algebraic thinking by embedding algebra in geometry problems. It includes the study of transformations and right triangle trigonometry. Inductive and deductive thinking skills are used in problem solving situations, and applications to the real world are stressed.

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 1 – FOUNDATIONS AND TOOLS

Desired Results

Priority Standards

G.CO.1. Demonstrates understanding of key geometrical definitions, including angle, circle, perpendicular line, parallel line, line segment, and transformations in Euclidean Geometry. Understand undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Transfer

Students will be able to independently use their learning to…
Use the correct terminology for basic geometric figures.
Apply basic formulas in and out of the coordinate plane.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Geometry is omnipresent in the physical world; it can be used to solve problems in real life.
- Geometry uses standard vocabulary and symbols to communicate facts and relationships about geometric figures.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are ways geometric properties are used in real-life situations?
- What symbols, formulas, and vocabulary are conventional for communicating within the context of Geometry?

Acquisition

Students will know…

- Key geometrical definitions.
- The length of a segment can be given as an expression.
- Angle postulates.
- There are different types of angles (adjacent, vertical complementary, and supplementary).
- There are varieties of tools that help us make formal geometric constructions.

Students will be skilled at…

- I can apply and draw facts about points, lines, segments, rays, and planes.
- I can use length and midpoint of a segment to calculate measures and construct midpoints and congruent segments.
- I can measure/construct angles, angle bisectors, and using angle classifications and postulates to calculate the measure of pairs of angles.
- I can differentiate between pairs of angles and use this differentiation to calculate angle measures.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 1 test (will be attached later) Construction performance task should include: • copy/bisect a segment • copy/bisect an angle • measure length to the nearest 16th of inch and millimeter • measure an angle with a protractor OTHER EVIDENCE: Formative assessments, construction labs

Learning Plan

Flexible Content – To be determined

Ch 1: Sections 1.1 - 1.4

- compass constructions: pg 14, 22, 23 and bisect a midpoint (supplement)
- ruler lab - knowing how to measure to the 16th of an inch
- protractor lab - knowing how to measure an angle
- drawing lab - planes, intersecting planes, lines, rays, segments relationships

Mathematical practices: (reference pg 4 of teachers edition)

- Section 1.1
  - reason abstractly and quantitatively #28-34
  - construct viable arguments and critique the reasoning of others #31-34, 38
  - Model with mathematics #22
  - look for and express regularity in repeated reasoning #45
- Section 1.2
  - construct viable arguments and critique the reasoning of others #24-27
  - use appropriate tools strategically #5, 13, 35

- Look for and make use of structure #44
- Section 1.3
  - reason abstractly and quantitatively #19-22, 32
  - model with mathematics #3, 11
  - use appropriate tools strategically #4-6, 12-14, 23-26, 40
- Section 1.4
  - construct viable arguments and critique the reasoning of others #34-37
  - model with mathematics #12
  - look for and make use of structure #32

Additional resources/assignments/activities:

- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Acute angle	Endpoint	Pi
Adjacent angles	Exterior of an angle	Plane
Angle	Height	Point
Angle bisector	Hypotenuse	Postulate
Between	Interior of an angle	Ray
Bisect	Leg	Right angle
Collinear	Length	Segment
Complementary angles	Line	Segment bisector
Congruent angles	Linear pair	Straight angle
Congruent segments	Midpoint	Supplementary angles
Construction	Measure	Undefined term
Coplanar	Obtuse angle	Vertex
Degree	Opposite rays	Vertical angles
Diameter	Perimeter	

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 2 – FORMULAS, COORDINATES, AND TRANSFORMATIONAL TOOLS

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
G.CO.5. Given a geometric figure and a rotation, reflections, or translation, draw the transformed figure using, e.d., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
Supporting Standards
G.GPE.7. Use coordinates to compute perimeters and areas of polygons using the distance formula.
G.CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g.; translation versus horizontal stretch).
G.CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.
G.CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and the line segments.</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Find distances between points in the real world (between cities).
Determine materials needed to make triangular or rectangular objects.
Design patterns to create products (e.g. clothing, furniture, art).</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Formulas help us measure the perimeter, area, and circumference of basic geometric shapes.
• Mathematical situations can be analyzed by applying transformations and using symmetry.
• Geometry allows measurement of things that can’t be measured easily using traditional methods.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How is the perimeter, area, and circumference of basic geometric shape calculated?
• How to determine the midpoint and length of segment?
• How to determine the image of figure after a transformation?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• The formulas for area, midpoint, distance, and the Pythagorean theorem.
• The types of congruent transformations (rotation, reflection, rotation).
• Midpoint and distance in a coordinate plane.
• Transformations in the coordinate plane.</td><td>Students will be skilled at…
• I can apply formulas for perimeter, area, circumference, midpoint, distance, and the Pythagorean Theorem.
• I can use the distance formula and Pythagorean Theorem to find the distance between two points.
• I can identify and write transformations in transformation notation.
• I can predict the coordinates of the image, given the preimage and transformation notations.</td></tr>
</table>

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 2 – FORMULAS, COORDINATES, AND TRANSFORMATIONAL TOOLS

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 2 assessment (to be attached later) OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Students should, but may not have understanding of:

- Perimeter and area of triangles and rectangles
- Pythagorean Theorem
- Midpoint Formula

Consider reviewing 1.5
Chapter 1: section 1.6 - Focus on problems in the coordinate plane → supplement with other problems
Chapter 9: sections 9.1 - 9.4
Mathematical practices:

- Section 1.5
  - reason abstractly and quantitatively #55
  - Construct viable arguments and critique the reasoning of others #54
  - model with mathematics #6, 13, 26, 30
  - Look for and make use of structure #27, 31
- Section 1.6
  - model with mathematics #11, 21, 26, 27, 33, 37
  - look for and make use of structure #25
- Section 9.1
  - construct viable arguments and critique the reasoning of others: #52
  - model with mathematics #8, 19, 27, 37
  - use appropriate tools strategically #43, 45
  - look for and make use of structure #53-57

- Section 9.2
  - model with mathematics #44
  - use appropriate tools strategically # 36-38
  - look for and make use of structure #45-49
- Section 9.3
  - construct viable arguments and critique the reasoning of others #37, 46
  - model with mathematics #11, 22, 31, 45
  - use appropriate tools strategically #36, 41
  - look for and make use of structure #47-51
- Section 9.4
  - reason abstractly and quantitatively #16-20
  - construct viable arguments and critique the reasoning of others #14

Additional resources/assignments/activities:

- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Area	Preimage	Coordinate plane
Perimeter	Radius	Distance
Circumference	Reflection	Midpoint
Coordinate	Rotation	Translation

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 3 – LOGIC, PROOF, AND GEOMETRIC REASONING

Desired Results

Priority Standards

G.CO.9. Using methods of proof including direct, indirect, and counter examples to prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

Supporting Standards

A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.

Transfer

Students will be able to independently use their learning to…
Use inductive and deductive reasoning to make valid arguments.
Plan and write geometric proofs.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- A proof is a formal argument supported by postulates, theorems, and definitions.
- Logical reasoning helps us come to a conclusion.
- A proof is a formal argument supported by postulates, theorems, and definitions.

ESSENTIAL QUESTIONS

Students will keep considering…

- How and why is deductive reasoning used in geometric proof?
- How can traditional constructions deepen understanding and illustrate geometric relationships?

Acquisition

Students will know…

- The difference between inductive and deductive reasoning.
- The Law of Detachment and The Law of Syllogism in logical reasoning.
- The properties of equality and congruence.

Students will be skilled at…

- I can analyze & write conditional & biconditional statements.
- I can use symbolic notation for conditional statements.
- I can form conclusions by using laws of logic.
- I can prove geometric theorems by using deductive reasoning.
- I can write the inverse, converse, and contrapositive of a conditional statement.
- I can apply the Law of detachment and the law of syllogism in logical reasoning.
- I can write and analyze biconditional statements.
- I can recognize algebraic properties of equality/properties of congruence.

		• I can write reasons for steps in a proof. • I can write two-column proofs. • I can use deductive reasoning to prove statements about segments and angles. • I can perform constructions: copy a segment, copy an angle.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): KPBSD common unit exam OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 2: Sections 2.1 - 2.7
Mathematical practices:

- Section 2.1
  - reason abstractly and quantitatively #5-7, 14-16, 23, 28, 30, 33, 35
  - construct viable arguments and critique the reasoning of others: #8-10, 17-19, 24-27
  - Use appropriate tools strategically #43
  - look for the make use of structure: #40
  - look for and express regularity in repeated reasoning: #2-4, 11-13, 20-22, 31
- Section 2.2
  - reason abstractly and quantitatively #4, 5, 9, 10, 18, 20, 30-32, 39 41, 51, 52, 57
  - construct viable arguments and critique the reasoning of others: #9-11, 19-21, 38-41, 56
  - Look for and make use of structure: #3-7, 12-18, 22, 23, 30-37, 48, 54, 55
- Section 2.3
  - reason abstractly and quantitatively #8, 13, 15-18, 22, 24, 26-28
  - construct viable arguments and critique the reasoning of others #4, 5, 11, 12, 19-21, 24, 26

  - look for and make use of structure #4-8, 11-13, 15-18
- Section 2.4
  - reasons abstractly and quantitatively #6, 7, 16, 17, 20-23, 33, 34, 37, 38, 41, 43, 45
  - construct viable arguments and critique the reasoning of others #6, 7, 16, 17, 20-23, 41
  - look for and make use of structure #2-5, 8-15, 18, 19, 24-35, 37, 42-44
- Section 2.5
  - reason abstractly and quantitatively #29, 36, 39, 44
  - construct viable arguments and critique the reasoning of others #2-9, 16-21, 36, 37
  - look for and make sure of structure #2-9, 12-21, 23-28, 30-32, 37, 41
- Section 2.6
  - reason abstractly and quantitatively #4-10, 14, 16-19, 28
  - attend to precision #23
  - look for and make use of structure: #3-10, 14, 24, 28
- Section 2.7
  - reason abstractly and quantitatively #11-13, 19, 21, 23, 24-26
  - construct viable arguments and critique the reasoning of others #17-19, 24-26
  - look for and make use of structure #3-10, 18

Additional resources/assignments/activities:

- 20 beginning proof worksheet: https://drive.google.com/file/d/1f7bQJSNqHKe_MNNcj_M-T1G7K1KG9FO3/view?usp=sharing
- helpful hints for writing proofs: https://drive.google.com/file/d/1AGCa5zgXbKO3n8HJ-FtOGI0YV2Zz3JDM/view?usp=sharing
- assumptions & justifications: https://drive.google.com/file/d/1jWadkISU73UpdNj3wj6nF4hqVJu5chXq/view?usp=sharing
- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Biconditional statement	Definition	Polygon
Conclusion	Hypothesis	Proof
Conditional statement	Inductive reasoning	Quadrilateral
Conjecture	Inverse	Theorem
Contrapositive	Logically equivalent statements	Triangle
Converse	Negation	Truth value
Counter example	Deductive reasoning	Two-column proof

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 4 – PARALLEL AND PERPENDICULAR LINES

Desired Results

Priority Standards

G.CO.1. Demonstrates understanding of key geometrical definitions, including angle, circle, perpendicular line, parallel line, line segment, and transformations in Euclidean Geometry. Understand undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.9. Using methods of proof including direct, indirect, and counter examples to prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent, and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Supporting Standards

G.GPE.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Transfer

Students will be able to independently use their learning to…
Use and prove properties of parallel lines and the angles formed by parallel lines and transversals.
Represent lines in a coordinate plane.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Lines and angles.
- Angles formed by parallel lines and transversal.
- Properties/relationships of parallel and perpendicular lines.
- Slopes of lines.
- Lines in a coordinate plane.

ESSENTIAL QUESTIONS

Students will keep considering…

- What algebraic and geometric conditions are sufficient and necessary to prove lines parallel or perpendicular?
- What are the angle relationships when parallel lines are cut by a transversal?
- What are the conventional forms of proof?

Acquisition

Students will know…

- Parallel, perpendicular, and skew lines.
- The types of angles formed by two lines and a transversal.
- Slopes of parallel and perpendicular lines.

Students will be skilled at…

- I can prove and use theorems about angles formed by parallel lines and a transversal.
- I can use the angles forme.
- I can use slopes of lines to determine if two lines are parallel or perpendicular.

KPBSD MATH CURRICULUM

GEOMETRY

UNIT 4 – PARALLEL AND PERPENDICULAR LINES

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 4 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 3: Sections: 3.1 - 3.6

Mathematical practices:

- Section 3.1
  - reason abstractly and quantitatively #42, 54
  - construct viable arguments and critique the reasoning of others #34
  - model with mathematics #26, 30-33, 41, 43
- Section 3.2
  - reason abstractly and quantitatively #27, 28, 32, 33, 35
  - construct viable arguments and critique the reasoning of others #13-19, 25, 26, 31, 32, 39
- Section 3.3
  - reason abstractly and quantitatively #1-42, 44
  - construct viable arguments and critique the reasoning of others #1-39, 41-46
- Section 3.4
  - reason abstractly and quantitatively #3, 7, 10-21, 34, 36, 27, 31-16
  - construct viable arguments and critique the reasoning of others #4, 5, 8, 22, 23, 28, 37, 38
  - model with mathematics: #5, 9, 24
  - use appropriate tools strategically #29, 30
  - attend to precision #25
  - look for and make use of structure #4, 8
- Section 3.5
  - reason abstractly and quantitatively #26, 29, 30, 32, 33

- model with mathematics #6, 14, 18, 24, 28
- look for and make use of structure #2-5, 7-9, 10-13, 15-18, 23

- Section 3.6
  - reason abstractly and quantitatively #8-11, 19-22, 33-44, 51, 52, 65, 66
  - construct viable arguments and critique the reasoning of others #32, 54, 56
  - model with mathematics #12, 23, 45, 53, 55
  - attend to precision #46
  - look for and make use of structure #2-4, 8-11, 13-15, 19-22, 24-31, 33-44, 47-52, 62-64, 66

Additional resources/assignments/activities:

- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Alternate exterior angles Alternate interior angles Corresponding angles Distance from a point to a line Parallel lines Run	Parallel planes Perpendicular bisector Perpendicular lines Point-slope form Rise	Same-side interior angles Skew lines Slope Slope-intercept form Transversa

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 5 – TRIANGLE CONGRUENCE

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
G.CO.9. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
G.CO.7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G.CO.8. Explain how the criteria for triangle congruence (ASA, SAS, SSS, AAS, and HL) follow from the definition of congruence in terms of rigid motions.
G.CO.10. Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.SRT.5. Apply congruence and similarity properties and prove relationships involving triangles and other geometric figures.
G.GPE.4. Perform simple coordinate proofs. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).
G.GPE.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Proof and use the triangle sum theorem.
Understand congruence and prove and apply congruence relationships for triangles.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
In congruent triangles, each pair of corresponding parts is congruent.
Triangles can be proven congruent using SSS, SAS, ASA, AAS and HL postulates, and theorem.
Base angles of an isosceles triangle are congruent, and conversely, if two angles of a triangle are congruent, then the triangle is isosceles.
A triangle is equiangular if and only if it is equilateral.
In an isosceles triangle, the median to the base, the altitude to the base and the bisector of the vertex angle are the same segment.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
What are the different classifications for triangles?
How can triangles be proven congruent?
How can congruent triangles be used to solve problems?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
Triangles are classified by sides and angles.
There are relationships between triangles and other geometric figures.
The properties of isosceles and equilateral triangles.</td><td>Students will be skilled at…
I can solve problems based on interior and exterior angle relationships.
I can identify congruent figures and corresponding parts.
I can understand and apply postulates and theorems proving triangles congruent.</td></tr>
</table>

perpendicular to a given line that passes through a given point)		• I can prove triangles congruent with given information. • I can copy a triangle by construction. • I can use congruent triangles to prove segment or angle relationships. • I can use congruent triangles to solve problems.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 5 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 4: Sections 4.1-4.9
Mathematical practices:
- Section 4.1
  - construct viable arguments and critique the reasoning of others #9. 10. 22-24 33
  - model with mathematics #11, 25, 28, 32, 38
  - attend to precision #34, 35
  - look for and make use of structure #3-6, 13-18, 26, 27, 29, 30, 37
- Section 4.2
  - reason abstractly and quantitatively #9, 10, 18, 19, 21, 22, 32, 34-37, 44, 47, 48
  - construct viable arguments and critique the reasoning of others #46
  - model with mathematics #11, 33
  - use appropriate tools strategically #20-39
  - look for and make use of structure #38
- Section 4.3

- construct viable arguments and critique the reasoning of others #324, 25, 27, 28, 38, 47
- model with mathematics #4, 5, 15, 36
- use appropriate tools strategically #37, 39
- attend to precision #37, 39
- look for and make use of structure #6-14, 16-22, 29-32, 35

- Section 4.4
  - reason abstractly and quantitatively #9 10, 17, 18, 23-25, 32-36
  - construct viable arguments and critique the reasoning of others #11, 12, 19, 20, 26, 27, 29, 30
  - look for and make use of structure #3-8, 13-18, 21, 22, 31, 37
- Section 4.5
  - reason abstractly and quantitatively #2, 3, 8, 9, 18, 23, 29-31
  - construct viable arguments and critique the reasoning of others #5-7, 11-17, 19-21, 32-34
  - model with mathematics #4, 10, 22, 25
  - use appropriate tools strategically #27
- Section 4.6
  - reason abstractly and quantitatively #4, 5, 7, 8, 11, 12, 14, 15, 18, 26, 29
  - construct viable arguments and critique the reasoning of others #6, 13, 20-24, 30, 32-34
  - model with mathematics #2, 3, 9, 10, 19, 31
  - use appropriate tools strategically #25
- Section 4.7
  - reason abstractly and quantitatively #17, 18, 22, 24, 26, 27, 32
  - construct viable arguments and critique the reasoning of others #3, 4, 8-11, 14, 15, 19-21, 29-31
- Section 4.8
  - reason abstractly and quantitatively #16, 17, 20, 21, 28, 29, 33
  - construct viable arguments and critique the reasoning of others #4, 7, 10 13, 22-24, 34
  - model with mathematics #15
  - look for and make use of structure #2, 3, 5, 6, 8, 9, 11, 12, 14, 27, 31, 32
- Section 4.9
  - reason abstractly and quantitatively #3-10, 13-20, 22-25, 26, 28, 29, 32, 34-43, 44
  - construct viable arguments and critique the reasoning of others #11, 21, 30, 35-37, 39, 41, 45
  - model with mathematics #2, 12, 38
  - use appropriate tools strategically #31

Additional resources/worksheets/labs:

- review of right triangle congruency worksheet https://drive.google.com/file/d/16RcR4KvdN4UA4YIaQb4iKFa0_EcGZSYC/view?usp=sharing
- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Acute triangle	Dilation	Isometry
Equiangular triangle	Equiangular triangle	Legs of an isosceles triangle
Right triangle	Equilateral triangle	Obtuse triangle
Auxiliary line	Exterior	Remote interior angle
Base	Exterior angle	Right triangle
Base angle	Included angle	Rigid transformation
Congruent polygons	Interior	Scalene triangle
Coordinate proof	Interior angle	Triangle rigidity
Corollary	Isosceles triangle	Vertex angle
Corresponding angles	Corresponding sides	CPCTC

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 6 – PROPERTIES OF TRIANGLES

Desired Results

Priority Standards

G.CO.10. Using methods of proof including direct, indirect, and counter examples to prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180, base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

Supporting Standards

G.CO.9. Using methods of proof including direct, indirect, and counter examples to prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
G.C.3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

Transfer

Students will be able to independently use their learning to…
Apply the properties of special triangle segments to solve real-world problems.
Justify and apply inequality relationships in triangles.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Segments can be created in triangles using perpendicular and angle bisectors, medians and altitudes, special points in triangles, and a triangle mid-segment to solve equations and inequalities about the triangle.

ESSENTIAL QUESTIONS

Students will keep considering…

- What segments have special purposes in understanding triangles and solving problems?
- What are some traditional constructions involving special segments in triangles?
- What is indirect proof and how is it different from direct proof?

Acquisition

Students will know…

- Triangles are classified by sides and angles.
- There are relationships between triangles and other geometric figures.
- The properties of isosceles and equilateral triangles.

Students will be skilled at…

- I can use properties of perpendicular bisectors & angle bisectors to solve problems.
- I can construct circle circumscribing a triangle.
- I can construct centroid of a triangle.
- I can solve problems using properties of a centroid.
- I can solve problems using properties of medians & altitudes of a triangle.
- I can solve problems using properties using the mid-segments of a triangle.
- I can write and solve inequalities using properties of sides and angles of one triangle.
- I can write and solve inequalities comparing

		sides/angles of two triangles.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): ● KPBSD common unit exam ● compass constructions of: centroid, circumcenter, incenter, orthocenter, midsegment OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 5: Sections 5.1 - 5.8
Mathematical practices:

- Section 5.1
  - reason abstractly and quantitatively #2-7, 12-17, 23-29, 34-36
  - construct viable arguments and critique the reasoning of others #30, 31, 38, 40, 41
  - model with mathematics #8, 18, 33, 37
  - attend to precision #32
- Section 5.2
  - reason abstractly and quantitatively #3-6, 9, 10, 12-15, 18, 19, 21, 28-32
  - construct viable arguments and critique the reasoning of others #35, 36, 43
  - model with mathematics #11, 20, 37
  - attend to precision #38
  - use appropriate tools strategically #39
- Section 5.3
  - reason abstractly and quantitatively #3-6, 9, 10, 12-15, 18, 19, 21, 28-32
  - construct viable arguments and critique the reasoning of others #35, 36, 43
  - model with mathematics #11, 20, 37
  - attend to precision #38
  - use appropriate tools strategically #39

- Section 5.4
  - reason abstractly and quantitatively #3-8, 11-16, 18-26, 30-36, 40, 41, 44, 45
  - construct viable arguments and critique the reasoning of others #2, 10, 27, 38
  - model with mathematics #9, 17, 37
  - attend to precision #29
  - look for and make use of structure #42, 43
- Section 5.5
  - reason abstractly and quantitatively #12-14, 26-31, 33, 42-53, 60-65, 69, 71
  - construct viable arguments and critique the reasoning of others #2, 3, 16, 17, 66-68, 74, 75
  - model with mathematics #15, 32, 59
  - look for and make use of structure #4-11, 18-25, 34, 35, 54-57, 72
- Section 5.6
  - reason abstractly and quantitatively #1-6, 9-14, 17-27, 31, 34
  - construct viable arguments and critique the reasoning of others #8, 16, 35
  - model with mathematics #7, 15, 30 ,33
  - attend to precision #29
- Section 5.7
  - reason abstractly and quantitatively #53, 55
  - construct viable arguments and critique the reasoning of others #29, 45, 46
  - model with mathematics #5, 18, 36, 47
  - attend to precision #44
  - look for and make use of structure #9-14, 22-27, 52-54
  - look for and express regularity in repeated reasoning #51

Additional resources/assignments/activities:

- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Altitude of a triangle	Equidistant	Mediant of a triangle
Centroid of a triangle	Incenter of a triangle	Midsegment of a triangle
Circumcenter of a triangle	Indirect proof	Orthocenter of a triangle
Circumscribed	Inscribed	Point of concurrency
Concurrent	Locus	Pythagorean triple

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 7 – POLYGONS AND QUADRILATERALS

Desired Results

Priority Standards

G.CO.11. Using methods of proof including direct, indirect, and counter examples to prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

G.SRT.5. Apply congruence and similarity properties and prove relationships involving triangles and other geometric figures.

Supporting Standards

G.CO.13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Transfer

Students will be able to independently use their learning to…
Apply the properties of regular polygons to solve real-world problems.
Justify and apply the properties of special parallelograms.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Polygons have properties depending on their sides and angle relationships.
- Parallelograms and other special quadrilaterals help define our physical world.
- Diagonals are an important part to prove that shapes are special parallelograms.

ESSENTIAL QUESTIONS

Students will keep considering…

- By what characteristics can I classify quadrilaterals?
- What are necessary and sufficient conditions for proving a quadrilateral is a parallelogram?
- How can algebra be used to classify quadrilaterals?

Acquisition

Students will know…

- The properties of polygons.
- Polygons can be classified based on their sides and angles.
- Properties of parallelograms, rectangles, rhombi, squares, trapezoids, and kites.

Students will be skilled at…

- I can find and use the measures of interior and exterior angles of polygons.
- I can use properties of parallelograms to solve problems.
- I can prove that a given quadrilateral is a parallelogram.
- I can prove and apply properties of parallelograms, rectangles, rhombi, squares, trapezoids, and kites.
- I can use properties of rectangles, rhombuses, and squares to solve problems.
- I can use coordinate geometry in conjunction with quadrilaterals to solve problems

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 7 – POLYGONS AND QUADRILATERALS

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 7 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 6: sections 6.1-6.6
Mathematical properties:

- Section 6.1
  - reason abstractly and quantitatively #9-13, 22-26, 32-34, 39-42, 56, 57, 58
  - construct viable arguments and critique the reasoning of others #43, 59
  - use appropriate tools strategically #44
- Section 6.2
  - reason abstractly and quantitatively #32-43, 46, 47, 49, 53
  - construct viable arguments and critique the reasoning of others #14, 26, 44, 45, 56, 57
  - attend to precision #50
- Section 6.3
  - reason abstractly and quantitatively #20-24, 35
  - construct viable arguments and critique the reasoning of others #1-15, 17-19, 26-31, 37, 40
  - model with mathematics #16, 38
  - use appropriate tools strategically #33
- Section 6.4
  - reason abstractly and quantitatively #6, 7, 14, 15, 24-31, 43, 45, 47, 48
  - construct viable arguments and critique the reasoning of others #8, 9, 16, 17, 34, 35, 37-39, 49, 50
  - model with mathematics #36
  - attend to precision #32, 51
- Section 6.5

  - reason abstractly and quantitatively #2, 3, 7, 8, 18, 19, 39, 41
  - construct viable arguments and critique the reasoning of others #17, 28, 30-32, 34, 42
  - model with mathematics #1, 6, 44
  - attend to precision #43
  - look for and make use of structure #20-26, 33
  - use appropriate tools strategically #36-38
- Section 6.6
  - reason abstractly and quantitatively #23-25, 48
  - construct viable arguments and critique the reasoning of others #38, 39, 46, 50
  - model with mathematics #3, 13, 26, 37
  - attend to precision #245
  - look for and make use of structure #9, 10, 19, 20, 34-36

Additional resources/assignments/activities:

- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Base of a trapezoid	Isosceles trapezoid	Regular polygon
Base of a trapezoid	Kite	Rhombus
Base angle of a trapezoid	Leg of a trapezoid	Side of a polygon
Concave	Midsegment of a trapezoid	Square
Convex	Parallelogram	Trapezoid
Diagonal	Rectangle	Vertex of a polygon

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 8 – SIMILARITY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
G-SRT.2. Given two figures, use the definition of similarity in terms of transformations to explain whether or not they are similar.
G-SRT.5. Apply congruence and similarity properties and prove relationships involving triangles and other geometric figures.
Supporting Standards
G-SRT.3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G-SRT.4. Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely.
G-C.1. Prove that all circles are similar.
G-CO.2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
G-GPE.6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Express geometric figures by known relationships of measures, often expressed as theorems and/or algebraic formulas.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Similar polygons have:
  ○ Corresponding angles that are congruent.
  ○ Corresponding sides that are in proportion.
• Certain lengths in triangles are in proportion.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How are ratio and proportion related to geometric figures?
• What information is needed to prove triangles similar?
• How is knowledge of similar figures applicable to real-world problems?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• Properties of similar polygons.
• Dilation is the resizing of an object.
• With dilation, the angles remain the same, but the distance between points increases or decreases by a common scale factor.
• A similarity transformation is a dilation or a composition of rigid motions and dilations.</td><td>Students will be skilled at…
• I can compute the ratio of two numbers.
• I can use proportions to solve problems.
• I can use properties of proportions.
• I can identify and define similar polygons and find their scale factor.
• I can use similar polygons to solve problems.
• I can identify similar triangles.
• I can draw and describe similarity transformation in a coordinate plane.
• I can use the AA, SSS, and SAS similarity theorems to prove two triangles are similar.
• I can use similar triangles to solve real-life problems.</td></tr>
</table>

		• I can use proportionality theorems to solve problems. • I can identify a dilation and write the scale factor of a dilation. • I can use dilations to solve problems.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 8 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 7: Sections 7.1 - 7.6
Mathematical practices:

- Section 7.1
  - reason abstractly and quantitatively #13-17, 19, 20, 27
  - construct viable arguments and critique the reasoning of others #29, 31, 32
  - attend to precision #24
- Section 7.2
  - reason abstractly and quantitatively #25
  - construct viable arguments and critique the reasoning of others #11, 12, 21, 22
  - model with mathematics #13, 23
  - look for and make use of structure #24, 27, 28
- Section 7.3
  - reason abstractly and quantitatively #20-22, 35, 37, 40
  - construct viable arguments and critique the reasoning of others #7, 8, 17, 18, 26, 28, 30, 32, 33, 38, 39
  - model with mathematics #10, 19, 31

- attend to precision #10, 19
- Section 7.4
  - reason abstractly and quantitatively #21, 32, 33, 35
  - construct viable arguments and critique the reasoning of others #23, 24, 31, 37, 38
  - model with mathematics #5, 12, 22, 28, 34
  - attend to precision #5, 12, 28
  - use appropriate tools strategically #29, 39
- Section 7.5
  - reason abstractly and quantitatively #3-9. 13-17, 27, 30, 33, 35, 38, 41-43, 46
  - construct viable arguments and critique the reasoning of others #38, 44, 45
  - model with mathematics # 2, 12, 27, 30-33, 43
  - look for and make use of structure #46
- Section 7.6
  - reason abstractly and quantitatively #17, 19, 22, 24, 25
  - construct viable arguments and critique the reasoning of others #5, 6, 13, 14, 18, 26
  - model with mathematics #20
  - look for and make use of structure #28

Additional resources/assignments/activities:
EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Dilation Directed line segment Indirect measurement Scale	Scale drawing Scale factor Similar	Similar polygons Similarity ratios Similarity transformation

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 9 – RIGHT TRIANGLES AND TRIGONOMETRY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
G.SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
Supporting Standards
G.SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.7. Explain and use the relationship between the sine and cosine of complementary angles.</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Solve problems using the similarity relationships of right triangles.
Apply trigonometric ratios to real-world situations.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
Trigonometric ratios exist across similar triangles.
The unknown sides or angles of a triangle can be solved, given certain triangle information (SSS, ASA, etc.).</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
What theorems and other rules apply specifically to right triangles?
What information is needed in order to apply these rules and theorems?
How is trigonometry used to solve real--world problems?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
The basic trigonometric ratios.
The inverse of basic trigonometric ratio.
How similar triangles are formed from an altitude within a right triangle.
The relationship between sine and cosine.</td><td>Students will be skilled at…
I can use geometric mean to find segment lengths in right triangles.
I can apply similarity relationships in right triangles to solve problems.
I can find the sine, cosine, and tangent of an acute angle.
I can use trigonometric ratios to find side lengths in right triangles and to solve real-world problems.
I can use the relationship between the sine and consine.
I can find the cosine of complementary angles.
I can apply properties of inverses to trigonometric functions.</td></tr>
</table>

		• I can use trigonometric ratios to find angle measures in right triangles and to solve real-world problems. • I can solve problems involving angles of elevation and angles of depression.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 9 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) clinometer activity - measure trees, building height OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 8: Sections 8.1 - 8.4
Mathematical practices:

- Section 8.1
  - reason abstractly and quantitatively #46, 50
  - construct viable arguments and critique the reasoning of others #41, 43, 45, 52
  - attend to precision #14, 27, 40, 42, 44, 47, 53
  - look for and make use of structure # 49
- Section 8.2
  - construct viable arguments and critique the reasoning of others #57, 61, 73
  - attend to precision #21, 43, 48, 52, 55
  - look for and make use of structure #66
  - use appropriate tools strategically #56
- Section 8.3
  - reason abstractly and quantitatively #51, 58
  - construct viable arguments and critique the reasoning of others #45, 62, 63
  - look for and make use of structure #46, 51

- model with mathematics #38, 47
- Use appropriate tools strategically #46

- Section 8.4
    - reason abstractly and quantitatively #17-20
    - construct viable arguments and critique the reasoning of others #26
    - model with mathematics #8, 9, 14-16, 23-25, 27-34
    - attend to precision #31-34

Additional resources/worksheets/videos

- Getting Triggy With It Rap video https://youtu.be/t2uPYYLH4Zo
- Solving right triangle worksheet https://drive.google.com/file/d/1vACAwnIqA2u0BXkSsfq_p28sUDnsgxM6/view?usp=sharing
- Multi-step trig problems https://drive.google.com/file/d/1-ktVYjJ5Rc8MdqRRPox2QYGP6S9wiFvD/view?usp=sharing
- EngageNY: https://www.engageny.org/sites/default/files/resource/attachments/geometry-m1-teacher-materials.pdf

Vocabulary

Angle of depression Angle of elevation Trigonometric ratio	Cosine Geometric mean	Sine Tangent

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 10 – PERIMETER, CIRCUMFERENCE, AND AREA

Desired Results

Priority Standards

G.MG.3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid system based on ratios).

G.GPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Supporting Standards

A.SSE.1. Interpret expressions that represent a quantity in terms of its context.

G.GMD.1. Explain how to find the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.

N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.

N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Transfer

Students will be able to independently use their learning to…

Develop and apply area formulas for circles, polygons, and composite figures.

Use area to solve geometric probability problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Area and perimeter of polygons and area and circumference of circles can be determined using formulas for the figure and dimensions given.
- Surface area and volume of three-dimensional solids can be determined using formulas for the figure and dimensions given.

ESSENTIAL QUESTIONS

Students will keep considering…

- How are area formulas for plane figures derived?
- How are area and perimeter used in real-world applications?
- How are surface area formulas for three-dimensional figures derived?
- How are surface area and volume formulas used in real-world applications?

Acquisition

Students will know…

- The coordinate plane is used to determine coordinates and the perimeter or area of a figure.
- The formulas for perimeter, area, volume, and circumference to determine these measurements.

Students will be skilled at…

- I can solve the perimeter of a polygon.
- I can determine the area of a square, a rectangle, a parallelogram, a triangle, and a trapezoid.
- I can determine the area of an unclassified quadrilateral whose diagonals are perpendicular.
- I can find the area of a regular polygon.
- I can use areas to solve problems.
- I can find the measures of and the sum of the interior and exterior angles of a polygon.
- I can solve the area and circumference of a circle.
- I can solve the length of an arc of a circle.
- I can find the area of a sector of a circle (regions

		of a circle). • I can find the surface area of a prism, cylinder, pyramid, cone, and sphere. • I can find the volume of a prism, cylinder, pyramid, cone, and sphere. • I can use volume and surface areas to solve real-life problems.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 10 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 10: Sections 10.1 - 10.6
Mathematical Practices:

- Section 10.1
  - reason abstractly and quantitatively #52, 53
  - construct viable arguments and critique the reasoning of others #43-46, 51, 60
  - look for and make use of structure #61
  - model with mathematics #29, 48, 49, 54, 56
  - Attend to precision #47, 50, 55
- Section 10.2
  - reason abstractly and quantitatively #42, 45
  - construct viable arguments and critique the reasoning of others #33
  - look for and make use of structure #48
  - model with mathematics #5, 13, 32, 38-41
- Section 10.3

  - reason abstractly and quantitatively #35, 36
  - construct viable arguments and critique the reasoning of others #22
  - model with mathematics #6, 13, 21, 23
  - Use appropriate tools strategically #24-26
  - Attend to precision #32
- Section 10.4
  - reason abstractly and quantitatively #18
  - construct viable arguments and critique the reasoning of others #21
- Section 10.5
  - reason abstractly and quantitatively #1-6, 8-13, 15-22, 24-31
  - model with mathematics #7, 14, 23, 32
- Section 10.6
  - reason abstractly and quantitatively #39-44, 48, 50, 51
  - construct viable arguments and critique the reasoning of others #31
  - model with mathematics #6, 7, 20-22, 38

Vocabulary

Apothem Center of circle Center of a regular polygon	Central angle of a regular polygon Circle	Composite figure Geometric probability

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 11 – THREE-DIMENSIONAL FIGURES: VOLUME AND SURFACE AREA

Desired Results

Priority Standards

G.GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. *For example, Solve problems requiring determination of a dimension not given.*

Supporting Standards

G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional
N.Q.2. Define appropriate quantities for the purpose of descriptive modeling. objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
G.MG.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
G.MG.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Transfer

Students will be able to independently use their learning to…
Geometric figures are ruled by known relationships of measures, often expressed as theorems and/or algebraic formulas.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Formulas help us solve problems.
- Geometric shapes, their measures, and their properties help us describe objects.

ESSENTIAL QUESTIONS

Students will keep considering…
- How are surface area formulas for three-dimensional figures derived?
- How are volume formulas for three-dimensional figures derived?
- How are surface area and volume formulas used in real-world applications?

Acquisition

Students will know…
- Three-dimensional figures are classified based on their properties.
- Volume formulas.
- Surface areas formulas.

Students will be skilled at…
- I can use nets and cross sections to analyze three-dimensional figures.
- I can apply volume/surface area formulas.

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 11 – THREE-DIMENSIONAL FIGURES: VOLUME AND SURFACE AREA

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 11 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) drawing 3D figure lab - spheres, prisms, pyramids, cones and cylinders OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 11: Sections 11.1 - 11.4
Mathematical practices:

- Section 11.1
  - construct viable arguments and critique the reasoning of others #38
  - model with mathematics #11, 12, 22, 23, 37, 48-50
- Section 11.2
  - reason abstractly and quantitatively #9, 10, 20, 21, 35, 36, 39
  - construct viable arguments and critique the reasoning of others #44
  - model with mathematics #5, 16, 25, 26, 32-34
- Section 11.3
  - reason abstractly and quantitatively #9, 10, 29, 21, 39, 50
  - construct viable arguments and critique the reasoning of others #38
  - model with mathematics #41
- Section 11.4
  - reason abstractly and quantitatively #5, 9, 10, 16, 20, 21, 28, 35-38, 40, 42, 45, 47, 48
  - construct viable arguments and critique the reasoning of others #39
  - look for and make use of structure #46
  - model with mathematics #33, 41, 45

MUST SUPPLEMENT SURFACE AREA FOR: PYRAMIDS, CONES, CYLINDERS, and PRISMS.
Additional resources/worksheets/projects:

- polyhedron project
    - list of polyhedron https://drive.google.com/file/d/1Fxv_JEnbQ6LiLNY4bjD-VJVaSkPqjvTe/view?usp=sharing
    - project explanation https://drive.google.com/file/d/1_a2OUm_3_7i6CKlGMpFwxzNrTKEsK6zG/view?usp=sharing

rubric https://drive.google.com/file/d/1VMfX95SIinU45cUwK3jlwzhHsvMXX6NI/view?usp=sharing

Vocabulary

Center of a sphere	Face	Radius of a sphere
Cone	Great circle	Sphere
Cross section	Hemisphere	Vertex
Cube	Net	Volume
Cylinder	Prism	
Edge	Pyramid	

KPBSD MATH CURRICULUM
GEOMETRY
UNIT 12 – CIRCLE

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
G.C.2. Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
G.C.5. Use and apply the concepts of arc length and areas of sectors of circles. Determine or derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
G.GPE.1. Determine or derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Develop and apply the properties of lines and angles that intersect circles.
Analyze the properties of circles in the coordinate plane and use them to solve real-world problems.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• All circles are similar.
• There are relationships among inscribed angles, radii, and chords.
• The radius of a circle is perpendicular to the tangent where the radius intersects the circle.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• What vocabulary is used to describe circles as they relate to lines and angles?
• How can circles give me information about angle measures and segment lengths?
• How are the equation of a circle and its graph on the Cartesian Plane related?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Properties of circles in problems.
• Properties of tangents to solve problems in geometry.
• Properties of chords and arcs to solve problems.
• Properties of the inscribed angles of a quadrilateral to solve problems.</td><td>Students will be skilled at…
• I can use all vocabulary associated with circles.
• I can name minor and major arcs of a circle.
• I can determine measures of central angles and arcs of circles.
• I can use the measures of central angles and their arcs to solve problems.
• I can use properties of chords and arcs to solve problems.
• I can identify the lengths of segments and chords in a circle.
• I can use the properties of inscribed angles to solve problems.
• I can use properties of the inscribed angles of a quadrilateral to solve problems.
• I can calculate angles formed by tangents,</td></tr>
</table>

		chords, and secants. • I can use angle measures to solve real-life problems. • I can write the equation of a circle and use it to solve real-life problems.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 12 assessment (to be attached later) (Find three mathematical practice problems and have students complete two.) OTHER EVIDENCE: Formative assessments, construction labs, quizzes

Learning Plan

Chapter 12: Sections 12.1 - 12.7
Mathematical practices:

- Section 12.1
  - reason abstractly and quantitatively #18-22, 40
  - construct viable arguments and critique the reasoning of others #28-30, 36, 37, 41
  - model with mathematics #8, 15, 43
- Section 12.2
  - reason abstractly and quantitatively #33-35, 37
  - construct viable arguments and critique the reasoning of others #40-43, 45
  - look for and make use of structure #52
  - Use appropriate tools strategically #36
- Section 12.3
  - reason abstractly and quantitatively #23-25, 28
  - model with mathematics #5-29
- Section 12.4

    - reason abstractly and quantitatively #23-25, 41
    - construct viable arguments and critique the reasoning of others #28, 30-32, 34, 35, 37, 43, 44
    - Use appropriate tools strategically #36, 38, 47
- Section 12.5
    - construct viable arguments and critique the reasoning of others #34-37, 45, 46
    - model with mathematics #11
- Section 12.6
    - reason abstractly and quantitatively #31
    - construct viable arguments and critique the reasoning of others #27-30, 38
    - model with mathematics #15, 26
- Section 12.7
    - reason abstractly and quantitatively #22-27
    - look for and make use of structure #9, 18, 21, 30-32
    - model with mathematics #37

Vocabulary

Adjacent arcs	Exterior of a circle	Secant segment
Arc	External secant segment	Sector of a circle
Arc length	Inscribed angle	Segment of a circle
Central angle	Intercepted arc	Semicircle
Chord	Interior of a circle	Subtend
Common tangent	Major arc	Tangent of a circle
Concentric circles	Minor arc	Tangent circles
Congruent arcs	Point of tangency	Tangent segment
Congruent circles	Secant	

Return Home

Algebra II Modules

Course Description:

Algebra II is the third course of a traditional mathematics pathway. Students will work with linear, quadratic, and exponential functions, and extend their repertoire of functions to include polynomial, rational, and radical functions. They will work closely with expressions that define functions, and continue to expand and hone their abilities to model situation and solve equations.

**Students must have a strong foundation in solving equations and systems prior to moving into quadratic functions. Some teachers spend a week or so reinforcing Algebra concepts before moving into Quadratics. Transformations are included in all units pertaining to functions.*

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 1 – QUADRATIC FUNCTIONS

Desired Results

Priority Standards

N.CN.1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real.

N.CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

N.CN.3. Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

N.CN.7. Solve quadratic equations with real coefficients that have complex solutions.

A.SSE.2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*

A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

a. Factor a quadratic expression to reveal the zeros of the function it defines. *For example, $x^2 + 4x + 3 = (x + 3)(x + 1)$.*

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. *For example, $x^2 + 4x + 3 = (x + 2)^2 - 1$.*

A.APR.4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity $(x^2 + y^2)^2 = (x2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples.*

Transfer

Students will be able to independently use their learning to…
Make connections among representations of quadratic functions.
Use various methods to solve quadratic equations and apply them to real-life world problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Quadratics can be written in multiple equivalent ways.
- Quadratics can have 0, 1, or 2 real solutions, or two complex solutions.
- Quadratic functions can be used to model and solve problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- Why is it advantageous to use and solve quadratics algebraically for real-world problems?
- How do I describe the transformation of a quadratic graph when an arithmetic operation is introduced to the parent function?
- How do I write and graph quadratic equations to model the relationship between two quantities?
- How can I represent the same quadratic in different ways?
- What is the most efficient way to solve any given quadratic?
- What are the key features of any given quadratic?
- What is and how can we express complex numbers?

Acquisition

Students will know…

- Quadratic functions and complex numbers.
- Applications of Quadratic functions.

Students will be skilled at…

- I can transform quadratic functions.
- I can describe the effects of changes in the coefficients of a quadratic function written in vertex form.
- I can define, identify, and graph quadratic functions.

A.CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **A.CED.2.** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A.REI.4.b.** Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. *Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.* **A.REI.11.** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. *Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.** **F.IF.7.a**. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. *a.* Graph linear and quadratic functions and show intercepts, maxima, and minima.		• I can identify and use maximums and minimums of quadratic functions to solve problems. • I can solve quadratic equations by graphing or factoring. • I can determine a quadratic function from its roots. • I can solve quadratic equations by completing the square. • I can write quadratic functions in vertex form. • I can define and use imaginary and complex numbers. • I can solve quadratic equations with complex roots. • I can solve quadratic equations using the Quadratic Formula. • I can classify roots using the discriminant. • I can solve quadratic inequalities by using tables, graphs, and algebra. • I can use quadratic functions to model data. • I can use quadratic models to analyze and predict. • I can perform operations with complex numbers.

F.IF.8.a. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. *a.* Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **F.IF.9.** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically, in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* **F.BF.3.** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.* **G.GPE.2.** Determine or derive the equation of a parabola given a focus and directrix.		

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 2-1
  - Reason abstractly and quantitatively #43,48
  - Model with mathematics #16,31,45
- Section 2-2
  - Reason abstractly and quantitatively #40,49
  - Construct viable arguments and critique the reasoning of others # 40
  - Model with mathematics #11,30-33
  - Use appropriate tools strategically # 35-38
- Section 2-3
  - Reason abstractly and quantitatively # 64, 75
  - Construct viable arguments and critique the reasoning of others #65
  - Model with mathematics #27, 46-47, 66
- Section 2-4
  - Reason abstractly and quantitatively #71
  - Construct viable arguments and critique the reasoning of others # 50, 63, 78
  - Model with mathematics # 38-40, 60-61, 64
  - Use appropriate tools strategically # 65-70
- Section 2-5
  - Reason abstractly and quantitatively # 58-65, 72, 83-84
  - Model with mathematics # 36, 75

- Section 2-6
  - Make sense of problems and persevere in solving them #59
  - Reason abstractly and quantitatively # 54
  - Model with mathematics # 36,37,44,60
- Section 2-7
  - Reason abstractly and quantitatively # 59-60
  - Construct viable arguments and critique the reasoning of others #60, 65
  - Model with mathematics #11,27,34,52,58
  - Use appropriate tools strategically 54-57
- Section 2-8
  - Reason abstractly and quantitatively #42,44,51
  - Model with mathematics #11,19,29,38-40
  - Use appropriate tools strategically 37
  - Look for and make use of structure #12-14,30-35
  - Look for and express regularity in repeated reasoning #24
- Section 2-9
  - Reason abstractly and quantitatively #105 - 108, 110- 111
  - Construction viable arguments and critique the reasoning of others #109
  - Model with mathematics #103-104
  - Look for and make use of structure. #117
  - Look for and express regularity in repeated reasoning. #84

Vocabulary

Absolute value of a complex Number Complex conjugate Complex number	Imaginary number Maximum value Minimum value Parabola	Quadratic function Vertex form Zero of a function

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 2 – POLYNOMIALS

Desired Results

Priority Standards

N.CN.9. Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

A.SSE.2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$ *, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$*.*

A.APR.2. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.APR.4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*

A.APR.6. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.

A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For*

Transfer

Students will be able to independently use their learning to…

Solve problems with polynomials.

Identify characteristics of polynomial functions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Solving higher order polynomials is an extension of solving quadratics.
- Graphing polynomial transformations is an extension of graphing quadratic transformations.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can I tell when/if a polynomial expression can be simplified?
- How can a polynomial be expressed graphically and what does each part of the graph represent?
- What is the best way to solve a polynomial equation?
- What do complex numbers mean as solutions of polynomials?

Acquisition

Students will know…

- Operations with polynomial functions.
- Applications of polynomial functions.

Students will be skilled at…

- I can identify, evaluate, add, and subtract polynomials.
- I can classify and graph polynomials.
- I can multiply polynomials.
- I can use binomial expansion to expand binomial expressions that are raised to positive integer powers.

example, represent inequalities describing cost constraints in various situations. **F.IF.4.** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **F.IF.7.c.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. c. Graph polynomial functions, identifying zeros (using technology) or algebraic methods when suitable factorizations are available, and showing end behavior.		• I can apply long division and synthetic division to divide polynomials. • I can identify the multiplicity of roots. • I can use the Rational Root Theorem to solve polynomial equations. • I can apply the Fundamental Theorem of Algebra and its corollary to write a polynomial equation of least degree with given roots. • I can identify all of the roots of a polynomial equation. • I can use properties of end behavior to analyze, describe, and graph polynomial functions. • I can identify and use maxima and minima of polynomial functions to solve problems. • I can transform polynomial functions. • I can use finite differences to determine the degree of a polynomial that will fit a given set of data.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 3.1
  - Construct viable arguments and critique the reasoning of others. #47-49, 52-53
  - Model with mathematics #31,50
  - Use appropriate tools strategically #51
- Section 3.2
  - Construct viable arguments and critique the reasoning of others #54,56-57
  - Model with mathematics #9,39,53
  - Use appropriate tools strategically #35-38
- Section 3.3
  - Construct viable arguments and critique the reasoning of others #49-50
  - Model with mathematics #29,37,63
- Section 3.4
  - Reason abstractly and quantitatively #39
  - Model with mathematics #32,45
  - Look for and make use of structure #55
- Section 3.5
  - Reason abstractly and quantitatively #37-39
  - Model with mathematics #35
  - Use appropriate tools strategically #27
- Section 3.6
  - Reason abstractly and quantitatively #44-47, 56, 66, 70
  - Construct viable arguments and critique the reasoning of others #37,54
  - Model with mathematics #52
  - Use appropriate tools strategically #48-51
- Section 3.7
  - Reason abstractly and quantitatively #43, 46, 54-55
  - Model with mathematics #31,42
  - Look for and make use of structure #53-55
- Section 3.8
  - Construct viable arguments and critique the reasoning of others. #26,28
  - Model with mathematics #27
  - Use appropriate tools strategically #10-12,22-24
- Section 3.9

- Construct viable arguments and critique the reasoning of others #12,15
- Model with mathematics #4-5,9-13
- Look for and make use of structure #1-3,6-8

Vocabulary

End behavior Leading coefficient Local maximum Local minimum	Monomial Multiplicity Polynomial	Polynomial function Synthetic division Turning point

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 3 – EXPONENTIAL AND LOGARITHMIC FUNCTIONS

Desired Results

Priority Standards

A.SSE.3.c. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15t can be rewritten as (1.151/12) 12t ≈* **1.01212t** *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

A.CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing cost constraints in various situations.*

A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or

Transfer

Students will be able to independently use their learning to…

Communicate the relationship between exponential and logarithmic functions.

Solve problems using exponential and logarithmic functions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Exponential and logarithmic functions are inverses of each other.
- When an exponential or a logarithmic function is appropriate to model a problem.
- Transformations of logarithmic and exponential functions are the same as transformations of other types of functions.

ESSENTIAL QUESTIONS

Students will keep considering…

- What do exponential growth and decay graphs look like?
- What is an asymptote?
- What is the number “e” and why do I have it?
- What is a logarithm?
- How do I solve an exponential and logarithmic equations?

Acquisition

Students will know…

- Exponential and logarithmic functions.
- Application of exponential and logarithmic functions.

Students will be skilled at…

- I can write and evaluate exponential expressions to model growth and decay situations.
- I can graph and recognize inverses of relations and functions.
- I can find inverses of functions.
- I can write equivalent forms for exponential and logarithmic functions.
- I can write, evaluate, and graph logarithmic functions.
- I can use properties to simplify logarithmic expressions.
- I can translate between logarithms in any base.

g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. **F.IF.4.** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **F.IF.7.e.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. **F.IF.8.b.** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y = (1.02)t , y = (0.97)t , y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.* **F.IF.9**. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically, in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*		• I can solve exponential and logarithmic equations and inequalities. • I can solve problems involving exponential and logarithmic equations. • I can use the number e to write and graph exponential functions representing real-world situations. • I can solve equations and problems involving e or natural logarithms. • I can transform exponential and logarithmic functions by changing parameters. • I can describe the effects of changes in the coefficients of exponential and logarithmic functions. • I can model data by using exponential and logarithmic functions. • I can use exponential and logarithmic models to analyze and predict.

F.BF.3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. **F.BF.4.c.** Find inverse functions. c. Read values of an inverse function from a graph or a table, given that the function has an inverse. **F.BF.5.** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **F.LE.1.** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **F.LE.2.** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input-output table of values. **F.LE.3.** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly,		

quadratically, or (more generally) as a polynomial function. **F.LE.4.** For exponential models, express as a logarithm the solution to abct = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. **F.LE.5.** Interpret the parameters in a linear or exponential function in terms of a context.		

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 4.1
  - Make sense of problems and persevere in solving them #5-6,10-11,15-17,20-22,27-28,40
  - Reason abstractly and quantitatively #23,41
  - Construct viable arguments and critique the reasoning of others #29
- Section 4.2
  - Make sense of problems and persevere in solving them #29,31
  - Reason abstractly and quantitatively #36,39,56
  - Construct viable arguments and critique the reasoning of others #34,37
  - Model with mathematics #35,47
- Section 4.3
  - Make sense of problems and persevere in solving them #34,37
  - Reason abstractly and quantitatively #45-46

- Construct viable arguments and critique the reasoning of others #31,35
- Section 4.4
  - Reason abstractly and quantitatively #57-64
  - Construct viable arguments and critique the reasoning of others #56,65
  - Model with mathematics #48
  - Use appropriate tools strategically #51-53
  - Look for and make use of structure #56
- Section 4.5
  - Construct viable arguments and critique the reasoning of others #44
  - Model with mathematics #46-47
  - Use appropriate tools strategically #43,53
- Section 4.6
  - Reason abstractly and quantitatively #38
  - Model with mathematics #25,30,37,40
  - Use appropriate tools strategically #23
- Section 4.7
  - Reason abstractly and quantitatively #32,40-43,49-50,57
  - Model with mathematics #15,31, 44, 51
  - Use appropriate tools strategically #56
- Section 4.8
  - Model with mathematics #6-7, 12-16, 18-20, 22-23, 25, 30
  - Use appropriate tools strategically #20,31
  - Look for and make use of structure #8-11, 21

Vocabulary

Asymptote Base Common logarithm	Exponential equation Inverse function Logarithmic equation	Logarithmic function Natural logarithm

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 4 – RATIONAL AND RADICAL FUNCTIONS

Desired Results

Priority Standards

N.RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define 51/3 to be the cube root of 5 because we want (51/3)^3 = 5(1/3)^3 to hold, so (51/3)^3 must equal 5.*

N.RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. *For example, write equivalent representations that utilize both positive and negative exponents.*

N.RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

A.APR.1. Add, subtract, and multiply polynomials. Understand that polynomials form a system similar to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.

A.APR.7. Add, subtract, multiply, and divide rational expressions. Understand that rational expressions form a system similar to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression.

A.CED.1. Create equations and inequalities in one variable and use them to solve problems. Include

Transfer

Students will be able to independently use their learning to…

Apply algebraic reasoning to solve problems with rational and radical expressions.

Make connections among multiple representations of rational and radical functions.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Radicals can be written as rational exponents, and the properties of exponents can be used to simplify radical expressions.

ESSENTIAL QUESTIONS

Students will keep considering…

- In what situations is zero or a negative number an inappropriate answer to a problem?
- How is factoring used to simplify a rational expression?
- How are reciprocals used to divide rational expressions?
- How do we add/subtract fractions with variables?
- What makes a number a rational number?
- What are the rules when performing basic operations and simplification of square roots?

Acquisition

Students will know…

- Rational functions and their applications
- The rules of basic operations and simplification of square roots.
- Ways to add, subtract, multiply and divide rational expressions.

Students will be skilled at…

- I can solve problems involving direct, inverse, joint, and combined variation.
- I can simplify rational expressions.
- I can multiply and divide rational expressions.
- I can add and subtract rational expressions.
- I can simplify complex fractions.
- I can graph rational functions.
- I can transform rational functions by changing parameters.
- I can solve rational equations and inequalities.

equations arising from linear and quadratic functions, and simple rational and exponential functions. **A.CED.2**. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A.REI .2.** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **A.REI.11.** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* **F.IF.5.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then negative numbers would be an inappropriate domain for the function.* **F.IF.7.b.** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.		• I can rewrite radical expressions by using rational exponents. • I can simplify and evaluate radical expressions and expressions containing rational exponents. • I can graph radical functions and inequalities. • I can transform radical functions by changing parameters. • I can solve radical equations and inequalities.

F.IF.7.d. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. d. Graph rational functions, identifying zeros and discontinuities (asymptotes/holes) using technology, and algebraic methods when suitable factorizations are available, and showing end behavior.		

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 5.1
  - Reason abstractly and quantitatively #32–36, 44
  - Construct viable arguments and critique the reasoning of others #43
  - Model with mathematics #38
  - Use appropriate tools strategically #38
  - Look for and make use of structure #13–15, 28–30, 40–41
- Section 5.2
  - Reason abstractly and quantitatively #46
  - Construct viable arguments and critique the reasoning of others #45
  - Model with mathematics #35
- Section 5.3

  - Construct viable arguments and critique the reasoning of others #48
- Section 5.4
  - Reason abstractly and quantitatively #46
  - Construct viable arguments and critique the reasoning of others #45, 48
  - Model with mathematics #47
- Section 5.5
  - Reason abstractly and quantitatively #52
  - Use appropriate tools strategically #47–49
- Section 5.6
  - Reason abstractly and quantitatively #86, 91–92
  - Construct viable arguments and critique the reasoning of others #81
  - Model with mathematics #58, 60–61, 72, 80
  - Use appropriate tools strategically #83
- Section 5.7
  - Reason abstractly and quantitatively #60–63, 71
  - Model with mathematics #19, 47, 55–59, 67, 69
- Section 5.8
  - Reason abstractly and quantitatively #60
  - Construct viable arguments and critique the reasoning of others #54
  - Model with mathematics #50–51, 58
  - Use appropriate tools strategically #55–57

Vocabulary

Complex fraction	Extraneous solutions	Radical function
Constant of variation	Hole (in a graph)	Rational equation
Continuous function	Inverse variation	Rational exponent
Direct variation	Radical equation	Rational function
Discontinuous function		

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 5 – PROPERTIES AND ATTRIBUTES OF FUNCTIONS

Desired Results

Priority Standards

A.APR.7. Add, subtract, multiply, and divide rational expressions. Understand that rational expressions form a system similar to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression.

A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

A.REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.

F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then negative numbers would be an inappropriate domain for the function.*

F.IF.7.b. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

F.BF.1.b. Write a function that describes a relationship between two quantities.

Transfer

Students will be able to independently use their learning to…
Make connections among representations of various function families.
Operate and solve problems with functions and their inverses.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There are problems that can only be modeled by combining two or more types of functions, called a piecewise function.
- Most math relationships have inverses, and many math relationships will have inverses if the domain is restricted.

ESSENTIAL QUESTIONS

Students will keep considering…

- How are the properties of functions and function operations useful?
- How do I graph piecewise functions?
- How do I find the inverse of a function?
- How are real-world situations modeled when they cannot be described with a single function?

Acquisition

Students will know…

- Functions and their graphs.
- Functional relationships.

Students will be skilled at…

- I can translate between the various representations of functions.
- I can solve problems by using the various representations of functions.
- I can write and graph piecewise functions.
- I can use piecewise functions to describe real-world situations.
- I can transform functions.
- I can recognize transformations of functions.
- I can add, subtract, multiply, and divide functions.
- I can write and evaluate composite functions.

b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* **F.BF.1.c.** Write a function that describes a relationship between two quantities. c. Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. **F.BF.3.** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. *Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.* **F.BF.4.** Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, f(x) = 2x3 for x > 0 or f(x) = (x + 1)/(x – 1) for x ≠ 1*. b. Verify by composition that one function is the inverse of another. c. Read values of an inverse function from a graph or a table, given that the function has an inverse.		• I can determine whether the inverse of a function is a function. • I can write rules for the inverses of functions. • I can apply functions to problem situations. • I can use mathematical models to make predictions.

d. Produce an invertible function from a non-invertible function by restricting the domain.		

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 6.1
  - Model with mathematics. #1–15, 19–22, 24–30
  - Look for and make use of structure. #5, 6, 11–15, 19–21
- Section 6. 2
  - Construct viable arguments and critique the reasoning of others. #22
  - Model with mathematics. #2,3, 5, 6, 19, 20, 26
  - Attend to precision. #6
  - Look for and make use of structure. #2, 3, 5, 6, 19, 20, 26
- Section 6.3
  - Model with mathematics. #8, 15, 19, 20, 24, 27, 30–33, 36, 37
  - Look for and make use of structure.#2, 3, 8–10, 27
- Section 6. 4
  - Reason abstractly and quantitatively.#7, 19–23, 27, 28
  - Construct viable arguments and critique the reasoning of others. #30, 31
  - Model with mathematics. #7,19, 20, 22–24, 27, 28

- Section 6.5
  - Reason abstractly and quantitatively. #43, 45
  - Construct viable arguments and critique the reasoning of others. #38, 44
  - Model with mathematics. #14, 33–37, 51
- Section 6.6
  - Reason abstractly and quantitatively. #42
  - Construct viable arguments and critique the reasoning of others. #44, 55
  - Model with mathematics. #22, 23, 36–41, 56

Vocabulary		
Composition of functions One-to-one function	Piecewise function	Step function

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 6 – PROBABILITY

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
A.APR.5. Know and apply the Binomial Theorem for the expansion of (x + y)n in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal’s Triangle.
S.IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?
S.CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).
S.CP.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
S.CP.3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
S.CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use</td>
<th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Apply concepts of probability to solve problems.
Use tables and diagrams to find probability of compound events.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Probability tells us the likelihood that something will happen and allows us to make predictions and informed decisions.
• The chance that an event happens may be represented by use of decimals, fractions, and or percentages.
• How a probability is calculated depends on recognizing which type of probability we are working with.</td>
<td>ESSENTIAL QUESTIONS
Students will keep considering…
• What influences the probability that a given event will occur?
• What is the difference between experimental and theoretical probability?
• What determines whether an event is dependent or independent?
• How can I use probability to form a prediction?
• What is a simulation?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• Experimental probability.
• Probability.</td>
<td>Students will be skilled at…
• I can solve problems involving the Fundamental Counting Principle.
• I can solve problems involving permutations and combinations.
• I can determine the theoretical probability of an event.
• I can calculate the experimental probability of an event.
• I can determine whether events are independent or dependent.
• I can identify the probability of independent and dependent events.</td></tr>
</table>

the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in 10th grade. Do the same for other subjects and compare the results.* **S.CP.5.** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* **S.CP.6.** Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model. **S.CP.7.** Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. **S.CP.8***.* Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **S.CP.9.** Use permutations and combinations to compute probabilities of compound events and solve problems.		• I can construct and interpret two-way frequency tables of data associated with each object being classified. • I can determine the probability of mutually exclusive events. • I can find the probability of inclusive events.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 7.1
  - Reason abstractly and quantitatively #33,34,38,40
  - Construct viable arguments and critique the reasoning of others #37
  - Model with mathematics #43
  - Look for and express regularity in repeated reasoning #42
- Section 7.2
  - Reason abstractly and quantitatively #21,23,24,30,41,42
  - Construct viable arguments and critique the reasoning of others #25,31,34
  - Attend to precision #35
- Section 7.3
  - Make sense of problems and persevere in solving them. #24
  - Reason abstractly and quantitatively. #33,35
  - Construct viable arguments and critique the reasoning of others. #31
  - Model with mathematics. #6, 7, 15, 16, 30, 38
  - Look for and make use of structure. #24, 34
- Section 7.4
  - Reason abstractly and quantitatively #10, 12, 18, 21, 22
  - Construct viable arguments and critique the reasoning of others #11,22
- Section 7.5
  - Reason abstractly and quantitatively. #20, 23, 31, 34

- Model with mathematics #21, 25, 27
- Look for and make use of structure #36-41

Vocabulary

Binomial experiment Combination Conditional probability Dependent events	Experimental probability Factorial Independent events	Outcomes Permutation Theoretical probability

KPBSD MATH CURRICULUM
ALGEBRA II
UNIT 7 – SEQUENCES AND SERIES

Desired Results

Priority Standards

A.SSE.4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.

F.IF.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥1.*

F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

a. Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F.BF.1.a. Write a function that describes a relationship between two quantities.

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Transfer

Students will be able to independently use their learning to…

Represent sequences and series algebraically to solve problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Sequences and series can model many mathematical ideas and realistic situations.
- Sequences help us to recognize and apply patterns to familiar and unfamiliar situations so we can make predictions.
- Patterns help identify relevant elements of geometric/arithmetic sequences and series.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I tell the difference between an arithmetic and geometric?
- How can different calculations with an arithmetic or geometric sequence be used in the real world?
- Why do I write a recursive and explicit formulas for sequences?
- Why would I need to find the sum of an infinite series?

Acquisition

Students will know…

- Arithmetic sequences and series.
- Geometric sequences and series.

Students will be skilled at…

- I can identify the ***n***th term of sequence.
- I can write rules of sequences.
- I can evaluate the sum of a series expressed in sigma notation.
- I can find the indicated terms of an arithmetic sequence.
- I can solve the sum of arithmetic series.
- I can determine terms of geometric sequence.
- I can identify the sum of geometric series.
- I can determine the sums of infinite geometric series.

F.LE.2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input-output table of values.		

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Mathematical practices:

- Section 9.1
  - Reason abstractly and quantitatively. #43, 46, 48
  - Construct viable arguments and critique the reasoning of others. #33
  - Model with mathematics. #43, 44, 47
  - Attend to precision. #58
  - Look for and make use of structure. #2–13, 15–32, 34–47, 50–58
  - Look for and express regularity in repeated reasoning. #11–13, 22–24, 34–47, 50–58
- Section 9.2
  - Reason abstractly and quantitatively. #43–45, 61
  - Model with mathematics. #12, 23, 34, 35, 42, 46, 48
  - Use appropriate tools strategically. #43–45
  - Look for and make use of structure. #2–11, 13–22, 24–33, 35–49, 54, 55, 57–60
  - Look for and express regularity in repeated reasoning. #47
- Section 9.3
  - Reason abstractly and quantitatively. #50, 51, 59–61

- Construct viable arguments and critique the reasoning of others. #58
- Model with mathematics. #20,36, 37, 46, 48, 49, 53
- Look for and make use of structure. #2–18, 21–35, 38–49, 55, 57

Vocabulary

Converge Diverge Explicit formula Finite sequence	Infinite sequence Iteration Limit Recursive formula	Sequence Series Term of a sequence

Statistics Modules

Purpose & Rationale

Studying Statistics provides tools for describing variability in data and for making informed decisions. Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability.

Statistics is a highly applicable subject for students considering any post-secondary education (business, engineering, nursing, sciences, etc.). The challenge comes in meeting students where they are when then enter the course. The pace and depth of this course may vary depending on the skills and knowledge of the students.

Consider using the *Statistics & Probability* course or *High School Statistics* mission in Khan Academy.

For open text resources, consider OpenStax CNX Intro to Statistics or Intro to Statistics for Business.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 1 – METHODS OF DATA COLLECTION

Desired Results

Priority Standards

S.IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

S.IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies.

Supporting Standards

S.IC.5. Use data randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

Transfer

Students will be able to independently use their learning to…

Determine appropriate tools for gathering data and communicate the purpose and value of statistics in understanding our world.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Statistics provides tools for describing variability in data and for making informed decisions that take it into account.
- Data is categorized qualitatively and quantitatively.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is statistics and how is data categorized?
- What is data?
- How do I communicate and understand data?
- How can data analysis be used to predict future happenings?

Acquisition

Students will know…

- Concepts of subject, variable, population, sample, parameter, statistic, qualitative, quantitative, placebo effect.

Students will be skilled at…

- I can recognize and differentiate between key terms.
- I can apply various types of sampling methods to data collection.
- I can determine statistical questions.
- I can follow guidelines for statistical studies.
- I can determine control and treatment groups.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 1 – METHODS OF DATA COLLECTION

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Unit on Study Design, Take unit test as pre-test and then post. Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 2 – ANALYZING CATEGORICAL DATA

Desired Results

Priority Standards

S.ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

S.ID.5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Supporting Standards

S.CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.

Transfer

Students will be able to independently use their learning to…
Organize, interpret, and communicate categorical data.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Dot plots, histograms, and box plots are graphical ways to display information.
- The shape of the display plays an important role in comparing two data sets.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are appropriate visuals to display information about data?
- What are common distribution shapes?

Acquisition

Students will know…

- Bar graph, pictograph, stem-and-leaf plot, histogram, two-way tables, relative, marginal, frequency, relative frequency.

Students will be skilled at…

- I can create and interpret frequency tables.
- I can display data graphically and interpret graphs: stem plots, histograms, and box plots.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Unit on Analyzing Categorical Data Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 3 – DISPLAYING, SUMMARIZE, AND COMPARING QUANTITATIVE DATA

Desired Results

Priority Standards

S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). *For example, Justify why median price of homes or income is used instead of the mean.*

Supporting Standards

S.ID.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Transfer

Students will be able to independently use their learning to…

Determine the statistical measurement(s) that best represent or compare data sets by conducting graphical and numerical analysis.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Interpretation of data is dependent upon the graphical displays and numerical summaries.
- The shape, center, and spread are important characteristics of a distribution.
- The question to be answered determines the data to be collected and how best to collect it.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is data?
- How can data analysis be used to predict future happenings?
- Does the data always lead to the truth?

Acquisition

Students will know…

- Median, mean, interquartile range, standard deviation, and normal distribution.

Students will be skilled at…

- I can use technology to display and interpret data.
- I can calculate measures of center, spread, and can use technology to estimate population percentages.

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Units on Display and Comparing Quantitative Data and Summarizing Quantitative Data Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 4 – SCATTER PLOT AND REGRESSION

Desired Results

Priority Standards

S.ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
b. Informally assess the fit of a function by plotting and analyzing residuals. *For example, Describe solutions to problems that require interpolation and* extrapolation.
c. Fit a linear function for a scatter plot that suggests a linear association.

S-ID.9. Distinguish between correlation and causation.

Supporting Standards

S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S-ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

Transfer

Students will be able to independently use their learning and knowledge of scatterplots, correlations, and regressions to determine the relationship between data in two variables.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Regression is an effective model for prediction.
- There is a difference between causation and correlation.
- Scatterplots and other graphs are used to illustrate solutions and solve problems.
- Data is analyzed to verify the truth.

ESSENTIAL QUESTIONS

Students will keep considering…

- What does it mean to regress?
- What is association? What is correlation? How are they connected?
- Does association imply causation?
- How can modeling data help me to understand patterns?
- Can I use extrapolation to predict the future?
- Is it possible to test for lack of correlation?

Acquisition

Students will know…

- Regression, residuals, correlation, and causation.

Students will be skilled at…

- I can construct and describe scatter plots in two variables.
- I can fit a function to a variety of models: linear, quadratic, and exponential, and interpret the fit of the data to the model.

Evidence	
Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Units on Exploring bivariate numerical data Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 5 – PROBABILITY

Desired Results

Priority Standards

S.CP.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
S.CP.3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
S.CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
S.CP.6. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

Supporting Standards

S.CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
S.CP.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample

Transfer

Students will be able to independently use their learning *of randomness, conditional probability, and independence to understand and quantify natural phenomena and operational decision-making.*

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Probability models are useful tools for making decisions and predictions.
- The notion and behavior of a random variable is foundational to understanding probability distributions.
- Probability is based on relative frequencies.
- The Law of Large Numbers is an important concept when simulating probability experiments but should be interpreted carefully.

ESSENTIAL QUESTIONS

Students will keep considering…
- How can I verify that two variables are independent?
- How can I base decisions on chance?
- How can probability be used to simulate events and to predict future happenings? What are the benefits of simulating events as opposed to gathering real data?
- Is independence desirable?

Acquisition

Students will know…
- Independent, mutually exclusive, probability, and conditional probability,

Students will be skilled at…
- I can determine whether two events are mutually exclusive and whether two events are independent.
- I can calculate probabilities using the Addition Rules and Multiplication Rules.
- I can construct and interpret Contingency Tables.
- I can construct and interpret Venn Diagrams.
- I can construct and interpret Tree Diagrams.
- I can calculate probabilities with permutations and combinations.

space to decide if events are independent and to approximate conditional probabilities. **S.CP.7.** Apply the Addition Rule, P(A or B)= P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. **S.CP.8.** (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. **S.CP.9.** (+) Use permutations and combinations to compute probabilities of compound events and solve problems.		

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Units on Probability and Counting, Combinations, and Permutations. Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 6 – DATA ANALYSIS: RANDOM VARIABLES AND BINOMIAL DISTRIBUTION

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
S.IC.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
S.IC.6. Evaluate reports based on data.
S.MD.2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
S.MD.3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
S.MD.4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
S.MD.6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using random number generator).
S.MD.7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).
Supporting Standards
S.IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result</td><th colspan="2">Transfer</th></tr>
<tr><td colspan="2">Students will be able to independently use their learning of discrete and continuous random variables to be able to analyze test results.</td></tr>
<tr><th colspan="2">Meaning</th></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Randomness and probability are the theoretical bases of statistical theory.
• Probability models are useful tools for making decisions and predictions.
• Probability is the basis of statistical inference.
• The notion and behavior of a random variable is foundational to understanding probability distributions.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• What is randomness?
• How can modeling predict the future?
• To what extent does our world exhibit binomial and geometric phenomena?
• When is probability a sure thing?
• How can we base decisions on chance?
• Is anything in nature truly random?</td></tr>
<tr><th colspan="2">Acquisition</th></tr>
<tr><td>Students will know…
• Random variables, discrete, continuous, expected value, probability distribution,</td><td>Students will be skilled at…
• I can recognize and understand discrete probability distribution functions, in general.
• I can calculate and interpret expected values.
• I can recognize the binomial probability distribution and apply it appropriately.
• I can recognize the hypergeometric probability distribution and apply it appropriately.
• I can classify discrete word problems by their distributions.</td></tr>
</table>

of 5 tails in a row cause you to question the model? **S.MD.1.** (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions. **S.MD.5.** (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.		

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Unit on Random Variables Student project demonstrating understanding of standards and spreadsheets.

KPBSD MATH CURRICULUM
STATISTICS
UNIT 7 – NORMAL DISTRIBUTION (OPTIONAL EXTENSION)

Desired Results

<table>
<tr><td rowspan="5">
Priority Standards
S.ID.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
Supporting Standards
S.IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
S.IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?
S.IC.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning of data exploration, planning studies and probability to estimate endangered species populations from sample data.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>
ENDURING UNDERSTANDINGS
Students will understand that…

Many discrete phenomena may be described and thus predicted by binomial and geometric models.
The normal distribution and central limit theorem are essential to analyzing samples of data.
Variation can be expected in the results of random samples and is affected by the design of the sample or experiment.

</td><td>
ESSENTIAL QUESTIONS
Students will keep considering…

How can modeling predict the future?
How does the normal distribution apply to the real world?
Is all data “created equal”?

</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td></td><td>
Students will know…

Normal distribution, central limits theorem, sample mean.

</td><td>
Students will be skilled at…

I can recognize the normal probability distribution and apply it appropriately.
I can recognize the standard normal probability distribution and apply it appropriately.
I can compare normal probabilities by converting to the standard normal distribution.

</td></tr>
</table>

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit exam (or) Khan Academy: Unit on Random Variables Student project demonstrating understanding of standards and spreadsheets.

Return Home

Integrated Math for Trades Modules

Course Description:

Integrated Math for Trades equips students with a solid foundation in the math needed for a variety of technical and vocational trades, such as allied health, electrical trades, plumbing, construction, and many more. The math concepts are presented completely within the context of practical on-the-job applications.

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 1 – RATIO, PROPORTION, AND PERCENT

Desired Results

Priority Standards

A.REI.1. Apply properties of mathematics to justify steps in solving equations in one variable.
A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A.CED.1. Create equations and inequalities in one variable and use them to solve problems.

Transfer

Students will be able to independently use their learning to…
Use ratios, proportions, and percent to solve real-world situations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Ratios, percent, and fractions help us solve real-world problems
- Numbers are represented as a fraction, decimal, and percent.
- Ratios and rates can be compared.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do I represent and/or solve real-world and mathematical problems using rates, ratios, and/or percent?
- How do I represent a number as a fraction, decimal, and percent?
- What are ways I can compare and order fractions, decimals, and percent?
- How do I find the percent of a number?
- How do I interpret and compare ratios and rates?
- How do I solve unit rate problems including those involving unit pricing and constant speed?

Acquisition

Students will know…

- What a ratio and proportion are and how to set them up.
- Proportions can be used to solve problems involving ratios.
- Percent calculations are important part of any business, technical skill, and trade.
- Percent, fractions, and decimals can be converted between each other.

Students will be skilled at…

- I can compare numbers using ratios.
- I can represent a number as a fraction, decimal, and percent.
- I can interpret and compare ratio and rate.
- I can convert rates and ratios into simplest form.
- I can identify an unknown value in a proportion.
- I can utilize proportions to solve real-world trade problems.
- I can use proportions to solve percentage problems.
- I can apply ratios and proportions to scale drawings and direct and indirect proportions.

		• I can analyze percent problems to identify the given information and the unknown quantity.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): To be determined

Learning Plan

Labs: To be determined
Mathematics for the Trades

- Section 4.1, Ratio and Proportion
  - Ratio
  - Simple Equations
  - Proportions
  - Problem Solving Using Proportions
- Section 4.2, Introduction to Percent
  - Changing Decimal Numbers to Percents
  - Changing Fractions to Percents
  - Changing Percents to Decimal Numbers
  - Changing Percents to Fractions
- Section 4.3, Percent Problems
  - When *P* is Unknown
  - When *R* is Unknown
  - When *B* is Unknown

- Section 4.4, Applications of Percent Calculations
  - Discounts
  - Sales Tax
  - Interest
  - Commission
  - Efficiency
  - Tolerances
  - Percent Change
- Section 4.5, Applications of Ratio and Proportion
  - Scale Drawings
  - Similar Figures
  - Direct and Inverse Proportions
  - Gears and Pulleys

Additional resources/assignments/activities:
Mathematics for the Trades - Problem Set 1

Kahn Academy - Ratios, rates, proportions, percents
https://www.khanacademy.org/math/pre-algebra/pre-algebrA.Ratios-rates

Based off the textbook: **Mathematics for the Trades - A Guided Approach** Hal M Saunders and Robert A. Carman
https://www.pearson.com/us/higher-education/product/Saunders-Mathematics-for-the-Trades-A-Guided-Approach-11th Edition/9780134756967.html

Vocabulary

Whole numbers	Reciprocal	Repeating Decimals
Estimate	Least Common Denominator (LCD)	Terminating Decimals
Prime Factors	Place Value	Ratio
Order of Operations	Decimal Digits	Gear Ratio
Improper Fraction	Rounding	Pulley Ratio
Mixed Number	Average	Compression Ratio
Equivalent Fraction	Proportions	

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 2 – MEASUREMENT

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret the scale and the origin in graphs and data displays.
N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.
N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
G.MG.2. Apply concepts of density based on area and volume in modeling situations.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Apply, with precision and accuracy, basic units of measurement for linear, angle, temperature, weight, speed, and solve problems based on these measurements.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Precision and accuracy of measurement is an important part of technical mathematical problems.
• There are specific units of measurement used for various technical problems.
• Units can be converted to other appropriate units.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• Why is precision in measurement important?
• How do I measure an object’s dimensions accurately?
• What tools best fit a measurement situation?
• How do I determine the best unit of measure for various measurements?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• The name, perimeter, area, and volume formulas.
• Tools of measurement are used for linear, temperature, weight, angular, and speed.
• Tools help us measure accurately and with precision accurately and with precision.
• Units of measurement can be converted to other units.</td><td>Students will be skilled at…
• I can apply formulas to applied technical problems.
• I can measure dimensions of objects, temperature, weight, angular, and speed.
• I can apply methods of unit conversion to problems.
• I can use the tools of measurement with accuracy and precision.</td></tr>
</table>

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 2 test Measurement performance task should include: ● accurately set up measurements for real-life trades situations and solve accordingly ● accurately use the measurement tools for length, angles ● converting from unit of measurement to another ● measure using appropriate precision OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs:

- ruler lab - knowing how to measure to the 16th of an inch
- caliper lab
- protractor lab - knowing how to measure an angle

Mathematics for the Trades

- Section 5.1, Working with Measurement Numbers
  - Units and significant digits
  - Precision and accuracy
  - Addition, subtraction, multiplication, and division of measurement numbers
  - Rounding products and quotients
  - Decimal equivalents
- Section 5.2, English units and unit conversion
  - Unity fractions
  - Compound units
  - Area, volume, speed
- Section 5.3, Metric units
  - Length, weight
  - Area, volume, speed, temperature

- Section 5.4, Direct measurements
  - Length measurements
  - Micrometers and vernier micrometers
  - Vernier calipers
  - Protractors
  - Meters
  - Gauge blocks

Additional resources/assignments/activities:

A New Algebra: Tools, Themes, Concepts (1993) Henri Picciotto, Anita Wah
http://www.mathedpage.org/new-algebra/new-algebra.html

Vocabulary

Precision	Ounces	Meter
Accuracy	Pound	Micrometer
Inch	Ton	Vernier micrometer
Foot	Pints	Millimeter
Tolerance	Quart	Centimeter
Yard	Gallon	Kilometer
Square inch	Barrel	Gram
Square foot	Caliper	Milligram
Square yard	Vernier Caliper	Kilogram
Square mile	Protractor	Metric Ton
Acre	Vernier Protractor	Fahrenheit
Cubic inch	Vertex	Celsius
Cubic foot	Baseline	Angle
Cubic yard		

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 3 – PRE-ALGEBRA

Desired Results

Priority Standards

N.RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define 51/3 to be the cube root of 5 because we want (51/3) 3 =* $5(1/3)^3$ *to hold, so* $(51/3)^3$ *must equal 5*.

N.RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. *For example, Write equivalent representations that utilize both positive and negative exponents.*

A.REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Transfer

Students will be able to independently use their learning to…

Evaluate number patterns and calculate accurately using signed numbers, exponents, square roots, and order of operations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Logical patterns exist and are a regular occurrence in mathematics and in trades.
- Relationships can be described and generalizations made for mathematical situations that have numbers or objects that repeat in predictable ways.
- Rules of arithmetic and algebra can be used together with (the concept of) equivalence to transform equations and inequalities so accurate solutions can be found to solve trades problems.

ESSENTIAL QUESTIONS

Students will keep considering…

- What are some ways to represent, describe, and analyze patterns that occur in the trades?
- Why are number and algebraic patterns important as rules of operations?

Acquisition

Students will know…

- How to discriminate between a negative number, zero, and a positive number.
- How to determine the order of a range of numbers.
- The meaning of an absolute number.
- Operations can be performed with negative numbers, positive numbers, exponents, and square roots using specific rules of operation.

Students will be skilled at…

- I can order a group of numbers.
- I can perform operations on real numbers using addition, subtraction, multiplication, and division.
- I can apply order of operations to real-world trades focused problems.
- I can apply concepts of exponents and square roots for solving practical trades problems.

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 3 test Pre-Algebra performance task should include: ● accurately set up an order of operation problem for real-life trades situations and solve accordingly ● accurately set up and solve problems that involve absolute value situations OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs:
Discovery Lab for adding positive and negative integers:
https://ideagalaxyteacher.com/teaching-adding-integers-discovery/

Absolute value activities and discovery lab:
https://ideagalaxyteacher.com/11-absolute-value-activities/

Mathematics for the Trades

- Section 6.1, Addition of Signed Numbers
  - The Meaning of signed numbers
  - Absolute values
- Section 6.2, Subtraction of Signed Numbers
  - Opposites
  - Subtraction of signed numbers
- Section 6.3, Multiplication and Division of Signed Numbers
  - Rules for multiplication and division
- Section 6.4, Exponents and Square Roots
  - Exponents
  - Order of operations with exponents
  - Square roots

Additional resources/assignments/activities:

Mathematics for the Trades - Problem Set 6

A New Algebra: Tools, Themes, Concepts (1993) Henri Picciotto, Anita Wah
http://www.mathedpage.org/new-algebra/new-algebra.html

Jeopardy Labs for Positive and Negative Numbers
https://jeopardylabs.com/play/positive-negative-numbers-7

Absolute Value Millionaire Game:
http://www.math-play.com/absolutevalue-millionaire.html

Vocabulary

Signed Numbers Absolute Value	Opposites Exponential Form	Square Roots

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 4 – ALGEBRA

<table>
<tr><th colspan="3">Desired Results</th></tr>
<tr><td rowspan="6">Priority Standards
A.SSE.1. Interpret expressions that represent a quantity in terms of its context.*
a. Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A.CED.1. Create equations and inequalities in one variable and use them to solve problems.
A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A.CED.4. Rearrange formulas (literal equations) to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V = IR to highlight resistance R.</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to…
Interpret expressions that represent a quantity in terms of its context.
Choose and produce an equivalent form of an expression
Use scientific notation
Solve word problems relating to real world situations.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>ENDURING UNDERSTANDINGS
Students will understand that…
• Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technologies.
• Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.
• Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technologies.
• Data can be analyzed to make informed decisions using a variety of strategies, tools, and technologies.
• Translate English into algebraic expressions to solve a variety of real world situations.</td><td>ESSENTIAL QUESTIONS
Students will keep considering…
• How is mathematics used to quantify, compare, represent, and model numbers?
• How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
• How are quantitative relationships represented by numbers?
• How do geometric relationships and measurements help us to solve problems and make sense of our world?
• How can collecting, organizing and displaying data help us analyze information and make reasonable and informed decisions?
• How is English translated to algebraic expressions?</td></tr>
<tr><td colspan="2">Acquisition</td></tr>
<tr><td>Students will know…
• Adding and Subtracting Algebraic Equations.
• Solving Simple Equations.
• Solving Equations Involving Two Operations.
• Solving Word Problems.
• Multiplying and Dividing Algebraic Expressions.</td><td>Students will be skilled at…
• Add, subtract, multiply and divide algebraic equations.
• Solve simple and two step operations.
• Solve word problems.
• Use scientific notation.</td></tr>
</table>

	• Scientific Notation.	

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 4 test Algebra performance task should include: ● accurately set up an equation for real-life trades situations and solve accordingly ● accurately set up and solve problems that involve two operations ● accurately translate from English to Algebra ● convert and use operations with Scientific Notation OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs: To be determined

Mathematics for the Trades

- Section 7.1, Algebraic Language and Formulas
  - Multiplication
  - Parentheses
  - Division
  - Algebraic Expressions
  - Evaluating Formulas
- Section 7.2, Adding and Subtracting Algebraic Equations
  - combining like Terms
  - Expressions with Parentheses
- Section 7.3, Solving Simple Equations
  - Solution
  - Equivalent Equations
  - Solving Equations
- Section 7.4, Solving Equations Involving Two Operations
- Section 7.5, Solving More Equations and Formulas
  - Parentheses in Equations

  - Variable on Both Sides
  - Solving Formulas
- Section 7.6, Solving Word Problems
  - Translating English to Algebra
  - Translating Sentences to Equations
  - General Word Problems
- Section 7.7, Multiplying and Dividing Algebraic Expressions
  - Multiplying Simple Factors
  - Rule for Multiplication
  - Dividing Simple Factors
  - Negative Exponents
- Section 7.8, Scientific Notation
  - Definition of Scientific Notation
  - Converting to Scientific Notation
  - Converting from Scientific Notation to Decimal Form
  - Multiplying and Dividing in Scientific Notation
  - Calculators and Scientific Notation

Additional resources/assignments/activities:

Mathematics for the Trades - Problem Set 7

Vocabulary

Algebraic expressions Formulas Combining like terms Equations	Solutions Two-step equations Multi-step equations	Solving formulas Exponent rules Scientific notation

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 5 – PRACTICAL PLANE GEOMETRY

Desired Results

Priority Standards

G.CO.1. Demonstrates understanding of key geometrical definitions, including angle, circle, perpendicular line, parallel line, line segment, and transformations in Euclidean geometry. Understand undefined notions of point, line, distance along a line, and distance around a circular arc.
G.GMD.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
G.SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
G.CO.9. Using methods of proof including direct, indirect, and counter examples to prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

Transfer

Students will be able to independently use their learning to…
Apply geometric properties and relationships to solve real-world problems and logically use reasoning to determine the relationships (informal proofs).

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Geometry is used to analyze spatial relationships and is developed by reasoning from the known to the unknown.
- A number operation can be used to find and compare the lengths of segments and the measures of angles.
- Special angle pairs can help identify geometric relationships to solve for other angles.
- Formulas can be used to find the perimeter and area of regular and irregular shapes.
- Given information, definitions, and properties can be used to justify a solution to a problem.

ESSENTIAL QUESTIONS

Students will keep considering…

- How can geometric representations and relationships apply to real-world situations?
- How is the representation of lines and angles essential to the study of the physical world?

Acquisition

Students will know…

- The types of angles formed by two lines and a transversal.
- Angle facts and classifications
- How to measure an angle (internal and external).
- The perimeter and area of a regular and irregular figures can be found using the dimensions and a formula.
- The Pythagorean Theorem is a common formula used for right triangles.

Students will be skilled at…

- I can use special angle pairs to calculate unknown angle measures.
- I can apply angle facts and definitions to calculate the measures of unknown angles.
- I can calculate the perimeter and area of regular and irregular shapes and apply this to trade situations.
- I can calculate an unknown side measure of a right triangle using the Pythagorean Theorem.

	• The circumference and area of a circle and parts of a circle can be found using the radius or diameter of a circle. • The areas and lengths can be calculated by recognizing figures can be separated into separate shapes to determine the formulas necessary.	• I can calculate the circumference and area of a circular figure and apply this to trade situations. • I can apply multiple formulas to calculate the area or a dimension of a figure.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 5 Test Geometry performance task should include: ● accurately set up formulas for real-life trades situations and solve accordingly ● accurately use the formulas for finding length, perimeter, circumference and area ● accurately use special angle pairs to calculate unknown angle measures OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs: To be determined
Discovery Lab for teaching area and circumference of a circle:
https://ideagalaxyteacher.com/teaching-area-and-circumference/

Mathematics for the Trades

- Section 8.1, Angle Measurement
  - Labeling Angles
  - Measuring Angles
  - Classifying Angles
  - Drawing Angles
  - Angle Facts
- Section 8.2, Area and Perimeter of Polygons
  - Polygons

  - Perimeter
  - Quadrilaterals
  - Rectangles
  - Squares
  - Parallelograms
  - Trapezoids
- Section 8.3, Triangles, Hexagons, and Irregular Polygons
  - Types of Triangles
  - Pythagorean Theorem
  - Area of Triangle
  - Hexagons
  - Irregular Polygons
- Section 8.4, Circle
  - Circumference
  - Parts of Circles
  - Area of Circle
  - Rings

Additional resources/assignments/activities:

Mathematics for the Trades - Problem Set 8

- Jeopardy Lab - Angle Pairs
  https://jeopardylabs.com/play/angle-pairs-review
- How to Teach Parallel Lines Cut By a Transversal Using Interactive Notebooks
  https://ideagalaxyteacher.com/parallel-lines-transversal-interactive-notebooks/

Vocabulary

Plane	Parallel Lines	Perimeter
Angle	Alternate interior angles	Pythagorean theorem
Vertex	Alternate exterior angles	Special right triangles
Sides	Polygons	3-4-5 right triangle
Minutes	Parallelogram	30-60-90 right triangle
Seconds	Rectangle	45-45-90 right triangle

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 5 – PRACTICAL PLANE GEOMETRY

Acute angles	Square	Hero's formula
Obtuse angles	Triangle	Areas of irregular polygons
Right angles	Trapezoid	Circles
Straight angles	Quadrilateral	Area of circles
Vertical angles	Hexagons	Area of rings
Adjacent angles	Area of all listed polygons	

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 6 – SOLID FIGURES

Desired Results

Priority Standards

G.GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. *For example, Solve problems requiring determination of a dimension not given.*

G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

G.MG.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Transfer

Students will be able to independently use their learning to…
Choose the correct formulas of Solid Figures to solve problems.
Solve word problems relating to real-world situations.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Solid figures are three-dimensional.
- Planes are two-dimensional.
- Pyramids and frustums of pyramids.
- Prisms.
- Cones and frustums of cones.

ESSENTIAL QUESTIONS

Students will keep considering…

- What is the difference between a solid figure and a plane?
- What does the frustum of a pyramid or cone refer to?
- What is a prism?

Acquisition

Students will know…

- Formulas can be used to find the surface area and volume for solid figures.
- Formulas can be used to find the frustum of pyramids and cones.
- How to apply the correct formula to solve a real-world situation.

Students will be skilled at…

- I can solve problems based on the shape of a solid figure.
- I can identify the correct formulas based on the cross section of a figure.
- I can understand and apply the formulas of a solid figure.

KPBSD MATH CURRICULUM

INTEGRATED MATH FOR TRADES

UNIT 6 – SOLID FIGURES

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 6 Test Solid Figures performance task should include: ● accurately set up formulas for real-life trades situations and solve accordingly ● accurately use the formulas for finding surface area and volume of Solid Figures ● accurately use formulas for finding the Frustum of a Pyramid and Cone OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs: To be determined

Mathematics for the Trades

- Section 9.1, Prisms
  - Surface Area and Volume
  - Volume Conversion
- Section 9.2, Pyramids and Frustums of Pyramids
  - Pyramids
  - Frustum of a Pyramids
- Section 9.3, Cylinders and Spheres
  - Cylinders
  - Spheres
- Section 9.4, Cones and Frustums of Cones
  - Cones
  - Frustums of Cones

Additional resources/assignments/activities:
Mathematics for the Trades - Problem Set 9

Vocabulary		
Prism	Right prism	Frustum of pyramids
Faces	Pyramid	Cylinder
Altitude	Right pyramid	Right cylinders
Surface Area	Square Pyramid	Cones
Volume	Triangular pyramid or tetrahedron	Frustum of cones
Rectangular prism	Lateral surface area	Sphere
Triangular prism	Trapezoidal prism	

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 7 – TRIANGLE TRIGONOMETRY

Desired Results

Priority Standards

G.SRT.6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.7. Explain and use the relationship between the sine and cosine of complementary angles.
G.SRT.8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Supporting Standards

G.SRT.10. Laws of Sines and Cosines and use them to solve problems.

Transfer

Students will be able to independently use their learning to…
Set up trigonometric ratios and use them to solve problems.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Trigonometric ratios help us to find unknown sides and angles.
- The Pythagorean Theorem is associated with right triangles.

ESSENTIAL QUESTIONS

Students will keep considering…

- How do you find the sine, cosine, and tangent ratios for an acute angle of a right triangle?
- What can you say about the side lengths and the trigonometric ratios associated with special right triangles?
- How do you find an unknown angle measure in a right triangle using trigonometric ratios?
- How can you use the sine ratio to find a formula for the area of a triangle?
- What is the Law of Sines, and how do you use it to solve problems?
- What is the Law of Cosines, and how do you use it to solve problems?

Acquisition

Students will know…

- Trigonometry ratios are used to find an unknown side or angle.
- Special angle pairs can help identify geometric relationships to solve for other angles.
- Formulas of special right triangles.
- Laws of Sines and Cosines.

Students will be skilled at…

- I can solve trigonometric ratios.
- I can identify the correct formulas based on the drawing of a triangle.
- I can understand and apply the formulas of a special right triangles.

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 7 – TRIANGLE TRIGONOMETRY

Evidence

Evaluative Criteria	Assessment Evidence
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 7 Test Trigonometry performance task should include: ● accurately set up a drawing and equation for real-life trades situations and solve accordingly ● accurately use the formulas for finding missing sides and angles ● accurately use special angle pairs to calculate unknown angle measures OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs: To be determined

Mathematics for the Trades

- Section 10.1, Angles and Triangles
  - Angle Measurement
  - Radian Measure
  - Sectors
  - Linear and Angular Speed
  - Right Triangles
  - Pythagorean Theorem
  - Special Right Triangles
- Section 10.2, Trigonometric Ratios
  - Sine Ratio
  - Cosine Ratio
  - Tangent Ratio
  - Finding Values of Trigonometric Functions
  - Angles in Degrees and Minutes
- Section 10.3, Solving Right Triangles
- Section 10.4, Oblique Triangles
  - Oblique Triangles
  - Law of Sines

- Law of Cosines

Additional resources/assignments/activities:
Mathematics for the Trades - Problem Set 10

Vocabulary

Trigonometry	Special right triangles	Cosine
Radian measure	3-4-5 right triangle	Tangent
Sectors	30-60-90 right triangle	Inverse trigonometric functions
Average linear speed	45-45-90 right triangle	Law of Sines
Average angular speed	Trigonometry ratios	Law of Cosines
Pythagorean Theorem	Sine	

KPBSD MATH CURRICULUM
INTEGRATED MATH FOR TRADES
UNIT 8 – ADVANCED ALGEBRA

Desired Results

Priority Standards

N.CN.7.
A.REI.4. Solve quadratic equations in one variable.
A.REI.5. Show that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
A.REI.6. Solve systems of linear equations exactly and approximately, e.g., with graphs or algebraically, focusing on pairs of linear equations in two variables.
A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing cost constraints in various situations.

Transfer

Students will be able to independently use their learning to…
Solve quadratic equations in one variable.
solve a system of equation using the most efficient method.

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…
- Quadratics can be written in multiple equivalent ways.
- The most efficient method for solving a system of equations.

ESSENTIAL QUESTIONS

Students will keep considering…
- Why is it advantageous to use and solve quadratics algebraically for real-world problems?
- How do I find an exact or approximate solution to systems of linear equations?
- How does representing functions graphically help me solve a system of equations?
- How does writing equivalent equations help me solve a system of equations?

Acquisition

Students will know…
- Functions can be represented graphically.
- Equivalent equations help us to solve a system of equations.
- Equivalent equations help us solve real world problems.

Students will be skilled at…
- I can write equivalent equations.
- I can graph to solve equations.

Evidence

Evaluative Criteria	**Assessment Evidence**
Rubrics Course Assignments Performance Tasks Teacher made assessments Observation Journals and Self-Reflection Technology-Based Assessments Other…	PERFORMANCE TASK(S): Unit 8 Test Advanced Algebra performance task should include: ● accurately set up two equations for real-life trades situations and solve accordingly ● accurately use substitution and elimination to solve a system ● accurately use Quadratic Formula to solve any system OTHER EVIDENCE: Formative assessments, labs, quizzes

Learning Plan

Labs: To be determined

Mathematics for the Trades

- Section 11.1, Systems of Equations
  - Solution by Substitution
  - Dependent and Inconsistent Systems
  - Solution by Elimination
  - Multiplication with the Elimination Method
  - Multiplying Both Equations
- Section 11.2, Quadratic Equations
  - Standard Form
  - Solutions to Quadratic Equations
  - Quadratic Formula

Additional resources/assignments/activities:
Mathematics for the Trades - Problem Set 11

Vocabulary		
Trigonometry Radian measure Sectors Average linear speed Average angular speed Pythagorean Theorem	Special right triangles 3-4-5 right triangle 30-60-90 right triangle 45-45-90 right triangle Trigonometry ratios Sine	Cosine Tangent Inverse trigonometric functions Law of Sines Law of Cosines