

KPBSD 2019-2020 Seventh Grade Mathematics Pacing Guide

| Quarter 1 | |
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| Module 1: Rational Numbers | Module 2: Expressions and Equations |
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| 7.NS.3 | 7.EE.3 |
| | 7.EE.4 |
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| | 7.SP.7 |
| | 7.SP.8 |
| | |

Yellow indicates the committee identified this standard as a Priority Standard and it is included on the District Benchmark Assessment

KPBSD MATH CURRICULUM

7TH GRADE

UNIT 1 – RATIONAL NUMBERS

Desired Results

| Desired Results | | | | | |
|--|--|--------------------------------|----------------------------|--|--|
| <p style="text-align: center;">Priority Standards</p> <p>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.</p> <p>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.</p> <p style="text-align: center;">Supporting Standards</p> <p>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.)</p> | Transfer | | | | |
| | <p>Students will be able to independently use their learning to...</p> <p>Apply the properties of integers to model situations and to apply the order of operations to rational numbers.</p> | | | | |
| | Meaning | | | | |
| | <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%; text-align: center;">ENDURING UNDERSTANDINGS</th> <th style="width: 50%; text-align: center;">ESSENTIAL QUESTIONS</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> <p>Students will understand that...</p> <ul style="list-style-type: none"> • 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 style="vertical-align: top;"> <p>Students will keep considering...</p> <ul style="list-style-type: none"> • 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> </tbody> </table> | ENDURING UNDERSTANDINGS | ESSENTIAL QUESTIONS | <p>Students will understand that...</p> <ul style="list-style-type: none"> • 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. | <p>Students will keep considering...</p> <ul style="list-style-type: none"> • 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? |
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KPBSD MATH CURRICULUM
7TH GRADE
UNIT 1 – RATIONAL NUMBERS

| Acquisition | |
|--------------------|--|
| | <p>Students will know...</p> <ul style="list-style-type: none"> • 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. |
| | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • 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. |

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UNIT 1 – RATIONAL NUMBERS

Evidence

| Evaluative Criteria | Assessment Evidence |
|---------------------|--|
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none">• Difference of Integers<ul style="list-style-type: none">○ 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<ul style="list-style-type: none">○ 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<ul style="list-style-type: none">○ 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<ul style="list-style-type: none">○ In this task, students must analyze the results of a survey in order to plan a school trip.• Taxi Cabs<ul style="list-style-type: none">○ In this task, students must use math to find the best way to organize cabs for a large group of people.• Cat Food<ul style="list-style-type: none">○ 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<ul style="list-style-type: none">○ When students calculate $100 \div 6$ using a calculator, the result is 16.666667 In this task, students will look at problems in which the answer might be $100 \div 6$. Students must decide whether this is true, and what would be a sensible answer to write down. |

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UNIT 1 – RATIONAL NUMBERS

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.

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UNIT 1 – RATIONAL NUMBERS

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

| Desired Results | | | | | |
|---|---|--------------------------------|----------------------------|--|---|
| <p style="text-align: center;">Priority Standards</p> <p>7.EE.1. Apply properties of operations as strategies to add, subtract, factor, expand, and simplify linear expressions with rational coefficients.</p> <p>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.</p> <p>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.</p> <p style="text-align: center;">Supporting Standards</p> <p>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.</p> | Transfer | | | | |
| | <p>Students will be able to independently use their learning to...</p> <p>Use properties of operations to generate equivalent expressions and solve real-world and mathematical problems using numerical and algebraic expressions and equations.</p> | | | | |
| | Meaning | | | | |
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UNIT 2 – EXPRESSIONS AND EQUATIONS

| Acquisition | |
|---------------------|--|
| | <p>Students will know...</p> <ul style="list-style-type: none"> • 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. |
| | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • 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 |
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> • Equivalent Expressions? <ul style="list-style-type: none"> ○ 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 |

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UNIT 2 – EXPRESSIONS AND EQUATIONS

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

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UNIT 2 – EXPRESSIONS AND EQUATIONS

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.

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UNIT 2 – EXPRESSIONS AND EQUATIONS

Vocabulary

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

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UNIT 3 – RATIOS AND PROPORTIONAL RELATIONSHIPS

Desired Results

| Priority Standards | Transfer | |
|---|---|--|
| <p>7.RP.2. Recognize and represent proportional relationships between quantities. Make basic inferences or logical predictions from proportional relationships.</p> <p>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).</p> <p>b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships in real-world situations.</p> <p>c. Represent proportional relationships by equations and multiple representations such as tables, graphs, diagrams, sequences, and contextual situations. <i>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 $t = pn$.</i></p> <p>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.</p> | <p>Students will be able to independently use their learning to...</p> <p>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.</p> | |
| | Meaning | |
| | <p>ENDURING UNDERSTANDINGS</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> • 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. | <p>ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> • 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? |

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UNIT 3 – RATIOS AND PROPORTIONAL RELATIONSHIPS

| | | |
|--|---|--|
| <p>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.</p> | Acquisition | |
| <p style="text-align: center;">Supporting Standards</p> <p>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. <i>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.</i></p> | <p>Students will know...</p> <ul style="list-style-type: none"> • 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. | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • I can use ratios to compute unit rates in like or different units to solve problems. <i>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.</i> • 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. |

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UNIT 3 – RATIOS AND PROPORTIONAL RELATIONSHIPS

Evidence

| Evaluative Criteria | Assessment Evidence |
|---------------------|--|
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> • Photographs <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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. |

KPBSD MATH CURRICULUM

7th GRADE

UNIT 3 – RATIOS AND PROPORTIONAL RELATIONSHIPS

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, $\text{distance}=\text{rate}\times\text{time}$. 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

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UNIT 4 – PERCENTS

| Desired Results | | |
|---|--|--|
| <p>Priority Standards</p> <p>7.RP.3. Use proportional relationships to solve multi-step ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i></p> <p>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. <i>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.</i></p> | Transfer | |
| | <p>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.</p> | |
| | Meaning | |
| | ENDURING UNDERSTANDINGS | ESSENTIAL QUESTIONS |
| | <p>Students will understand that...</p> <ul style="list-style-type: none"> • 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. | <p>Students will keep considering...</p> <ul style="list-style-type: none"> • 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 | | |
| <p>Students will know...</p> <ul style="list-style-type: none"> • The use of proportional relationships is also extended to solve percent problems. • Appropriate ways to convert between numerical forms. | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • 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. | |

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UNIT 4 – PERCENTS

Evidence

| Evaluative Criteria | Assessment Evidence |
|---------------------|---|
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> • Gotham City Taxis <ul style="list-style-type: none"> ○ 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? <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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! <ul style="list-style-type: none"> ○ In this task, students use mathematics to decide which special offers give the biggest and smallest price reductions. • T Shirt Sale <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ 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

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UNIT 4 – PERCENTS

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 $170 \times 4,500$, 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 1.25 (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 $600 \div 1.2$, or $6,000 \div 12$, to arrive at an estimate of \$500.*

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7th GRADE
UNIT 4 – PERCENTS

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 | | | | | | | | | | | | | |
|--|--|-----------------|--|--|--|----------------|--|--|--|--------------------|--|---|---|
| <p style="text-align: center;">Priority Standards</p> <p>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.</p> <p>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.</p> <p style="text-align: center;">Supporting Standards</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="background-color: #e0e0e0; text-align: center;">Transfer</th> </tr> <tr> <td colspan="2">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.</td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0; text-align: center;">Meaning</th> </tr> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p style="text-align: center;">ENDURING UNDERSTANDINGS</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> The relationships that exist between geometrical figures. Procedures can be employed to describe, measure, construct, and draw geometrical figures. </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p style="text-align: center;">ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> 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? </td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0; text-align: center;">Acquisition</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;"> <p>Students will know...</p> <ul style="list-style-type: none"> 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 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. </td> <td style="vertical-align: top; padding: 5px;"> <p>Students will be skilled at...</p> <ul style="list-style-type: none"> 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 </td> </tr> </table> | 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 | | <p style="text-align: center;">ENDURING UNDERSTANDINGS</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> The relationships that exist between geometrical figures. Procedures can be employed to describe, measure, construct, and draw geometrical figures. | <p style="text-align: center;">ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> 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 | | <p>Students will know...</p> <ul style="list-style-type: none"> 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 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. | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> 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 |
| 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 | | | | | | | | | | | | | |
| <p style="text-align: center;">ENDURING UNDERSTANDINGS</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> The relationships that exist between geometrical figures. Procedures can be employed to describe, measure, construct, and draw geometrical figures. | <p style="text-align: center;">ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> 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 | | | | | | | | | | | | | |
| <p>Students will know...</p> <ul style="list-style-type: none"> 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 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. | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> 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 | | | | | | | | | | | | |

KPBSD MATH CURRICULUM
7th GRADE
UNIT 5 – GEOMETRY

| | | |
|--|---|--|
| | <ul style="list-style-type: none"> • 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. | <p>triangle, more than one triangle or no triangle using appropriate tools (freehand, rulers, protractors, and technology).</p> <ul style="list-style-type: none"> • 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 |
|----------------------------|---|
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> • The Geometry of Letters <ul style="list-style-type: none"> ○ 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? <ul style="list-style-type: none"> ○ 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 <ul style="list-style-type: none"> ○ How many different triangles can students make that follow a set of rules? • Historic Bicycle <ul style="list-style-type: none"> ○ In this task, students will figure out some problems about a strange old bicycle. • Pizza Crusts <ul style="list-style-type: none"> ○ 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. |

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UNIT 5 – GEOMETRY

- [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.
- [Funsized 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.

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UNIT 5 – GEOMETRY

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

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UNIT 5 – GEOMETRY

- 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

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UNIT 6 – STATISTICS AND PROBABILITY

| Desired Results | | |
|--|---|---|
| <p style="text-align: center;">Priority Standards</p> <p>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. <i>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.</i></p> <p>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. <i>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.</i></p> <p>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. <i>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.</i></p> <p>7.SP.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</p> <p style="padding-left: 20px;">a. Understand that, just as with simple events, the probability of a compound event is the fraction</p> | Transfer | |
| | <p>Students will be able to independently use their learning to...</p> <p>Interpret probabilities, compute probabilities in simple settings, and estimate probabilities empirically and compare data distributions of two or more populations.</p> | |
| | Meaning | |
| | <p style="text-align: center;">ENDURING UNDERSTANDINGS</p> <p>Students will understand that...</p> <ul style="list-style-type: none"> • 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. | <p style="text-align: center;">ESSENTIAL QUESTIONS</p> <p>Students will keep considering...</p> <ul style="list-style-type: none"> • 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? |
| | Acquisition | |
| <p>Students will know...</p> <ul style="list-style-type: none"> • 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, | <p>Students will be skilled at...</p> <ul style="list-style-type: none"> • 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. | |

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UNIT 6 – STATISTICS AND PROBABILITY

- 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 $\frac{1}{2}$ 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.

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| <p>frequency, and predict the approximate relative frequency given the probability. <i>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.</i></p> <p>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.</p> <p>a. Design a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>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.</i></p> <p>b. Design a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>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></p> | | <ul style="list-style-type: none"> I can choose the appropriate method such as organized lists, tables and tree diagrams to represent sample spaces for compound events. |
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Evidence

| Evaluative Criteria | Assessment Evidence |
|---------------------|---|
| | <p>PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> Baseball Players <ul style="list-style-type: none"> Students will use knowledge of mean, median, mode, and range to calculate problems about baseball players. Ducklings <ul style="list-style-type: none"> 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 |

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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](#)

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- 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.

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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