7th Grade Mathematics
Units of Instruction
2021-2022

Revised Curriculum

7th Grade Mathematics

UNIT 1:Solving Area and Volume Problems with Fractions 5 Weeks	UNIT 2: Problem Solving with positive and negative rational numbers 4 Weeks	UNIT 3: Pi, Scale Drawings, and proportional relationships 6 Weeks	UNIT 4: Proportional and nonproportional relationships 5 Weeks	UNIT 5: Proportional relationships: Percents 5 Weeks	UNIT 6: Proportional relationships and statistics: Random Sampling 5 Weeks	UNIT 7: Angles and Equations 3 Weeks	Unit 8: Probability 3 Weeks
7.NS.3 **7.NS.1** **7.NS.2** **7.G.6 (rectangular)** 7.EE.1 7.EE.2	**7.NS.3** **7.EE.3** 7.NS.1 7.RP.1 7.EE.1 7.EE.2	**7.RP.2** **7.G.1** **7.G.6 (circular)** ***7.EE.4 (only y = kx)*** 7.RP.1 7.G.4 7.EE.2	**7.RP.2** **7.EE.4** ***7.NS.1*** ***7.NS.2*** 7.RP.1 7.RP.2 7.EE.2	***7.RP.2*** **7.RP.3** **7.EE.3** ***7.NS.2*** 7.RP.1 7.EE.2	**7.RP.2** **7.SP.2** **7.SP.4** 7.RP.1 7.SP.0 7.SP.1 7.SP.3	**7.EE.4** 7.G.2 7.G.5	**7.SP.5** ***7.NS.2*** **7.SP.8** 7.SP.6 7.SP.7
***Fluency Standards (taught all year long): 7.NS.1, 7.NS.2**							

Priority Standards: 7.RP.2, 7.RP.3, 7.NS.1, 7.NS.2, 7.NS.3, 7.EE.3, 7.EE.4, 7.SP.2, 7.SP.5, 7.SP.8, 7.G.1, 7.G.6, 7.SP.4

7th Grade Mathematics

Unit 1: Solving Area and Volume Problems with Fractions

Grade 7 Mathematics
Unit 1: Solving Area and Volume Problems with Fractions

In this unit, students extend their understanding and strategies of operations with fractions. They consider area and volume as a context to visualize multiplication and division and as a problem solving setting. They write, interpret and evaluate expressions related to area and volume. Note: because this unit is focused on area and volume, students will focus on operations with positive rational numbers. In the next unit, they will expand their strategies and models to positive and negative values. Also, students will concentrate on the area and volume of rectangular figures only in this unit (6.G.6), as they will focus on circles and circular bases in Unit 3.

Duration: 25 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.1 Apply and extend previous understandings of addition and subtraction to**	a. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. b. The sum of numbers is a directional movement from one number to another for a specified amount of spaces on the number line. The sum of opposites is 0 due to the fact that opposites have equivalent absolute values. c. Subtracting a positive number is the same as adding the positive number's opposite.

add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **a. Describe situations in which opposite quantities combine to make 0.** **b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.** **c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.** **d. Apply properties of operations as strategies to add and subtract rational numbers.** MP.2, MP.4, MP.7	**KY.6.NS.5** **KY.6.NS.6** **Coherence KY.6.NS.7→ KY.7.NS.1**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.** **a. Understand that multiplication is extended**	a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative numbers are connected to properties for the operations, rather than to think of them as arbitrary rules. They explain 4 times (-3) could be four days of golfing 3 under par and therefore, having an overall score of -12. The remaining operations are based on applying properties. b. Emphasis is on the equivalence relationship provided by the movement of one negative sign among the numerator, denominator, or in front of the entire fraction. **Coherence KY.6.NS.1→ KY.7.NS.2 → KY.8.NS.1**

from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. **b. Understand that integers can be divided, provided that the divisor is not zero and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts.** **c. Apply properties of operations as strategies to multiply and divide rational numbers.** MP.2, MP.7, MP.8	
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.** MP.1, MP.2, MP.5	Emphasis is on applying mathematical operations to rational numbers that occur in real world context. **Coherence KY.6.NS.3 → KY.7.NS.3**
Cluster: Solve real-life and mathematical	a. Emphasis is on finding the area of composite figures

problems involving angle measure, area, surface area and volume. **KY.7.G.6 Solve problems involving area of two-dimensional objects and surface area and volume of three-dimensional objects.** **a. Solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals and other polygons.** **b. Solve real-world and mathematical problems involving volume and surface area, using nets as needed, of three-dimensional objects including cubes, pyramids and right prisms.** MP.3, MP.4, MP.5	composed of convex polygons. b. Students understand volume and surface area are two different quantities used to describe the same three-dimensional figure. Building upon their understanding of area, students use nets of three dimensional objects to conceptualize surface area. Students calculate with appropriate units, using nets as a possible strategy for calculation as well as formulas for volume and surface area, where appropriate. **KY.6.G.1** **KY.6.G.2** **Coherence KY.6.G.4→ KY.7.G.6 → KY.8.G.6**
Supporting Standards	
Standards	**Clarifications**
Cluster: Use properties of operations to generate equivalent expressions. **KY.7.EE.1 Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.** MP.2, MP.3	Students demonstrate understanding of applying the order of operations to an expression involving multiple operations, including using the distributive property and variables in the expression. Students apply the properties of commutative, associative and distributive fluently. **Coherence KY.6.EE.3 → KY.7.EE.1 → KY.8.EE.7**
Cluster: Use properties of operations to generate equivalent expressions.	Students apply mathematical properties in order to rewrite expressions and clarify the relationship of quantities in a problem.

KY.7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related. MP.7, MP.8	For Example: If Tom and Jim both get paid a wage of $11 per hour, but Tom was paid an additional $55 for overtime, the expression $11(T + J) + 55$ may be more clearly interpreted as $11T + 55 + 11J$ for purposes of understanding Tom's pay separated from Jim's pay**.** **Coherence KY.6.EE.4 → KY.7.EE.2 → KY.8.EE.8c**

7th Grade Mathematics

Unit 2: Problem Solving with Positive and Negative Rational Numbers

7th Grade Mathematics
Unit 2: Problem Solving with Positive and Negative Rational Numbers

This unit extends students' understanding of and strategies for operations with positive and negative rational numbers. They write, interpret, and evaluate expressions involving unknowns and rational numbers. They use number lines as a primary model for making sense of concrete situations, especially when focused on addition and subtraction of negative rational numbers.

Duration: 20 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.** MP.1, MP.2, MP.5	Emphasis is on applying mathematical operations to rational numbers that occur in real world context. **Coherence KY.6.NS.3 → KY.7.NS.3**

Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **KY.7.EE.3 Solve real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.** MP.1, MP.4, MP.6	Students solve multi-step real-world and mathematical problems containing integers, fractions and decimals, using previously acquired skills around converting fractions, decimals and percentages and use properties of operations to find equivalent forms of expressions when needed. Students solidify understanding by checking their solutions for reasonableness using estimation strategies such as rounding, compatible numbers and benchmark numbers. **Coherence KY.7.EE.3 →KY.8.EE.4**
Supporting Standards	
Standards	**Clarifications**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.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.**	a. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. b. The sum of numbers is a directional movement from one number to another for a specified amount of spaces on the number line. The sum of opposites is 0 due to the fact that opposites have equivalent absolute values. c. Subtracting a positive number is the same as adding the positive number's opposite. **KY.6.NS.5** **KY.6.NS.6**

a. Describe situations in which opposite quantities combine to make 0. **b. Understand p + q as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.** **c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.** **d. Apply properties of operations as strategies to add and subtract rational numbers.** MP.2, MP.4, MP.7	**Coherence KY.6.NS.7→ KY.7.NS.1**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.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.** **MP.2, MP.6**	For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour. **KY.6.RP.2** **Coherence KY.6.RP.3→ KY.7.RP.1**
Cluster: Use properties of operations to generate equivalent expressions.	Students demonstrate understanding of applying the order of operations to an expression involving multiple

KY.7.EE.1 Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients. MP.2, MP.3	operations, including using the distributive property and variables in the expression. Students apply the properties of commutative, associative and distributive fluently. **Coherence KY.6.EE.3 → KY.7.EE.1 → KY.8.EE.7**
Cluster: Use properties of operations to generate equivalent expressions. **KY.7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.** MP.7, MP.8	Students apply mathematical properties in order to rewrite expressions and clarify the relationship of quantities in a problem. For Example: If Tom and Jim both get paid a wage of $11 per hour, but Tom was paid an additional $55 for overtime, the expression $11(T + J) + 55$ may be more clearly interpreted as $11T + 55 + 11J$ for purposes of understanding Tom's pay separated from Jim's pay**.** **Coherence KY.6.EE.4 → KY.7.EE.2 → KY.8.EE.8c**

7th Grade Mathematics

Unit 3: Pi, Scale Drawing, and Proportional Relationships

7th Grade Mathematics
Unit 3: Pi, Scale Drawings, and Proportional Relationships

In this unit, students consider figures that are scales of each other. They explore circles and conclude that all circles are scalar and that the ratio of the diameter to the circumference of any circle is a constant (pi). They use pi to determine area and circumference of circles and volumes of solids with circular bases. After this informal and specific case, students begin to understand proportional relationships, a concept that they will formalize and deepen across the course of the year.

Duration: 30 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.2 Recognize and represent proportional relationships between quantities.** **a. Decide whether two quantities represent a proportional relationship.** **b. Identify the constant of proportionality (unit**	Students test 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. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. **KY.8.F.2** **KY.8.F.4** **Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6**

rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships. **c. Represent proportional relationships by equations.** **d. 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.** MP.1, MP.2, MP.3	c. 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. **Coherence KY.7.RP.2c → KY.8.EE.5** d. Students describe points (x, y) in terms of the labels of the x- and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities. **Coherence KY.7.RP.2d → KY.8.F.5**
Cluster: Draw, construct and describe geometrical figures and describe the relationships between them. **KY.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.** MP.1, MP.2, MP.5	Emphasis is on being able to convert values from one given measurement to another based on a given scale factor. For example, 1 inch on the scale drawing equals how many feet in real life based on the scale factor given. Students reproduce a given drawing based on a scale factor. **Coherence KY.6.G.1→KY.7.G.1→KY.8.EE.6**
Cluster: Solve real-life and mathematical problems involving angle measure, area, surface area and volume. **KY.7.G.6 Solve problems involving area of two-dimensional objects and surface area and**	a. Emphasis is on finding the area of composite figures composed of convex polygons. b. Students understand volume and surface area are two different quantities used to describe the same three-dimensional figure. Building upon their understanding of area, students use nets of three

volume of three-dimensional objects. **a. Solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles, quadrilaterals and other polygons.** **b. Solve real-world and mathematical problems involving volume and surface area, using nets as needed, of three-dimensional objects including cubes, pyramids and right prisms.** MP.3, MP.4, MP.5	dimensional objects to conceptualize surface area. Students calculate with appropriate units, using nets as a possible strategy for calculation as well as formulas for volume and surface area, where appropriate. **KY.6.G.1** **KY.6.G.2** **Coherence KY.6.G.4→ KY.7.G.6 → KY.8.G.6**
Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **KY.7.EE.4 Use variables to represent quantities in a real-world or mathematical problem and construct equations and inequalities to solve problems by reasoning about the quantities.** **a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q and r are specific rational numbers. Solve equations of these forms. Graph the solution set of the equality and interpret it in context of the problem.** **b. Solve word problems leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \geq r$, $px + q \leq r$; where p, q and r are specific rational numbers. Graph the solution set of the inequality and interpret it in context of the problem.** MP.2, MP.4	a. Interpret word problems in the form of the initial value as a one-time occurrence within the problem and the coefficient as the recurring event within the problem. **Coherence KY.6.EE.7 → KY.7.EE.4 → KY.8.EE.7** b. Interpret word problems having one or more solutions that satisfy the conditions of the problem. Graph on a number line the solution set that satisfies the conditions of the problems. **Coherence KY.6.EE.8 → KY.7.EE.4**

Supporting Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.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.** **MP.2, MP.6**	For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour. **KY.6.RP.2** **Coherence KY.6.RP.3→ KY.7.RP.1**
Cluster: Solve real-life and mathematical problems involving angle measure, area, surface area and volume. **KY.7.G.4 Use formulas for area and circumference of circles and their relationships.** **a. Apply the formulas for the area and circumference of a circle to solve real-world and mathematical problems.** **b. Explore and understand the relationship between the radius, diameter, circumference and area of a circle.** MP.1, MP.2, MP.8	Circle Formulas: C=(pi)d A=(pi)r^2 Note: Calculating the radius or diameter of a circle given its area is not expected, as finding the square root of a number is reserved for 8th grade. a. Both area and circumference are represented; students recognize when circumference is needed and when area is needed. b. Emphasis is on calculating area given diameter; finding circumference given radius or diameter; and finding radius or diameter given circumference. Special attention given to the relationship between diameter and circumference as a ratio that leads to pi. **Coherence KY.7.G.4 → KY.8.G.9**

Cluster: Use properties of operations to generate equivalent expressions. **KY.7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.** MP.7, MP.8	Students apply mathematical properties in order to rewrite expressions and clarify the relationship of quantities in a problem. For Example: If Tom and Jim both get paid a wage of $11 per hour, but Tom was paid an additional $55 for overtime, the expression $11(T + J) + 55$ may be more clearly interpreted as $11T + 55 + 11J$ for purposes of understanding Tom's pay separated from Jim's pay**.** **Coherence KY.6.EE.4 → KY.7.EE.2 → KY.8.EE.8c**

7th Grade Mathematics

Unit 4: Proportional and Nonproportional Relationships

7th Grade Mathematics

Unit 4: Proportional and Nonproportional Relationships

This unit builds on the previous unit's concepts of scale drawing and equivalent ratios. Students formalize their definitions and models of proportional relationships, applying what they have learned about geometric cases to other situations. They use their conceptual understanding to write and interpret equations, tables of values, and descriptions of proportional relationships. They distinguish between proportional and nonproportional relationships, and solve problems involving each. Note, in this unit, students will encounter and solve equations in the form y = kx and y = kx +/- c. They will extend their strategies for solving to more complex forms in later units.

Duration: 25 days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.2 Recognize and represent proportional relationships between quantities.** **a. Decide whether two quantities represent a**	Students test 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. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. **KY.8.F.2**

proportional relationship. **b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships.** **c. Represent proportional relationships by equations.** **d. 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.** MP.1, MP.2, MP.3	**KY.8.F.4** **Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6** c. 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. **Coherence KY.7.RP.2c → KY.8.EE.5** d. Students describe points (x, y) in terms of the labels of the x- and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities. **Coherence KY.7.RP.2d → KY.8.F.5**
Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **KY.7.EE.4 Use variables to represent quantities in a real-world or mathematical problem and construct equations and inequalities to solve problems by reasoning about the quantities.** **a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q and r are specific rational numbers. Solve equations of these forms. Graph the solution set of the equality and interpret it in context of the problem.** **b. Solve word problems leading to inequalities of the form $px + q > r$, $px + q < r$, $px + q \geq r$, $px + q \leq r$; where p,**	a. Interpret word problems in the form of the initial value as a one-time occurrence within the problem and the coefficient as the recurring event within the problem. **Coherence KY.6.EE.7 → KY.7.EE.4 → KY.8.EE.7** b. Interpret word problems having one or more solutions that satisfy the conditions of the problem. Graph on a number line the solution set that satisfies the conditions of the problems. **Coherence KY.6.EE.8 → KY.7.EE.4**

q and r are specific rational numbers. Graph the solution set of the inequality and interpret it in context of the problem. MP.2, MP.4	
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.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.** **a. Describe situations in which opposite quantities combine to make 0.** **b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.** **c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (– q). Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts.** **d. Apply properties of operations as strategies to**	a. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. b. The sum of numbers is a directional movement from one number to another for a specified amount of spaces on the number line. The sum of opposites is 0 due to the fact that opposites have equivalent absolute values. c. Subtracting a positive number is the same as adding the positive number's opposite. **KY.6.NS.5** **KY.6.NS.6** **Coherence KY.6.NS.7→ KY.7.NS.1**

add and subtract rational numbers. MP.2, MP.4, MP.7	
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.** **a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules** **for multiplying signed numbers. Interpret products of rational** **numbers by describing real-world contexts.** **b. Understand that integers can be divided, provided that the** **divisor is not zero and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts.** **c. Apply properties of operations as strategies to multiply and divide rational numbers.** MP.2, MP.7, MP.8	a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative numbers are connected to properties for the operations, rather than to think of them as arbitrary rules. They explain 4 times (-3) could be four days of golfing 3 under par and therefore, having an overall score of -12. The remaining operations are based on applying properties. b. Emphasis is on the equivalence relationship provided by the movement of one negative sign among the numerator, denominator, or in front of the entire fraction. **Coherence KY.6.NS.1→ KY.7.NS.2 → KY.8.NS.1**

Supporting Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.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.** **MP.2, MP.6**	For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour. **KY.6.RP.2** **Coherence KY.6.RP.3→ KY.7.RP.1**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.2 Recognize and represent proportional relationships between quantities.** **a. Decide whether two quantities represent a proportional relationship.** **b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships.** **c. Represent proportional relationships by equations.** **d. 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.**	Students test 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. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. **KY.8.F.2** **KY.8.F.4** **Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6** c. 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. **Coherence KY.7.RP.2c → KY.8.EE.5**

MP.1, MP.2, MP.3	d. Students describe points (x, y) in terms of the labels of the x- and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities. **Coherence KY.7.RP.2d → KY.8.F.5**
Cluster: Use properties of operations to generate equivalent expressions. **KY.7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.** MP.7, MP.8	Students apply mathematical properties in order to rewrite expressions and clarify the relationship of quantities in a problem. For Example: If Tom and Jim both get paid a wage of $11 per hour, but Tom was paid an additional $55 for overtime, the expression $11(T + J) + 55$ may be more clearly interpreted as $11T + 55 + 11J$ for purposes of understanding Tom's pay separated from Jim's pay**.** **Coherence KY.6.EE.4 → KY.7.EE.2 → KY.8.EE.8c**

Unit 5: Proportional Relationships: Percents

7th Grade Mathematics
Unit 5: Proportional Relationships: Percents

This unit builds on the students' understanding of proportional relationships in the previous units to work with percents. They translate between decimals and percents and use both in expressions and equations. They use many strategies to evaluate percent expressions and solve problems.

Duration: 25 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.2 Recognize and represent proportional relationships between quantities.** **a. Decide whether two quantities represent a proportional relationship.** **b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships.**	Students test 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. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. **KY.8.F.2** **KY.8.F.4** **Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6** c. If total cost t is proportional to the number n of items

c. Represent proportional relationships by equations. **d. 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.** MP.1, MP.2, MP.3	purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$. **Coherence KY.7.RP.2c → KY.8.EE.5** d. Students describe points (x, y) in terms of the labels of the x- and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities. **Coherence KY.7.RP.2d → KY.8.F.5**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.3 Use percents to solve mathematical and real-world problems. a. Find a percent of a quantity as a rate per 100; solve problems involving finding the whole, a part and a percent, given two of these.** **b. Use proportional relationships to solve multistep ratio and percent problems.** MP.5, MP.6	
Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **KY.7.EE.3 Solve real-life and mathematical**	Students solve multi-step real-world and mathematical problems containing integers, fractions and decimals, using previously acquired skills around converting fractions, decimals and percentages and use properties of operations to find equivalent forms of expressions

problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. MP.1, MP.4, MP.6	when needed. Students solidify understanding by checking their solutions for reasonableness using estimation strategies such as rounding, compatible numbers and benchmark numbers. **Coherence KY.7.EE.3 →KY.8.EE.4**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.** **a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules** **for multiplying signed numbers. Interpret products of rational** **numbers by describing real-world contexts.** **b. Understand that integers can be divided, provided that the** **divisor is not zero and every quotient of integers (with non-zero divisor) is a rational number. If p**	a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative numbers are connected to properties for the operations, rather than to think of them as arbitrary rules. They explain 4 times (-3) could be four days of golfing 3 under par and therefore, having an overall score of -12. The remaining operations are based on applying properties. b. Emphasis is on the equivalence relationship provided by the movement of one negative sign among the numerator, denominator, or in front of the entire fraction. **Coherence KY.6.NS.1→ KY.7.NS.2 → KY.8.NS.1**

and q are integers, then –(p/q) = (–p)/q = p/(–q). **Interpret quotients of rational numbers by describing real-world contexts.** **c. Apply properties of operations as strategies to multiply and divide rational numbers.** MP.2, MP.7, MP.8	
Supporting Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.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.** **MP.2, MP.6**	For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour. **KY.6.RP.2** **Coherence KY.6.RP.3→ KY.7.RP.1**
Cluster: Use properties of operations to generate equivalent expressions. **KY.7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related.** MP.7, MP.8	Students apply mathematical properties in order to rewrite expressions and clarify the relationship of quantities in a problem. For Example: If Tom and Jim both get paid a wage of $11 per hour, but Tom was paid an additional $55 for overtime, the expression $11(T + J) + 55$ may be more clearly interpreted as $11T + 55 + 11J$ for purposes of understanding Tom's pay separated from Jim's pay**.**

	Coherence KY.6.EE.4 → KY.7.EE.2 → KY.8.EE.8c

7th Grade Mathematics

Unit 6: Proportional Relationships: Statistics and Random Sampling

7th Grade Mathematics
Unit 6: Proportional Relationships: Statistics and Random Sampling

This unit builds students' understanding of proportional relationships to deepen their understanding of statistical questions and processes. They understand that statisticians use proportional reasoning to draw conclusions about a population based on a sample. They create and interpret different data representations to analyze and compare distributions.

Duration: 25 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.7.RP.2 Recognize and represent proportional relationships between quantities.** **a. Decide whether two quantities represent a proportional relationship.** **b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and**	Students test 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. Students understand finding the unit rate in a table or graph is equivalent to the constant of proportionality in an equation or verbal description. **KY.8.F.2** **KY.8.F.4** **Coherence KY.6.RP.3a →KY.7.RP.2b →KY.8.EE.6**

verbal descriptions of proportional relationships. **c. Represent proportional relationships by equations.** **d. 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.** MP.1, MP.2, MP.3	c. 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. **Coherence KY.7.RP.2c → KY.8.EE.5** d. Students describe points (x, y) in terms of the labels of the x- and y-axes; students understand in a proportional relationship (0, 0) is a valid point and (1, r) represents the unit rate and the constant of proportionality for the relationship between the quantities. **Coherence KY.7.RP.2d → KY.8.F.5**
Cluster: Use random sampling to draw inferences about a population. **KY.7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest.** **a. Generate multiple samples of categorical data of the same size to gauge the variation in estimates or predictions.** **b. Generate multiple samples (or simulated samples) of numerical data to gauge the variation in estimates or predictions.** **c. Gauge how far off an estimate or prediction might be related to a population character of interest.** MP.2, MP.3, MP.7	Emphasis is on the sample size and how this affects the validity of the estimate or prediction. Examples: a. Randomly sample 6th, 7th and 8th graders about who their favorite superhero is to generate samples of data that are roughly the same size, looking specifically at patterns, if any. b. 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. **Coherence KY.6.SP.0→ 7.SP.2→ KY.HS.SP.12**

Cluster: Draw informal comparative inferences about two populations. **KY.7.SP.4 Calculate and use measures of center (mean and median) and measures of variability (interquartile range when comparing medians and mean absolute deviation when comparing means) for numerical data from random samples to draw informal comparative inferences about two populations.** MP.2, MP.5, MP.7	For example, decide whether the words in a chapter of a grade seven science book are generally longer than the words in a chapter of a grade four science book. **KY.HS.SP.10** **Coherence KY.6.SP.2→KY.7.SP.4→KY.HS.SP.13**
Supporting Standards	
Standards	**Clarifications**
Cluster: Analyze proportional relationships and use them to solve real-world and mathematical problems. **KY.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.** **MP.2, MP.6**	For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour. **KY.6.RP.2** **Coherence KY.6.RP.3→ KY.7.RP.1**
Cluster: Use random sampling to draw inferences about a population. **KY.7.SP.0 Create displays, including circle graphs (pie charts), scaled pictographs and bar graphs, to**	Students have been introduced to pictographs and bar graphs in grades 2 and 3; Circle graphs are new and connect to the grade 7 focus on percents. Also, students' knowledge of rates mean they can approach scaled pictographs in a more sophisticated manner.

compare and analyze distributions of categorical data from both matching and different-sized samples. MP.2, MP.3, MP.6	An important aspect of doing statistics is selecting an appropriate data display for the question under investigation. Students need to be asked, "Which data display fits this data set and why?" The circle graph focuses more on the relative values of the clustering of data, whereas the bar and pictographs add a dimension of quantity. The choice of which data display (and how categories are set up within each display) will result in different pictures of the shape of data. Finally students are comparing two distributions. When comparing two different distributions, circle graphs lend to comparing different sized samples, because circle graphs are based on percentages. **KY.7.SP.0** **KY.7.SP.2** **Coherence KY.6.SP.O→KY.7.SP.4**
Cluster: Use random sampling to draw inferences about a population. **KY.7.SP.1 Understand that statistics can be used to gain information about a population by examining a 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.** MP.3, MP.6	Recognize what makes a valid and non-valid sample of a population. Recognize the size of the sample holds importance to the accuracy of the sample. KY.6.SP.1 Coherence KY.6.SP.2→KY.7.SP.1→KY.HS.SP.9
Cluster: Draw informal comparative inferences about two populations.	For example, the mean height of players on the basketball team is 10 cm greater than the mean height

KY.7.SP.3 Describe the degree of visual overlap (and separation) from the graphical representations of two numerical data distributions (box plots, dot plots) with similar variabilities with similar contexts (same variable), measuring the difference between the centers (medians or means) by expressing this difference as a multiple of a measure of variability (interquartile range when comparing medians or the mean absolute deviation when comparing means). MP.1, MP.5, MP.7	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. **KY.6.SP.2** **Coherence KY.6.NS.1→KY.7.SP.3→KY.HS.SP.13** **KY.HS.SP.10**

7th Grade Mathematics

Unit 7: Angles and Equations

7th Grade Mathematics
Unit 7: Angles and Equations

In this unit, students investigate angles and angle relationships. They use algebraic expressions to describe measures of angles and algebraic equations to solve problems involving missing angle values. This unit provides students the opportunity to deepen their fluency with solving equations with a visible, concrete setting.

Duration: 15 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Solve real-life and mathematical problems using numerical and algebraic expressions and equations. **KY.7.EE.4 Use variables to represent quantities in a real-world or mathematical problem and construct equations and inequalities to solve problems by reasoning about the quantities.** **a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q and r**	a. Interpret word problems in the form of the initial value as a one-time occurrence within the problem and the coefficient as the recurring event within the problem. **Coherence KY.6.EE.7 → KY.7.EE.4 → KY.8.EE.7** b. Interpret word problems having one or more solutions that satisfy the conditions of the problem. Graph on a number line the solution set that satisfies the conditions of the problems.

are specific rational numbers. Solve equations of these forms. Graph the solution set of the equality and interpret it in context of the problem. **b. Solve word problems leading to inequalities of the form px +q > r, px + q <r, px+q≥r, px+q≤r; where p, q and r are specific rational numbers. Graph the solution set of the inequality and interpret it in context of the problem.** MP.2, MP.4	**Coherence KY.6.EE.8 → KY.7.EE.4**
Supporting Standards	
Standards	**Clarifications**
Cluster: Draw, construct and describe geometrical figures and describe the relationships between them. **KY.7.G.2 Draw (freehand, with ruler and protractor and with technology) geometric shapes 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.** MP.6, MP.7	Emphasis is on taking given conditions and converting them to geometric shapes, constructing triangles with given angle measures and side lengths and determining when the given conditions do not meet the conditions of a triangle. **Coherence KY.7.G.2→KY.8.G.1**
Cluster: Solve real-life and mathematical	Emphasis is on the relationships between the various

problems involving angle measure, area, surface area and volume. **KY.7.G.5 Apply properties of supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.** MP.3, MP.6, MP.7	angles listed to find missing angles based on the relationships and to write and solve equations to find unknown angles. **KY.8.G.1** **Coherence KY.4.MD.7 →KY.7.G.5 →KY.8.G.5**

7th Grade Mathematics

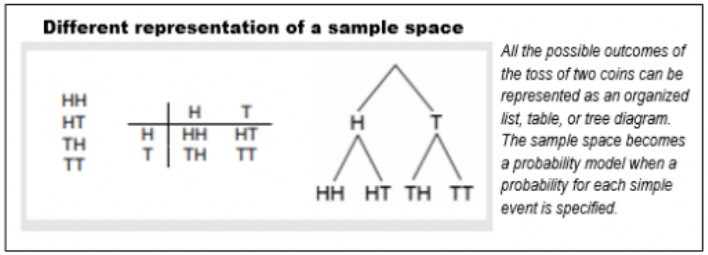
Unit 8: Probability

7th Grade Mathematics
Unit 8: Probability

In this unit, students develop a conceptual understanding of the probability of an event. They use various counting methods to determine the probability and compare the probabilities of different events. They use models to measure or approximate probabilities.

Duration: 15 Days

Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Priority Standards	
Standards	**Clarifications**
Cluster: Investigate chance processes and develop, use and evaluate probability models. **KY.7.SP.5 Describe the probability of a chance event is a number between 0 and 1, which tells how likely the event is, from impossible (0) to certain (1). 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.**	Emphasis is on descriptive language used to describe numerical probabilities; impossible event, unlikely event, equally likely event, likely event, certain event. Students understand all probabilities must fall between 0 and 1.

MP.5, MP.6, MP.7	
Cluster: Investigate chance processes and develop, use and evaluate probability models. **KY.7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams and simulation.** **a. Explain just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.** **b. Represent sample spaces for compound events described in everyday language using methods such as organized lists, tables and tree diagrams.** **c. Design and use a simulation to generate frequencies for compound events.** MP.2, MP.4, MP.7	Example: a. If the probability of heads occurring on a coin is ½, then the probability of three heads in a row is ½ ½ ½ = ⅛. b. For a simulation of tossing two fair coins:  c. 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 it will take at least 4 donors to find one with type A blood? **Coherence KY.7.SP.8→ KY.HS.SP.14**
Cluster: Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers. **KY.7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.** **a. Understand that multiplication is extended from fractions to rational numbers by requiring**	a. Emphasis is on exploring and understanding how the rules for multiplying and dividing with negative numbers are connected to properties for the operations, rather than to think of them as arbitrary rules. They explain 4 times (-3) could be four days of golfing 3 under par and therefore, having an overall score of -12. The remaining operations are based on applying properties. b. Emphasis is on the equivalence relationship provided by the movement of one negative sign among the numerator, denominator, or in front of the entire fraction. **Coherence KY.6.NS.1→ KY.7.NS.2 → KY.8.NS.1**

that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. **b. Understand that integers can be divided, provided that the divisor is not zero and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then –(p/q) = (–p)/q = p/(–q). Interpret quotients of rational numbers by describing real-world contexts.** **c. Apply properties of operations as strategies to multiply and divide rational numbers.** MP.2, MP.7, MP.8	
Supporting Standards	
Standards	**Clarifications**
Cluster: Investigate chance processes and develop, use and evaluate probability models. **KY.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 frequency and predict the approximate relative frequency given the probability.** MP.1, MP.2	Estimate the likelihood of an event, test the estimate by trial and collect data. Students observe accuracy of the estimate will increase with the frequency of repeated trials. **Coherence KY.7.SP.6→ KY.HS.SP.10**

Cluster: Investigate chance processes and develop, use and evaluate probability models. **KY.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. Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of events.** **b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.** MP.4, MP.7, MP.8	For example: a. If a student is selected at random from a class, find the probability Jane will be selected and the probability a girl will be selected. b. Find the approximate probability a spinning penny will land heads up or 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? **KY.7.RP.3** **Coherence KY.7.SP.7→ KY.HS.SP.14**