Mississippi College- and Career-Readiness Standards for Mathematics Scaffolding Document

Compacted Mathematics Grade 7

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	**Major**

7.RP.1	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour*.	• The meaning of ratio language. • The meaning of unit rate. • How to compute unit rate when given two whole number values. • How to convert measurement units. • How to multiply fractions. • How to divide fractions.	• A rate is a ratio that compares, by division, the amount one quantity changes as another quantity changes. • The concept of a unit rate a/b associated with a ratio a:b with b≠ 0. • Various units of measurement and the connections between them. • Reason abstractly and quantitatively. • Model with mathematics. • Attend to precision.	• Use a four-function calculator or standard algorithm to compute unit rates. • Set up and solve ratios to include complex fractions. • Determines when it is appropriate to use unit rate and understands when it has limitations. • i.e. *When given a recipe including fractional amounts, students can increase/ decrease the amount of ingredients needed to adjust the recipe using units rates and ratios with fractions.* • i.e. *In a recent turtle race, the winning turtle traveled 6.75 feet in ¾ of a minute. How fast was the turtle traveling in feet per second?*

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	Major

7.RP.2a **Recognize and represent proportional relationships between quantities.** **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.**	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• How to reason about tables of equivalent ratios. • Make tables of equivalent ratios. • Model ratio understanding using tape diagrams, double number lines, or equations. • Define proportional reasoning. • How to analyze simple drawings that indicate relative size of quantities. • Plotting rational numbers in the coordinate plane.	• How to use proportional reasoning to solve problems involving scale drawings and missing values. • A proportional relationship when graphed on a coordinate grid passes through the origin and contains a constant rate or proportionality. • Relationships between tables, graphs, and equations. • Model with mathematics. • Use appropriate tools strategically.	• Use a four-function calculator or standard algorithm to determine if two quantities are proportional. • Determine proportionality between two quantities that are not whole numbers. • Construct graphs or tables to determine if quantities are proportional. • Solve problems beyond those that involve whole number values. • When given a table of values, student can determine if the data is proportional or not; and explain why or why not?

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	**Major**

7.RP.2b

Recognize and represent proportional relationships between quantities.
b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Make table of equivalent ratios. • Model ratio understanding using tape diagrams, double number lines, or equations. • Solve problems of unit pricing and constant speed. • How to solve simple equations. • How to evaluate expressions. • Ratios and unit rates were introduced in sixth grade and will flow into functions in eighth grade.	• How to use proportional reasoning to solve problems involving scale drawings and missing values. • Relationships between tables, graphs, and equations. • Reason abstractly and quantitatively. • Use appropriate tools strategically. • Look for and express regularity in repeated reasoning.	• Identify the unit rate given any of the various forms of proportional relationships. • Will not be allowed to use a four-function calculator to represent relationships in various forms. • When given a real-world scenario, the student will create a table of values, a graph, and an equation that will describe the situation and determine if the situation represents a proportional relationship. • Compares proportional relationships given in different forms (tables, equations, diagrams, verbal, graphs).

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	**Major**

7.RP.2c	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
Recognize and represent proportional relationships between quantities. **c. Represent proportional relationships by equations.** *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.*	• Use ratio language. • Identify equivalent expressions. • Understand dependent and independent variable relationships. • This is a progressing standard. Ratios and unit rates were introduced in sixth grade and will flow into functions in eighth grade.	• The relationships and connections between graphs, tables, equations, and verbal descriptions. • How to represent situations in multiple ways, i.e., graphs, tables, equations, verbally. • Reason abstractly and quantitatively. • Look for and express regularity in repeated reasoning.	• Will not be allowed to use a four-function calculator to solve equations involving proportions. • Write equations representing proportional relationships when provided a real-world context. • For example: *Sam is making cupcakes. The number of cups of flour he uses is proportional to the number of batches of cupcakes he makes. Sam uses 14 ½ cups of flour to make 8 batches of cupcakes. Write an equation to show the relationship between the cups of flour Sam uses, and the number of cupcake batches he makes.*

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	Major

7.RP.2d **Recognize and represent proportional relationships between quantities.** **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.**	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• Use ratio language correctly. • Understand the concept of unit rate. • Use positive and negative numbers to represent real-world quantities. • Plot ordered pairs on a coordinate plane system. • This is a progressing standard. Ratios and unit rates were introduced in sixth grade and will flow into functions in eighth grade.	• The concept of a ratio. • The concept of a unit rate a/b associated with a ratio a:b with b≠ 0. • The relationships described in proportional situations. • Reason abstractly and quantitatively. • Model with mathematics.	• Interpret a point on the graph of a proportional relationship in terms of the situation. • Describe what the point (0,0) means in the context in the graph or situation provided. • Accurately draw a graph when the value of *y* is proportional to the value of *x*, and the constant of proportionality is provided. • Will not be allowed to use a four-function calculator to explain points on a given graph.

COMPACTED MATHEMATICS GRADE 7

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems	**Major**

7.RP.3	**Desired Student Performance**		
	A student should know	**A student should understand**	**A student should be able to do**
Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*	• Calculate percentages as a rate per 100. • Solve part-whole relationships dealing with percents**.** • Accurately perform operations with decimals. • Calculate the percent of a number when given a single step scenario. • Solve simple equations. • Accurately perform operations with fractions. • Set up word problems.	• The close relationships between fractions, decimals, and percents. • Percentages are rational numbers. • How to solve proportions. • Make sense in problems and persevere in solving them. • Reason abstractly and quantitatively. • Use appropriate tools strategically. • Attend to precision.	• Use a four-function calculator or standard algorithm to solve multi-step ratio problems. • Set up and solve multistep problems involving real-world percentages. • For example: *Brian needs to buy new tires for his truck. Each tire costs $300. Gateway Tire has a special going on now if you buy 3 tires you get the 4th tire 75% off. Brian is going to buy four tires at Gateway Tire. The sales tax is 7%. How much money will Brain save using the deal vs. paying full price?* • Determine when it is appropriate to use unit rate and understand when it has limitations.

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers — **Major**

7.NS.1a

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. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

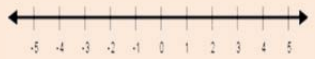
Desired Student Performance

A student should know

- Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An integer is a number expressible in the form a or –a for some whole number a.
- The procedure for adding and subtracting rational numbers with and without the use of a number line.
- The definition of opposites. Two numbers that are an equal distance from zero on a number line; also called additive inverse.

A student should understand

- Two numbers whose sum is 0 are additive inverses of one another. For example, ¾ and -3/4 are additive inverses of one another because
- ¾ + (-3/4) = (-3/4) + ¾ = 0.
- How to find the opposite of a number.
- The number line is a diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity.



- Use appropriate tools strategically.

A student should be able to do

- Use a horizontal or vertical number line to add -4 + 6. For example, to find the answer, students find -4 on the number line and move 6 units in a positive direction. The stopping point of 2 is the sum of this expression.
- Use a horizontal or vertical number line to subtract -5 – (-2). For example, this problem is asking for the distance between -5 and -2. The distance between -5 and -2 is 3 and the direction from -2 to -5 is negative. The answer would be -3. It should be noted that this answer is the same as adding the opposite of -2: -5 + 2 = -3.
- Answer questions in a real-world context. *i.e. During a football game, Freddie Jackson loses 4 yards on the first down and then gains one yard during the second down. Explain what Freddie Jackson needs to do on the third down to make his team be back where they were when they started.*

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers	Major

7.NS.1b

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. 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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The absolute value of a number is the distance it is from zero and shown by | |. • The definition of opposites. Two numbers that are an equal distance from zero on a number line; also called additive inverse. • The commutative property for addition which states, a + b = b + a.	• How to find the absolute value of a number. • Two numbers whose sum is 0 are additive inverses of one another. • How to find the opposite of a number. • Reason abstractly and quantitatively.	• Use a horizontal or vertical number line to illustrate p + q. • Use a horizontal or vertical number line to illustrate p + (-q). • Use a horizontal or vertical number line to illustrate p + (-p) = (-p) + p = 0 • Determine the possible values of numbers that are a given distance from a known number. For example, the value of x is a distance of 4 units from 2. What are the possible values of x? • Explain, in a real-world context, the sum of rational numbers.

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers	Major

7.NS.1c

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. 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.

Desired Student Performance

A student should know

- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b.
- An integer is a number expressible in the form a or –a for some whole number a.
- The procedure for adding rational numbers with and without the use of a number line.
- The procedure for subtracting rational numbers with and without a number line.
- The definition of opposites. Two numbers that are an equal distance from zero on a number line; also called additive inverses.

A student should understand

- Two numbers whose sum is 0 are additive inverses of one another.
- How to find the opposite of a number.
- How to add and subtract like fractions, unlike fractions, and mixed numbers.

A student should be able to do

- Use a horizontal or vertical number line to illustrate p - q.
- Use a horizontal or vertical number line to illustrate p + (-q).
- Use a horizontal or vertical number line to illustrate p + (-p) = (-p) + p = 0
- Solve the following problem: Kevin, Briana, Kimberly, and Edward all live on the same street as their school, which runs from north to south. Kevin lives 5.5 blocks to the north, Briana lives 4.25 blocks to the south, Kimberly lives 2.75 blocks to the north, and Edward lives 6.5 blocks to the south. Edward says that he lives 3.75 blocks away from Kimberly. Is he correct? Explain your reasoning using a number line or by using sums or differences.

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers — **Major**

7.NS.1d

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. d. Apply properties of operations as strategies to add and subtract rational numbers.

Desired Student Performance

A student should know

- The associative property of addition which states:
  (a + b) + c = a + (b + c).
- The commutative property of addition which states:
  a + b = b + a
- The additive identity property of 0 which states:
  a + 0 = 0 + a = a.
- The existence of additive inverses which states: For every a there exists –a so that
  a + (-a) = (-a) + a = 0.
- The distributive property of multiplication over addition which states
  a x (b + c) = a x b + a x c.

A student should understand

- How to apply the properties of operations to simplify a problem that contains rational numbers using addition and subtraction.
- Reason abstractly and quantitatively when given real world problems involving addition and subtraction of rational numbers.
- Use appropriate tools strategically.

A student should be able to do

- Use a four function calculator with square root to add and subtract rational numbers.
- Add or subtract up to 3 rational numbers with and without the use of a horizontal or vertical number line.
- Add and subtract up to 3 like or unlike fractions and mixed numbers.
- Demonstrate conceptual understanding by producing or recognizing an expression equivalent to a given sum or difference. For example, -8.1 + 7.4 = -(8.1 – 7.4).

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers — **Major**

7.NS.2a

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.

Desired Student Performance

A student should know

- Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An integer is a number expressible in the form a or –a for some whole number a.
- The procedure for multiplying whole numbers.
- The procedure for multiplying fractions.
- The rules for multiplying signed numbers, which are: The product of two integers with different signs is negative and the product of two integers with the same sign is positive.
- The multiplicative property of zero which states that the product of any number and zero is zero.
- The commutative property of multiplication which states:
  a x b = b x a.

A student should understand

- Multiplication of integers is an extension of multiplication of whole numbers.
- The basic idea of multiplication is repeated addition. For example, 5 x 3 = 5 + 5 + 5 = 15. Additionally, ½ x 3 = ½ + ½ + ½ = 3/2.
- Repeated addition also works for signed numbers. For example, -3 x 4 = -3 + -3 + -3 + -3 = -12
- Construct viable arguments and critique the reasoning of others.

A student should be able to do

- Multiply integers and rational numbers.
- Write properties for given mathematical statements. For example:

Statements	Properties
0 = -2(0)	Multiplicative Property of Zero
0 = -2[1 + (-1)]	Additive Inverse Property
0 = -2(1) + (-2)(-1)	Distributive Property
0 = -2 + (-2)(-1)	Multiplicative identity

- Solve real-world problems involving multiplication of integers.
- Demonstrate conceptual understanding by producing or recognizing equivalent expressions using properties of operations. For example,
  (-3)(6 + -4 + -3) = (-3)(6 + -4) + (-3)(-3).

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers	Major

7.NS.2b **Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.** **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.**	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7. • A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers. • An integer is a number expressible in the form a or –a for some whole number a. • The procedures for dividing whole numbers and fractions. • The rules for dividing integers, which are: The quotient of two integers with different signs is negative and the quotient of two integers with the same sign is positive.	• Division of integers is an extension of division of whole numbers. • Integers can be divided provided that the divisor is not zero. Since multiplication and division sentences are related, they can be used to find the quotient of integers with different signs and the same sign. • When division of rational numbers is represented with a fraction bar, each number can have a negative sign.	• Divide integers and rational numbers. • Solve real-world problems involving division of integers and rational numbers. • Evaluate an expression using division. • Demonstrate conceptual understanding by producing or recognizing equivalent expressions using properties of operations.

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers — **Major**

7.NS.2c

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
c. Apply properties of operations as strategies to multiply and divide rational numbers.

Desired Student Performance

A student should know

- Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.
- How to multiply rational numbers.
- How to divide rational numbers.

A student should understand

- How to apply the properties of operations to simplify a problem that contains rational numbers using multiplication and division.
- Reason abstractly and quantitatively.
- Use appropriate tools strategically.

A student should be able to do

- Multiply and divide up to 3 rational numbers.
- Demonstrate conceptual understanding by producing or recognizing equivalent expressions using properties of operations.
- Write properties for given mathematical statements. For example:

Statements	Properties
0 = -2(0)	Multiplicative Property of Zero
0 = -2[1 + (-1)]	Additive Inverse Property
0 = -2(1) + (-2)(-1)	Distributive Property
0 = -2 + (-2)(-1)	Multiplicative identity

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers — **Major**

7.NS.2d

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Desired Student Performance

A student should know

- Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7.
- The decimal form of a fraction is called a repeating or terminating decimal.
- A repeating decimal is the decimal form of a rational number. Repeating decimals can be represented using bar notation where a bar is drawn only over the digit(s) that repeat. For example, 0.333333…. = $0.\overline{3}$
- A decimal is called terminating if its repeating digit is 0. For example, $0.25\overline{0}$ is typically written 0.25.

A student should understand

- That you can use bar notation to indicate a number pattern that repeats indefinitely.
- Any fraction can be expressed as a decimal by dividing the numerator by the denominator.

A student should be able to do

- Write a fraction or a mixed number as decimal using long division.
- Write a decimal as a fraction or mixed number in simplest form.
- Use long division to express fractions as decimals.
- Explain which fractions will result in terminating or repeating decimals.

COMPACTED MATHEMATICS GRADE 7

The Number System

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers	Major

7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• Because there are no specific standards for rational number arithmetic in later grades and because so much other work in grade 7 depends on rational number arithmetic, fluency with rational number arithmetic should be the goal in grade 7. • How to add rational numbers. • How to subtract rational numbers. • How to multiply rational numbers. • How to divide rational numbers.	• How to use the order of operations to write and solve problems with all rational numbers. • Reason abstractly and quantitatively. • Use appropriate tools strategically.	• Add rational numbers when provided a real-world context. • Subtract rational numbers when provided a real-world context. • Multiply rational numbers when provided a real-world context. • Divide rational numbers when provided a real-world context.

COMPACTED MATHEMATICS GRADE 7

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers	Supporting

8.NS.1
Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

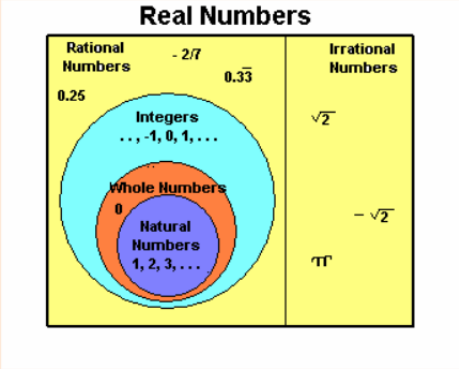
Desired Student Performance

A student should know

- Real numbers is the set of rational numbers together with the set of irrational numbers.
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An irrational number is a number that cannot be expressed as the ratio *a/b*, where *a* and *b* are integers and $b \neq 0$.
- The decimal form of a fraction is called a repeating or terminating decimal.
- A repeating decimal is the decimal form of a rational number. Repeating decimals can be represented using bar notation where a bar is drawn only over the digit(s) that repeat. For example, 0.333333…. = $0.\overline{3}$
- A decimal is called terminating if its repeating digit is 0. For example, $0.25\overline{0}$ is typically written 0.25.

A student should understand

- Real numbers are either rational or irrational.
- That the set of real numbers can be represented with a Venn diagram.



A student should be able to do

- Write a fraction or mixed number as a repeating decimal by showing, filling in, or otherwise producing the steps of long division.
- Write a repeating decimal as a fraction or mixed number in simplest form.
- Name all sets of numbers to which a given real number belongs.
- Convert a repeating decimal into a rational number.

COMPACTED MATHEMATICS GRADE 7

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers	Supporting

8.NS.2

Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

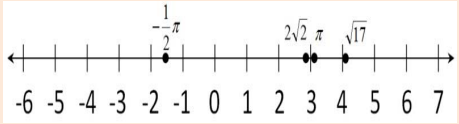
Desired Student Performance

A student should know

- The square root of a number is one of its two equal factors. If $a^2 = b$, then $a = \pm\sqrt{b}$
- A perfect square is a rational number whose square root is a whole number. *For example, 36 is a perfect square because its square root is 6.*
- The cube root of a number is one of three equal factors of a number. If $a^3 = b$, then $a = \sqrt[3]{b}$.
- Real numbers is the set of rational numbers together with the set of irrational numbers.
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An irrational number is a number that cannot be expressed as the ratio *a/b*, where *a* and *b* are integers and $b \neq 0$.
- The decimal form of a fraction is called a repeating or terminating decimal.

A student should understand

- Every positive number has both a positive and negative square root. In real-world situations, only the positive or principal square root is considered.
- How to compare and order rational and irrational numbers.
- The value of a square root can be approximated between integers.
- The square root of a non-perfect square is irrational.
- Square roots may be negative and written as $-\sqrt{24}$.
- How to plot irrational numbers on a number line.



A student should be able to do

- Find the square and cube roots of numbers.
- Estimate square roots and cube roots to the nearest integer using perfect squares and perfect cubes.
- Estimate square roots and cube roots to an appropriate approximation by truncating, or dropping, the digits after the first decimal place, then after the second decimal place and so on.
- Compare and order rational and irrational numbers using a number line.
- Use the estimated value of an irrational number to evaluate an expression.

COMPACTED GRADE 7

Expressions and Equations

Use properties of operations to generate equivalent expressions	Major

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

Desired Student Performance

A student should know

- This is a continuation of work from 6th grade using properties of operations and combining like terms.
- A variable is a symbol, usually a letter, used to represent a number in mathematical expressions or sentences.
- An algebraic expression is a combination of variables, numbers, expressions, and at least one operation.
- The associative property of addition which states:
  $(a + b) + c = a + (b + c)$.
- The commutative property of addition which states:
  $a + b = b + a$
- The distributive property of multiplication over addition which states:
  $a \times (b + c) = a \times b + a \times c$.
- A linear expression is a collection of variable terms and constant terms that are joined by addition or subtraction and the variables are raised to the first power.
- A rational coefficient is the number that is multiplied times a variable.
- To combine like terms means to add the terms that have the exact same variable raised to the exact same power.

A student should understand

- All operations involving the properties of addition and the distributive property of multiplication over addition can be used to simplify expressions.
- Variables can be used to represent quantities in a real-world or mathematical problem.
- Expressions are powerful tools for exploring, reasoning about, and representing situations.
- Two or more expressions may be equivalent even when their symbolic forms differ.
- Factor a linear expression using greatest common factor.

A student should be able to do

- Add, subtract, factor, and expand linear expressions with and without rational coefficients.
- Utilize properties of operations to rewrite expressions in a different form.
- Factor by using division to express a linear expression by its factors and then also expand by using multiplication to rewrite the factors in a linear expression as a product.
- Produce and identify equivalent expressions. For example,
  $y(3 + x + k) = 3y + xy + ky = y(3 + x) + yk$.

COMPACTED GRADE 7

Expressions and Equations

Use properties of operations to generate equivalent expressions	Major

7.EE.2	Desired Student Performance		
Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*	**A student should know** • To simplify means to write an expression in simplest form. • An expression is in simplest form when it has no like terms or parentheses. • Equivalent expressions are two or more expressions that have the same solution.	**A student should understand** • The reason for rewriting an expression in terms of a contextual situation. *For example, students understand that a 40% discount is the same as finding 60% of the cost, c (0.60c).* • Sales tax and tips are calculated as a percent of the price and can be represented as a percent of increase. • How to write an expression in simplest form. • How to determine if two or more expressions are equivalent.	**A student should be able to do** • Write an expression from a real-world context possibly involving sales tax, tip, discount, gratuity, markup, selling price, perimeter, area, and angle measures of a triangle. • Evaluate an expression given a value for the variable. • Translate verbal expression into an algebraic expression. • Use manipulatives such as algebra tiles to factor expressions.

COMPACTED GRADE 7

Expressions and Equations

Solve real-life and mathematical problems using numerical and algebraic expressions and equations	Major

7.EE.3

Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), 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. *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.*

Desired Student Performance

A student should know

- Meeting standard 7.EE.B.3 in its entirety will involve using rational number arithmetic and percents.
- This is a major capstone standard for arithmetic and its applications.
- How to use front end estimation.
- How to use clustering around an average.
- How to round numbers.
- How to use compatible numbers.
- How to add, subtract, multiply, and divide integers and rational numbers.

A student should understand

- How to use estimation strategies for calculations with fractions and decimals.
- How to write an expression in simplest form.
- How to determine if two or more expressions are equivalent.
- Model with mathematics.
- Use appropriate tools strategically.
- How to apply properties of operations.

A student should be able to do

- Solve contextual problems and mathematical problems using rational numbers.
- Convert between fractions, decimals, and percents as needed to solve a problem.
- Compare and order rational numbers on a number line.
- Apply properties of operations to calculate with numbers in any form.
- Use estimation to justify the reasonableness of answers

COMPACTED GRADE 7

Expressions and Equations

Solve real-life and mathematical problems using numerical and algebraic expressions and equations	Major

7.EE.4a

Use variables to represent quantities in a real-world or mathematical problem, and construct simple 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 fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

Desired Student Performance

A student should know

- An equation is a sentence stating that two quantities are equal.
- The solution of an equation is the value of a variable that makes the equation true.
- The coefficient is the numerical factor of a term that contains a variable.
- Addition property of equality.
- Subtraction property of equality.
- Multiplication property of equality.
- Division property of equality.
- Define a variable and use appropriate units.

A student should understand

- How to write a phrase as an algebraic expression.
- Whether to write an equation or inequality for a given situation.
- How to use the properties of equality.
- How to solve one and two step equations.
- Make sense of problems and persevere in solving them.
- Model in mathematics.

A student should be able to do

- Solve multi-step equations derived from word problems.
- Use arithmetic from a given problem to generalize an algebraic solution.
- Explain how they determined whether to write an equation or inequality and the properties of the real number system that they used to find a solution.

COMPACTED GRADE 7

Expressions and Equations

Solve real-life and mathematical problems using numerical and algebraic expressions and equations — **Major**

7.EE.4b

Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
b. Solve word problems leading to inequalities of the form *px + q > r* or *px + q < r*, where *p, q,* and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• An inequality is an open sentence that uses <, >, ≠, ≤, or ≥ to compare two quantities. • The solution of an inequality is the value of a variable that makes the inequality true. • The coefficient is the numerical factor of a term that contains a variable. • Addition property of inequality. • Subtraction property of inequality. • Multiplication property of inequality. • Division property of inequality. • Define a variable and use appropriate units.	• How to write a phrase as an algebraic expression. • Whether to write an equation or inequality for a given situation. • How to use the properties of inequality. • How to solve one and two step inequalities. • When you multiply or divide each side of an inequality by a negative number, the inequality symbol must be reversed for the inequality to remain true. • Make sense of problems and persevere in solving them. • Model in mathematics.	• Solve multi-step inequalities derived from word problems. • Graph the solution set of the inequality. • Use arithmetic from a given problem to generalize an algebraic solution. • Explain how they determined whether to write an equation or inequality and the properties of the real number system that they used to find a solution.

COMPACTED GRADE 7

Expressions and Equations

Work with radicals and integer exponents	Major

8.EE.1
Know and apply the properties of integer exponents to generate equivalent numerical expressions.
For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

Desired Student Performance

A student should know

- A power is a product of repeated factors using an exponent and a base.
- The base in a power is the number that is the common factor.
- The exponent in a power is the number of times the base is used as a factor.
- A monomial is a number, a variable, or a product of a number and one or more variables.
- To multiply powers with the same base, add their exponents. (Product of Powers) $a^m \times a^n = a^{m+n}$
- To divide powers with the same base, subtract their exponents. (Quotient of Powers) $\frac{a^m}{a^n} = a^{m-n}$
- To find the power of a power, multiply the exponents. (Power of a Power) $(a^m)^n = a^{m \times n}$
- To find the power of a product, find the power of each factor and multiply. (Power of a Product) $(ab)^m = a^m b^m$
- Any nonzero number to the zero power is 1. $x^0 = 1, x \neq 0$
- Any nonzero number to the negative n power is the multiplicative inverse of its nth power. $x^{-n} = \frac{1}{x^n}, \ x \neq 0$

A student should understand

- All operations involving the properties of addition and the distributive property of multiplication over addition can be used to simplify expressions.
- Variables can be used to represent quantities in a real-world or mathematical problem.
- Expressions are powerful tools for exploring, reasoning about, and representing situations.
- Two or more expressions may be equivalent even when their symbolic forms differ.

A student should be able to do

- Write an expression using exponents.
- Evaluate an expression containing exponents.
- Simplify expressions involving one, two, or three properties using the Laws of Exponents.
- Write an expression using a positive exponent.
- Write a fraction as an expression using a negative exponent other than -1.
- Multiply and divide with negative exponents.
- Classify expressions by their equivalence to a given expression.

COMPACTED GRADE 7

Expressions and Equations

Work with radicals and integer exponents — **Major**

8.EE.2

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

Desired Student Performance

A student should know

- The radical sign is the symbol $\sqrt{\ }$ placed before a number or quantity to indicate the extraction of a root, which will be the square root. The value of a higher root is indicated by a raised digit in front of the symbol, as in $\sqrt[3]{\ }, \sqrt[4]{\ }, \ldots, \sqrt[n]{\ }$, where n is an integer.
- The square root of a number is one of its two equal factors. If $a^2 = b$, then $a = \pm\sqrt{b}$
- A perfect square is a rational number whose square root is a whole number. *For example, 36 is a perfect square because its square root is 6.*
- The cube root of a number is one of three equal factors of a number. If $a^3 = b$, then $a = \sqrt[3]{b}$.
- A perfect cube is a rational number whose cube root is a whole number. *For example, 64 is a perfect cube because its cube root is 4.*
- A rational number is a number expressed in the form a/b or –a/b for some fraction a/b. The rational numbers include the integers.
- An irrational number is a number that cannot be expressed as the ratio a/b, where a and b are integers and $b \neq 0$.

A student should understand

- How to recognize perfect squares.
- How to recognize perfect cubes.
- That non-perfect squares and non-perfect cubes are irrational numbers.
- Squaring a number and taking the square root ($\sqrt{\ }$) of a number are inverse operations.
- Cubing a number and taking the cube root ($\sqrt[3]{\ }$) of a number are inverse operations.
- When solving $x^2 = 36$, there are two solutions, ± 6 since 6 x 6 = 36 and -6 x -6 = 36.

A student should be able to do

- Find square roots of numbers.
- Find cube roots of numbers.
- Estimate square roots and cube roots to the nearest integer.
- Order and compare real numbers.
- Find the distance between two points using the distance formula.
- Find parts of a right triangle using the Pythagorean Theorem.
- Find the edge length of a cubical object with a given volume.

COMPACTED GRADE 7

Expressions and Equations

Work with radicals and integer exponents	Major

8.EE.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger.*

Desired Student Performance

A student should know

- Scientific notation is when you express a number as product of two factors. The first factor must be greater than or equal to one but less than ten and the second factor is a power of ten. $a \times 10^n, where\ 1 \leq a < 10$ *and n is an integer*
- How to write a number in scientific notation from standard form.
- How to write a number in standard form from scientific notation.
- Exponential and standard forms of powers of 10. For example, 0.1 is 10^{-1}.

A student should understand

- Scientific notation is used to express very large or very small numbers.
- When looking at a number in scientific notation, if the exponent increases by one, the value increases 10 times.
- When looking at a number in scientific notation, if the exponent decreases by one, the value decreases 10 times.

A student should be able to do

- Compare and interpret scientific notation quantities in the context of the situation.
- Evaluate expressions involving addition, subtraction, multiplication, or division and express the answer in scientific notation.

COMPACTED GRADE 7

Expressions and Equations

Work with radicals and integer exponents	Major

8.EE.4

Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology

Desired Student Performance

A student should know

- Scientific notation is when you express a number as product of two factors. The first factor must be greater than or equal to one but less than ten and the second factor is a power of ten. $a \times 10^n, where\ 1 \leq a < 10$ *and n is an integer*
- How to write a number in scientific notation from standard form.
- How to write a number in standard form from scientific notation.
- Exponential and standard forms of powers of 10. For example, 0.1 is 10^{-1}.
- How to convert a number from standard form to scientific notation with and without the use of technology.

A student should understand

- Scientific notation is used to express very large or very small numbers.
- How to compare and interpret scientific notation quantities in the context of the situation with or without a scientific calculator.
- When looking at a number in scientific notation, if the exponent increases by one, the value increases 10 times.
- When looking at a number in scientific notation, if the exponent decreases by one, the value decreases 10 times.
- How to read a number that is written in scientific notation using technology. For example, 3.7E-2 is 3.7 x 10^{-2}.

A student should be able to do

- Perform operations with numbers expressed in both decimal and scientific notation and express the answer in scientific notation without a scientific calculator.
- Compare and order numbers expressed as decimals and scientific notation without a calculator.
- Choose a meaningful unit of measure in the context of the situation with and without a scientific calculator.
- Interpret scientific notation that has been generated by a scientific calculator.

COMPACTED GRADE 7

Expressions and Equations

Understand the connections between proportional relationships, lines, and linear equations — **Major**

8.EE.5

Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

Desired Student Performance

A student should know

- Students build on their work with ratios, unit rates, and proportional relationships from 6th and 7th grade.
- A rate is a ratio that compares two quantities with different kinds of units.
- A unit rate is a rate that has a denominator of 1 unit.
- A proportional relationship exists when the rate is constant.
- Constant rate of change is when the rate of change between any two points is the same.
- Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- Constant of proportionality (unit rate) is the constant ratio in a proportional linear relationship.

A student should understand

- A linear relationship has a constant rate of change and a straight line graph.
- Slope is the rate of change between any two points on a line. The ratio of the rise, or vertical change, to the run, or horizontal change.
- The rise is the vertical change between any two points on a line.
- The run is the horizontal change between any two points on a line.
- Slope = $\frac{rise}{run}$
- A linear relationship is a direct variation when the ratio of *y* to *x* is a constant, *m*. We say *y* varies directly with *x*. $m = \frac{y}{x}$ or $y = mx$, where m is the constant of variation and m ≠ 0.
- In a direct variation equation *y* = *mx, m* represents the constant of variation, the constant of proportionality, the slope, and the unit rate.

A student should be able to do

- Graph real-world proportional relationships such as earnings per hour.
- Determine whether the relationship between two quantities is linear.
- Find the constant rate of change in a linear relationship.
- Compare proportional relationship between two different quantities represented in different forms.
- Find the slope of a line using a table, graph, equation, diagram, and verbal description.
- Find the slope of a line that passes through two given points.
- Given an equation of a proportional relationship, students can graph the relationship and recognize that the unit rate is the coefficient of x.

COMPACTED GRADE 7

Expressions and Equations

Understand the connections between proportional relationships, lines, and linear equations	Major

8.EE.6

Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation *y = mx + b* for a line intercepting the vertical axis at *b*.

Desired Student Performance

A student should know

- Similar triangles have the same shape.
- The ratio of the rise to the run of two slope triangles formed by a line is equal to the slope of the line.
- The slope m of a line passing through points (x_1, y_1) and (x_2, y_2) is the ratio of the difference in the y-coordinates to the corresponding difference in the x-coordinates.
  $m = \frac{y_2 - y_1}{x_2 - x_2}$, where $x_2 \neq x_1$

A student should understand

- Since the ratios of the rise to the run of two similar triangles are the same as the slope of the line, the slope *m* of a line is the same between any two distinct points on a non-vertical line in the coordinate plane.
- The ratio of the vertical leg to the horizontal leg of given similar slope triangles formed by a line is equivalent to the absolute value of the slope of the line.
- How to use the slope formula, point *(x,y)* and the origin *(0,0)* to derive the equation *y = mx*.
- How to use the slope formula, point *(x,y),* and point *(0,b)* to derive *y = mx + b.*

A student should be able to do

- Graph two triangles given the vertices of both and determine if they are similar.
- Graph a pair of similar triangles, write a proportion comparing the rise to the run for each of the similar slope triangles, and find the numeric value.
- Given the hypotenuse of a right triangle in a coordinate plane, choose two pair of points and record the rise, run, and slope relative to each pair and verify that they are the same.

COMPACTED GRADE 7

Expressions and Equations

Analyze and solve linear equations and pairs of simultaneous linear equations	Major

8.EE.7a
Solve linear equations in one variable.
results (where *a* and *b* are different numbers).
a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers).

Desired Student Performance

A student should know

- The product of a number and its multiplicative inverse is 1. $\frac{a}{b} \times \frac{b}{a} = 1$, where a and b $\neq 0$
- The coefficient is the numerical factor of a term that contains a variable.
- An equation is a sentence stating that two quantities are equal.
- The solution of an equation is the value of a variable that makes the equation true.
- Addition property of equality.
- Subtraction property of equality
- Multiplication property of equality.
- Division property of equality.
- A two-step equation contains two operations.
- How to solve simple one-step equations.

A student should understand

- How to find the multiplicative inverse of a number.
- To solve an equation in which the coefficient is not 1, you must multiply or divide each side by the coefficient of the variable. *For example, in the equation -3x = 12, you must divide both sides by -3. A common error in problems of this type is for students to divide both sides by 3.*
- Some equations have variables on each side of the equals sign. To solve, use the properties of equality to write an equivalent equation with the variables on one side of the equals sign and then solve the equation.
- Some equations have no solution. When this occurs, the solution is the null set or empty set and is shown by the symbol ∅ or { }. After solving the equation the solution will look like a = b, where a and b are different numbers.
- Other equations may have every number as their solution. An equation that is true for every value of the variable is called an identity. After solving the equation the solution will look like a = a.

A student should be able to do

- Solve an equation using the multiplicative inverse.
- Solve an equation using the addition, subtraction, multiplication, or division properties of equality to justify the steps to the solution.
- Solve multi-step equations in which coefficients and constants may be any rational number.
- Translate a word phrase or real-world problem into an equation.
- Solve equations with variables on both sides of the equals sign.
- Determine if an equation has no solution.
- Determine if an equation is an identity with infinitely many solutions.
- Create equations that have one solution, infinitely many solutions, or no solution.
- Classify equations by number of solutions.

COMPACTED GRADE 7

Expressions and Equations

Analyze and solve linear equations and pairs of simultaneous linear equations	Major

8.EE.7b

Solve linear equations in one variable.

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Desired Student Performance

A student should know

- The product of a number and its multiplicative inverse is 1. $\frac{a}{b} \times \frac{b}{a} = 1$, where a and b $\neq 0$
- The coefficient is the numerical factor of a term that contains a variable.
- An equation is a sentence stating that two quantities are equal.
- The solution of an equation is the value of a variable that makes the equation true.
- Addition property of equality.
- Subtraction property of equality
- Multiplication property of equality.
- Division property of equality.
- A two-step equation contains two operations.
- How to solve simple one-step equations.

A student should understand

- How to find the multiplicative inverse of a number.
- To solve an equation in which the coefficient is not 1, you must multiply or divide each side by the coefficient of the variable. *For example, in the equation -3x = 12, you must divide both sides by -3. A common error in problems of this type is for students to divide both sides by 3.*
- Some equations have variables on each side of the equals sign. To solve, use the properties of equality to write an equivalent equation with the variables on one side of the equals sign and then solve the equation.
- How to use the Distributive Property. For example, 3(x+2) is equivalent to 3x+6.
- How to combine like terms. For example, 2r+r+5r = 8r.

A student should be able to do

- Solve an equation using the multiplicative inverse.
- Solve an equation using the addition, subtraction, multiplication, or division properties of equality to justify the steps to the solution.
- Solve multi-step equations in which coefficients and constants may be any rational number.
- Create equivalent expressions by combining like terms and using the Distributive Property.
- Translate a word phrase or real-world problem into an equation.
- Solve equations with variables on both sides of the equals sign.
- Solve equations containing grouping symbols.
- Determine if an equation has no solution.
- Determine if an equation is an identity with infinitely many solutions.

COMPACTED MATHEMATICS GRADE 7

Geometry

Draw, construct, and describe geometrical figures and describe the relationships between them. — **Additional**

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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Have a solid understanding of ratios and describing the relationship between two quantities. • How to use rate reasoning to set up real-world problems. • Fluent in multiplication facts. • Fluent in division facts. • How to calculate area. • This is an introductory standard to scaling and scale drawings, but is based on the understanding of ratio reasoning.	• How to calculate the area of a shape using decomposition when needed. • The concepts of proportional reasoning as applied to scale factors. • Reason abstractly and quantitatively. • Use appropriate tools strategically.	• Use a four-function calculator to determine actual lengths and areas of scale drawings. • Solve problems involving scale drawings when given as mathematical or real-world problems. • Reproduce a scale drawing that is proportional to a given geometric figure using a different scale. • Identify corresponding sides of scaled geometric figures. • An example task may provide students with two sets of dimensions of the same figure and ask students to determine the ratio of the scale.

COMPACTED MATHEMATICS GRADE 7

Geometry

Draw, construct, and describe geometrical figures and describe the relationships between them. — **Additional**

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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Attributes of basic two-dimensional shapes. • Classify two-dimensional figures based on properties. • How to draw polygons. • How to accurately use a ruler to draw and measure given lengths. • Students have been exposed to triangles and their attributes since kindergarten. • In fourth grade, students have to recognize right triangles.	• How to use a protractor to measure and draw angles accurately. • The attributes of various triangles. • The characteristics of angles that create triangles. • Construct viable arguments and critique the reasoning of others. • Use appropriate tools strategically. • Attend to precision.	• Use a four-function calculator to assist in identifying angle measures found in geometric shapes. • Solve mathematical problems involving the construction of triangles. • Construct triangles from three given angle measures. • Construct triangles from three given side measures. • An example task may ask students if it is possible to draw a triangle with a 90° angle and one leg that is 4 inches long and one leg that is 3 inches long? If so, draw one, and is there more than one way to draw this?

COMPACTED MATHEMATICS GRADE 7

Geometry

Draw, construct, and describe geometrical figures and describe the relationships between them. — **Additional**

7.G.3

Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Desired Student Performance

A student should know

- How to represent three-dimensional shapes.
- The attributes of two-dimensional figures.
- The definition of a right rectangular prism.
- The definition of a right rectangular pyramid.
- The difference between prisms and pyramids.
- The definition of slicing as a cross-section of a three-dimensional figure.

A student should understand

- The definition of a plane section is the area created by cutting through a solid.
- Cuts made parallel will take the shape of the base.
- Cuts made perpendicular will take the shape of the lateral face.
- Cuts made at an angle through a right rectangular prism will produce a parallelogram.
- Cuts made at an angle through a rectangular prism will also produce a parallelogram.
- Use appropriate tools strategically.

A student should be able to do

- Use a four-function calculator to assist in describing two-dimensional figures resulting from slicing three-dimensional figures.
- Solve simple real-world problems or mathematical problems involving two- and three-dimensional figures.
- An example task may provide students with various three-dimensional figures and ask students to identify the shape of the horizontal and vertical cross sections.

COMPACTED MATHEMATICS GRADE 7

Geometry

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. — **Additional**

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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The attributes of a circle. • This is an introductory standard for area and circumference of a circle. • Area means the amount of space inside a two-dimensional figure. • The formulas for calculating the area and circumference of a circle. • Proficient in operations involving decimals and fractions. • This is the students' initial work with circles, knowing that a circle is created by connecting all the points equidistant from a point (center) is essential.	• The relationship between the radius and the diameter of a circle. • The ratio of circumference to diameter can be expressed as π. • Why the formula works and how the formula relates to the measure (area and circumference) and the figure. • Reason abstractly and quantitatively. • Model with mathematics. • Use appropriate tools strategically.	• Use a four-function calculator to assist with calculating the area of circles, the circumference of circles, and when identifying relationships between the two. . • Tasks may require answers to be written in terms of π. • Identify and produce a logical conclusion about the relationship between the circumference and the area of a circle. For example, that given 3 three circles with areas A1>A2>A3, the circumference satisfy C1>C2>C3. • Example task: The 7th grade class is building a minim golf game. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size?

COMPACTED MATHEMATICS GRADE 7

Geometry

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. — **Additional**

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.

Desired Student Performance

A student should know

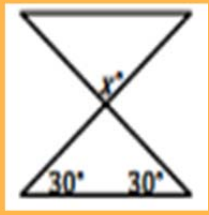
- Parallel lines are two lines that will never intersect.
- Perpendicular lines are two lines that intersect and create a 90-degree angle.
- Right angles are formed by two lines or line segments, and create a 90-degree angle.
- How to use variables to represent unknown numbers.
- How to write and solve simple equations.
- Definitions of supplementary, complementary, vertical, and adjacent angles.

A student should understand

- Use appropriate tools strategically.
- Attend to precision.
- How to solve one and two step equations.
- How to solve equations with variables on both sides.
- How to represent angle relationships using equations to solve for unknown angles.

A student should be able to do

- Use a four-function calculator to assist in classifying and solving problems dealing with various types of angles.
- Solve mathematical and real-world problems involving types of angles and their measures.
- Determine complements and supplements of a given angle.
- An example task may provide the student with a figure, as the one shown below, and ask students to write and solve an equation to find the measure of angle *x*.



COMPACTED MATHEMATICS GRADE 7

Geometry

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. — **Additional**

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.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Volume is an attribute of solid, (three-dimensional), figures. • How to calculate volume using manipulatives. • Volume formulas for right rectangular prisms. • How to calculate the area of triangles and quadrilaterals. • How to represent three-dimensional figures using nets. • How to use nets to calculate surface area.	• Why the formula works and how the formula relates to the measure (area and circumference) and the figure. • Volume can be supported by focusing on the area of the base times the height. • Surface area can be supported by focusing on the sum of the area of the faces. • Net can be used to evaluate surface area calculations. • How to decompose figures into familiar shapes. • Make sense of problems and persevere in solving them. • Use appropriate tools strategically.	• Use a four-function calculator to assist in calculating the area, volume, and surface area of two- and three-dimensional figures. • Solve mathematical and real-world problems involving area, surface area, and volume of geometric figures. • Tasks focus on area of two-dimensional objects. • All computations should make use of formulas and involve whole numbers, fractions, decimals, ratios, and various units of measure with same system conversions.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.1a **Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length.**	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• A transformation is a geometric operation that relates each point of a figure to an image point. • Symmetry transformations produce images that are identical in size and shape to the original figure. • Verify means to demonstrate something is true, accurate or justified. • Look for and express regularity in repeated reasoning.	• Ideas about how distance behaves under transformations are used to describe and analyze two-dimensional figures. • Translations do not change the orientation. • Reflections reverse the orientation. • Rotations change the orientation. • Geometric attributes of lines provide descriptive information about an object's properties and position in space. • Reflections, rotations, and translations are symmetry transformations.	• Identify lines and line segments in two-dimensional figures. • Measure and compare lengths of a figure and its image. • Verify that after a figure has been translated, reflected, or rotated, corresponding lines and line segments remain the same length. • Determine the change in orientation to isolate the transformations used.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.1b
Verify experimentally the properties of rotations, reflections, and translations:
b. Angles are taken to angles of the same measure.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• A transformation is a geometric operation that relates each point of a figure to an image point. • Symmetry transformations produce images that are identical in size and shape to the original figure. • Verify means to demonstrate something is true, accurate or justified. • An angle is a figure formed by two rays or line segments that have a common vertex. • Look for and express regularity in repeated reasoning.	• Ideas about how angles behave under transformations are used to describe and analyze two-dimensional figures. • Geometric attributes of angles provide descriptive information about an object's properties and position in space. • Reflections, rotations, and translations are symmetry transformations.	• Identify angles in two-dimensional figures. • Measure and compare angle measures of a figure and its image. • Verify that after a figure has been translated, reflected, or rotated, corresponding angles have the same measure.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.1c **Verify experimentally the properties of rotations, reflections, and translations:** **c. Parallel lines are taken to parallel lines.**	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
	• A transformation is a geometric operation that relates each point of a figure to an image point. • Symmetry transformations produce images that are identical in size and shape to the original figure. • Verify means to demonstrate something is true, accurate or justified. • Parallel lines are lines in a plane that never meet. • Look for and express regularity in repeated reasoning.	• Ideas about how distance behaves under transformations are used to describe and analyze two-dimensional figures. • Geometric attributes of lines provide descriptive information about an object's properties and position in space. • Reflections, rotations, and translations are symmetry transformations.	• Identify parallel lines in two-dimensional figures. • Measure and compare parallelism of a figure and its image. • Verify that after a figure has been translated, reflected, or rotated, corresponding parallel lines remain parallel.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.2
Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• A transformation is a geometric operation that relates each point of a figure to an image point. • A rigid motion is a sequence of one or more rotations, reflections, and/or translations. • Understand means to know how something works or happens. • How to identify corresponding sides and angles from congruency statement and/or figures. • Look for and make use of structure.	• Transformations can be used to prove that two figures are congruent. • Geometric attributes of figures provide descriptive information about an object's position in space. • The connection between congruence and transformations. • Ideas about congruence can be used to describe and analyze two-dimensional figures and to solve problems. • Two plane figures are congruent if one can be obtained from the other by rigid motion. • Matching tick marks and arcs may be used to show congruency of sides and angles.	• Perform a series of transformations to prove or disprove that two given figures are congruent. • Describe a sequence of transformations that exhibit congruence of two figures.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• A transformation is a geometric operation that relates each point of a figure to an image point. • Symmetry transformations produce images that are identical in size and shape to the original figure. • Dilations move each point along the ray through the point emanating from a fixed center and multiply distances from the center by a common scale factor. • A similarity transformation is a rigid motion followed by a dilation. • Coordinates are ordered pairs of numbers used to locate points on a coordinate grid. • Reason abstractly and quantitatively.	• The relationship between x- and y- coordinates and the x- and y-axes. • In a dilation, each coordinate of the original image is multiplied by the scale factor. • In a translation, the x and y coordinates of the original image changes by the value of the horizontal and vertical changes. • In a rotation, each point of the original figure and its new image are the same distance from the center of rotation. • In a reflection, each point of the original image and its new image are the same distance from the line of reflection.	• Name an ordered pair as the coordinates of a point in a coordinate plane. • Graph coordinates in a coordinate plane. • Describe the changes occurring to coordinates of a figure after transformations and dilations. • Determine the new coordinates of an image given the original coordinates and a series of transformations and/or dilations to be applied.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.4
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• A transformation is a geometric operation that relates each point of a figure to an image point. • A rigid motion is a sequence of one or more rotations, reflections, and/or translations. • Understand means to know how something works or happens. • Two polygons are similar when their corresponding angles are congruent and the measures of their corresponding sides are proportional. • Dilations move each point along the ray through the point emanating from a fixed center and multiply distances from the center by a common scale factor. • A similarity transformation is a rigid motion followed by a dilation. • Look for and make use of structure.	• Transformations and dilations can be used to prove that two figures are similar. • Geometric attributes of figures provide descriptive information about an object's position in space. • Dilations create similar figures. • Ideas about similarity can be used to describe and analyze two-dimensional figures and to solve problems. • Similarity transformation is a rigid motion followed by a dilation.	• Perform a series of transformations and dilations to prove or disprove that two given figures are similar. • Describe a sequence of transformations and dilations that exhibit similarity of two figures.

COMPACTED MATHEMATICS GRADE 7

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software	Major

8.G.5

Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• An exterior angle is an angle at a vertex of a polygon where the sides of the angle are one side of the polygon and the extension of the other side meeting at the vertex. • An interior angle is the angle inside a polygon formed by two adjacent sides of the polygon. • Parallel lines are lines in a plane that never meet. • A transversal is a line that intersects two or more lines.	• The angle-angle criterion for similarity of triangles states that two triangles with two pairs of equal angles are similar. • The sum of any triangle's interior angles will have the same measure as a straight angle. • The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles. • The relationships and measurements of the angles created when two parallel lines are cut by a transversal.	• Construct triangles from three measures of angles. • Construct viable arguments. • Make conjectures regarding relationships and measurements of the angles created when two parallel lines are cut by a transversal. • Apply proven relationships to establish properties to justify similarity. • Show that the sum of the angles in a triangle is the angle formed by a straight line.

COMPACTED MATHEMATICS GRADE 7

Geometry

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres — **Additional**

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

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Volume is the capacity of a three-dimensional shape. • Recognize three-dimensional shapes cone, cylinder, and sphere. • The formulas used to find the volumes of cones, cylinders, and spheres. • This is the culminating standard of acquiring a well-developed a set of geometric measurement skills.	• The volume is the number of unit cubes that will fit into a three-dimensional figure. • The similarity between finding the volume of a cylinder and the volume of a right prism. • The relationship between the volume of a cylinder and the volume of a cone with the same base. • The relationship between the volume of a sphere and the volume of a circumscribed cylinder.	• Use the formulas to find the volume of cylinders, cones, and spheres. • Solve real-world problems involving the volume of cylinders, cones, and spheres.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Use random sampling to draw inferences about a population	Supporting

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.

Desired Student Performance

A student should know

- How to calculate measures of center and variability.
- Fluent in rational number operations.
- The standards in this cluster represent opportunities to apply percentages and proportional reasoning.
- The definition of generalization is a general statement or concept obtained by inference from specific cases.
- Validity is based on having sound basis in logic or fact.

A student should understand

- A key element of a representative sample is the understanding that a random sampling guarantees that each element of the population has an equal opportunity to be selected in the sample.
- A random sample must be used in conjunction with the population to get accuracy.
- Recognize sampling techniques such as convenience, random, systematic, and voluntary.
- Know that generalizations about a population from a sample are valid only if the sample is representative of that population.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining statistics.
- Apply statistics to gain information about a population from a sample of the population.
- A task may provide students with a table of information obtained from a survey and ask students to determine statements that are supported by the data as it pertains to the whole population and not just the sampling provided.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Use random sampling to draw inferences about a population	Supporting

7.SP.2
Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*.

Desired Student Performance

A student should know

- The standards in this cluster represent opportunities to apply percentages and proportional reasoning.
- How to make an inference.
- How to calculate measures of center and variability.
- How to identify an appropriate sample size.
- An inference is a conclusion reached on the basis of evidence and reasoning.

A student should understand

- The relationship between a sample and the entire population.
- How to read data.
- The relationship between sample size and validity.
- How to collect and use multiple samples of data to answer questions about a population.
- Variation across samples may occur and how to interpret these in relation to the overall population.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining statistics.
- Compare a random sample to the overall population.
- A task may provide students with a large amount of data and ask students to describe a method of sampling to answer simple questions about the population in all.
- An example task may be having students make at least two inferences based on the data in the table below.

Lunch Preferences				
Student Sample	Hamburgers	Tacos	Pizza	Total
#1	12	14	74	100
#2	12	11	77	100

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Draw informal comparative inferences about two populations — **Additional**

7.SP.3
Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable*.

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• Calculate measures of center and variability. • How to display data on graphical representations, such as a dot plot or box plot. • An inference is a conclusion reached on the basis of evidence and reasoning. • This is the students' first experience with comparing two data sets. Students build on their understanding of graphs, mean, median, Mean Absolute Deviation (M.A.D.) and interquartile range from 6th grade.	• How different inferences can be made based on the same two sets of data. • A full understanding of the data requires consideration of the measures of variability as well as mean or median. • Variability is responsible for the overlap of two data sets, and that an increase in variability can increase the overlap. • Median is paired with the interquartile range and mean is paired with the mean absolute deviation. • Model with mathematics.	• Use a four-function calculator to assist in determining statistics. • Provided with two populations, students may use the data to persuade two different sides of an argument. • Tasks may use mean absolute deviation or range as a measure of variability. • Compare two numerical data distributions on a graph by visually data displays, and assessing the degree of overlap. • Tasks may ask students to compare the differences in the measure of central tendency in two numerical data distributions by measuring the difference between the centers.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Draw informal comparative inferences about two populations — **Additional**

7.SP.4

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*.

Desired Student Performance

A student should know

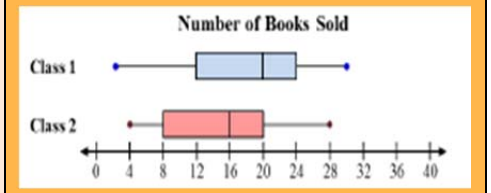
- Calculate measures of center and variability.
- Measures of center include mean, medina, and mode.
- Measures of variability include range, mean absolute deviation, and interquartile range.
- How to display data on graphical representations, such as a dot plot or box plot.
- An inference is a conclusion reached on the basis of evidence and reasoning.

A student should understand

- How to analyze and interpret data using measures of central tendency and variability.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining statistics.
- Draw informal comparative inferences about two populations from random samples.
- A task may provide data as displayed below and ask students to make conclusions surrounding the measures of variability.



COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

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.

Desired Student Performance

A student should know

- Ratio and proportional relationships in sixth grade develops fractions as ratios and percents as ratios.
- How to convert between rational numbers, (fractions, decimals, percentages).
- Fluent in ration number operations.
- This is students' first formal introduction to probability.
- The definition of probability is the likelihood of something happening or being the case.

A student should understand

- The probability of a single event can be recognized as a fraction. The closer the fraction is to one, the greater the probability the event will occur.
- A random event with a probability of ½ is equally likely to happen.
- As probability moves closer to 0 it is less likely to occur.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining probability.
- Draw conclusions to determine that a greater likelihood occurs as the number of favorable outcomes approaches the total number of outcomes.
- An example of a task may be: a container contains 2 gray, 1 white, and 4 black disks. Without looking, if you choose a disk from the container, will the probability be closer to 0 or 1 that you select a white disk? A gray disk? A black disk? Justify each of your predictions.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

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. *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*.

Desired Student Performance

A student should know

- The definition of probability is the likelihood of something happening or being the case.
- How to describe and show frequency of an event happening, i.e., dot plot.
- An approximation is close to the actual, but not completely accurate or exact.
- How to set up ratios.
- How to solve proportions.
- Fluent in rational operations to include fractions and decimals.

A student should understand

- The difference between theoretical and experimental probabilities.
- As students collect data from a probability experiment, they recognize that as the number of trials increases, the experimental probability approaches the theoretical probability.
- Relative frequency is the observed proportion of successful events.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining probability.
- Students try an experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.
- Create a second scenario with a different ratio and make a conjecture about the outcome.
- Predict the relative frequency (experimental probability) of an event based on the (theoretical) probability.
- If the task is technologically-enhanced, the task can simulate a data-gathering process.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

7.SP.7a	Desired Student Performance		
	A student should know	**A student should understand**	**A student should be able to do**
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.** *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.*	• The definition of probability is the likelihood of something happening or being the case. • How to solve proportions. • Fluent in rational operations including fractions and decimals. • Recognize uniform (equally likely) probability. • How to use models to determine the probability of events.	• Probabilities are useful for predicting what will happen over the long run. • Using theoretical probability, students can predict frequencies of outcomes. • How to recognize an appropriate design to conduct an experiment with simple probability events, understanding that the experimental data give realistic estimates of the probability of an event but are affected by sample size. • Model with mathematics.	• Use a four-function calculator to assist in determining probability. • Develop a uniform probability model and use it to determine the probability of each outcome/event. • Analyze a probability model and justify why it is uniform or explain the discrepancy if it is not.

COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

7.SP.7b

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.

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

Desired Student Performance

A student should know

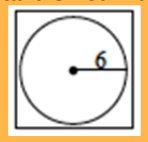
- The definition of probability is the likelihood of something happening or being the case.
- How to solve proportions.
- Fluent in rational operations including fractions and decimals.
- Recognize uniform (equally likely) probability.
- How to use models to determine the probability of events.
- How to write equivalent fractions.

A student should understand

- How to develop models for geometric probability, (i.e. a target).
- How to recognize an appropriate design to conduct an experiment with simple probability events, understanding that the experimental data gives realistic estimates of the probability of an event but are affected by sample size.
- Determine if a game is fair or unfair and justify their conclusion using probability.
- Use appropriate tools strategically.
- Model with mathematics.

A student should be able to do

- Use a four-function calculator to assist in determining probability.
- Tasks may provide the data students are to use, or if the task is technology enhanced, the task can simulate a data-gathering process.
- Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
- An example task may provide the diagram below and ask “If you choose a point in the square, what is the probability that it is not in the circle?”



COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

7.SP.8a

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. Understand that, 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.

Desired Student Performance

A student should know

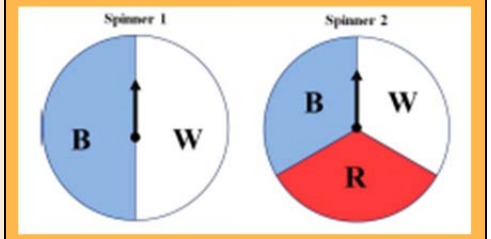
- How to find the probability of simple events.
- The definition of a compound event is the probability of two or more things happening at once.
- Fluency in operations dealing with fractions.
- Solving proportions.

A student should understand

- The meaning of fractions.
- The probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
- Probabilities are useful for predicting what will happen over the long run.
- Model with mathematics.
- Use appropriate tools strategically.

A student should be able to do

- Use a four-function calculator to assist in determining probability.
- Define and describe a compound event.
- Given tow spinners such as the ones below, students will find the probability of a compound event. What is the likelihood of both spinners landing on B when spun simultaneously?



COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

7.SP.8b

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. 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.

Desired Student Performance

A student should know

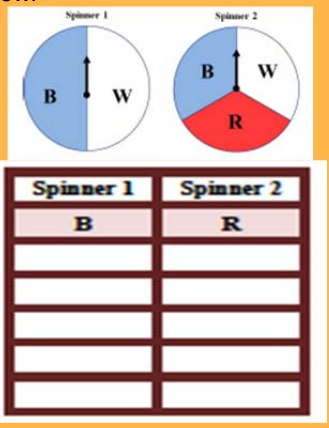
- How to create a tree diagram, frequency table, organized lists, and simulations to determine the probability of compound events.
- Sample space is the set of all of the possible outcomes in a probability experiment.
- How to find the probability of simple events.
- The definition of a compound event is the probability of two or more things happening at once.
- Fluency in operations dealing with fractions.
- Solving proportions.

A student should understand

- The relationship between various graphical representations of compound probabilities, (tree diagrams, frequency tables, etc.)
- How to choose the appropriate method such as organized lists, tables, and tree diagrams to represent sample spaces for compound events.
- How to use the Fundamental Counting Principle to find the number of possible outcomes in a sample space.
- Model with mathematics.
- Use appropriate tools strategically.

A student should be able to do

- Use a four-function calculator to assist in determining probability.
- Tasks may ask students to complete a table to display possible outcomes of a compound event such as the one below.



COMPACTED MATHEMATICS GRADE 7

Statistics and Probability

Investigate chance processes and develop, use, and evaluate probability models	Supporting

7.SP.8c

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

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?*

Desired Student Performance

A student should know	A student should understand	A student should be able to do
• The definition of a compound event is the probability of two or more things happening at once. • How to represent frequencies of an event occurring in multiple ways. • Fluency in operations dealing with fractions. • Solving proportions. • How to model probability in various ways such as, tree diagrams and tables. • Writing equivalent ratios. • The definition of simulation is the imitation of the operation of a real-world process or system over time.	• Probabilities are useful for predicting what will happen over the long run. • Using theoretical probabilities to predict frequencies of outcomes. • Simulations allow one to act out an event that would not be practical to perform. • How to recognize an appropriate design to conduct an experiment with simple probability events, understanding that the experimental data give realistic estimates of the probability of an event but are affected by sample size. • Model with mathematics. • Use appropriate tools strategically.	• Use a four-function calculator to assist in determining probability. • Design and use a simulation to generate frequencies for compound events. • Students may choose to roll two number cubes to simulate the number of strikes two bowling partners will get in the next 20 games. Based on the current season, Bowler 1 gets a strike 1 out of 3 times, while Bowler 2 gets a strike 50% of the time. The first number cube rolled must land on a number less than 3 to represent a strike for Bowler 1, while the second number cube rolled must land on a number greater than or equal to 4 to represent a strike for Bowler 2.