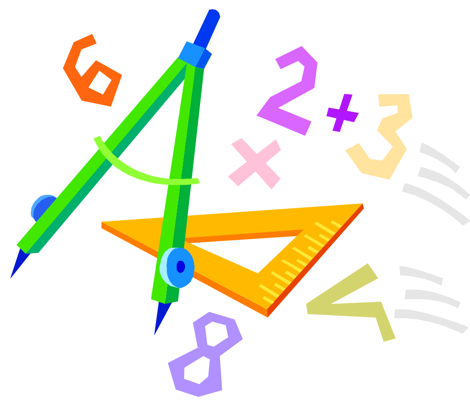
MATHEMATICS
ALIGNED STANDARDS OF LEARNING
CURRICULUM FRAMEWORK
GRADE 7



7M-NSCE1 The student will

a) add fractions with like denominators (halves, thirds, fourths, and tenths) so the solution is less than or equal to one.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Negative exponents for powers of 10 are used to represent numbers between 0 and 1. (e.g., $10^{-3} = \frac{1}{10^3} = 0.001$). • Negative exponents for powers of 10 can be investigated through patterns such as: $10^2 = 100$ $10^1 = 10$ $10^0 = 1$ $10^{-1} = \frac{1}{10^1} = \frac{1}{10} = 0.1$ • A number followed by a percent symbol (%) is equivalent to that number with a denominator of 100 (e.g., $\frac{3}{5} = \frac{60}{100} = 0.60 = 60\%$). • Scientific notation is used to represent very large or very small numbers. • A number written in scientific notation is the product of two factors — a decimal greater than or equal to 1 but less than 10, and a power of 10 (e.g., $3.1 \times 10^5 = 310{,}000$ and $2.85 \times 10^{-4} = 0.000285$). • Equivalent relationships among fractions, decimals, and percents can be determined by using manipulatives (e.g., fraction bars, Base-10 blocks, fraction circles, graph paper, number lines and calculators).	• When should scientific notation be used? Scientific notation should be used whenever the situation calls for use of very large or very small numbers. • How are fractions, decimals and percents related? Any rational number can be represented in fraction, decimal and percent form. • What does a negative exponent mean when the base is 10? A base of 10 raised to a negative exponent represents a number between 0 and 1. • How is taking a square root different from squaring a number? Squaring a number and taking a square root are inverse operations. • Why is the absolute value of a number positive? The absolute value of a number represents distance from zero on a number line regardless of direction. Distance is positive.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Recognize powers of 10 with negative exponents by examining patterns. • Write a power of 10 with a negative exponent in fraction and decimal form. • Write a number greater than 0 in scientific notation. • Recognize a number greater than 0 in scientific notation. • Compare and determine equivalent relationships between numbers larger than 0 written in scientific notation. • Represent a number in fraction, decimal, and percent forms. • Compare, order, and determine equivalent relationships among fractions, decimals, and percents. Decimals are limited to the thousandths place, and percents are limited to the tenths place. Ordering is limited to no more than 4 numbers. • Order no more than 3 numbers greater than 0 written in scientific notation. • Determine the square root of a perfect square less than or equal to 400. • Demonstrate absolute value using a number line. • Determine the absolute value of a rational number. • Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle to solve practical problems.[†]

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• A square root of a number is a number which, when multiplied by itself, produces the given number (e.g., $\sqrt{121}$ is 11 since 11 x 11 = 121). • The square root of a number can be represented geometrically as the length of a side of the square. • The absolute value of a number is the distance from 0 on the number line regardless of direction. (e.g., $\left\lvert\frac{-1}{2}\right\rvert = \frac{1}{2}$).		

7M-NSCE2 The student will

a) solve multiplication problems with products to 100;
b) solve division problems with divisors up to five and also with a divisor of 10 without remainders;
c) demonstrate the value of various money amounts using decimals.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The set of integers is the set of whole numbers and their opposites (e.g., … –3, –2, –1, 0, 1, 2, 3, …). • Integers are used in practical situations, such as temperature changes (above/below zero), balance in a checking account (deposits/withdrawals), and changes in altitude (above/below sea level). • Concrete experiences in formulating rules for adding and subtracting integers should be explored by examining patterns using calculators, along a number line and using manipulatives, such as two-color counters, or by using algebra tiles. • Concrete experiences in formulating rules for multiplying and dividing integers should be explored by examining patterns with calculators, along a number line and using manipulatives, such as two-color counters, or by using algebra tiles.	• The sums, differences, products and quotients of integers are either positive, zero, or negative. How can this be demonstrated? This can be demonstrated through the use of patterns and models.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Model addition, subtraction, multiplication and division of integers using pictorial representations of concrete manipulatives. • Add, subtract, multiply, and divide integers. • Simplify numerical expressions involving addition, subtraction, multiplication and division of integers using order of operations. • Solve practical problems involving addition, subtraction, multiplication, and division with integers.

7M-NSCE3 The student will

a) use a ratio to model or describe a relationship;

b) use the concept of equality with models to solve one-step addition and subtraction equations.

UNDERSTANDING THE STANDARD **(Background Information for Instructor Use Only)**	**ESSENTIAL UNDERSTANDINGS**	**ESSENTIAL KNOWLEDGE AND SKILLS**
• A proportion is a statement of equality between two ratios. • A proportion can be written as $\frac{a}{b} = \frac{c}{d}$, a:b = c:d, or a is to b as c is to d. • A proportion can be solved by finding the product of the means and the product of the extremes. For example, in the proportion a:b = c:d, a and d are the extremes and b and c are the means. If values are substituted for a, b, c, and d such as 5:12 = 10:24, then the product of extremes (5×24) is equal to the product of the means (12×10). • In a proportional situation, both quantities increase or decrease together. • In a proportional situation, two quantities increase multiplicatively. Both are multiplied by the same factor. • A proportion can be solved by finding equivalent fractions. • A rate is a ratio that compares two quantities measured in different units. A unit rate is a rate with a denominator of 1. Examples of rates include miles/hour and revolutions/minute. • Proportions are used in everyday contexts, such as speed, recipe conversions, scale drawings, map reading, reducing and enlarging, comparison shopping, and monetary conversions.	• What makes two quantities proportional? Two quantities are proportional when one quantity is a constant multiple of the other.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Write proportions that represent equivalent relationships between two sets. • Solve a proportion to find a missing term. • Apply proportions to convert units of measurement between the U.S. Customary System and the metric system. Calculators may be used. • Apply proportions to solve practical problems, including scale drawings. Scale factors shall have denominators no greater than 12 and decimals no less than tenths**.** Calculators may be used. • Using 10% as a benchmark, mentally compute 5%, 10%, 15%, or 20% in a practical situation such as tips, tax and discounts. • Solve problems involving tips, tax, and discounts. Limit problems to only one percent computation per problem.

7M-NSCE3 The student will

a) use a ratio to model or describe a relationship;

b) use the concept of equality with models to solve one-step addition and subtraction equations.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Proportions can be used to convert between measurement systems. For example: if 2 inches is about 5 cm, how many inches are in 16 cm? – $\frac{2 inches}{x} = \frac{5 cm}{16 cm}$ • A percent is a special ratio in which the denominator is 100. • Proportions can be used to represent percent problems as follows: – $\frac{percent}{100} = \frac{part}{whole}$		

7M-MG1 The student will

a) find the area of a rectangle given the length and width using a model.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The area of a rectangle is computed by multiplying the lengths of two adjacent sides. • The area of a circle is computed by squaring the radius and multiplying that product by π ($A = \pi r^2$, where $\pi \approx 3.14$ or $\frac{22}{7}$). • A rectangular prism can be represented on a flat surface as a net that contains six rectangles — two that have measures of the length and width of the base, two others that have measures of the length and height, and two others that have measures of the width and height. The surface area of a rectangular prism is the sum of the areas of all six faces ($SA = 2lw + 2lh + 2wh$). • A cylinder can be represented on a flat surface as a net that contains two circles (bases for the cylinder) and one rectangular region whose length is the circumference of the circular base and whose width is the height of the cylinder. The surface area of the cylinder is the area of the two circles and the rectangle ($SA = 2\pi r^2 + 2\pi rh$). • The volume of a rectangular prism is computed by multiplying the area of the base, B, (length times width) by the height of the prism ($V = lwh = Bh$). • The volume of a cylinder is computed by multiplying the area of the base, B, (πr^2) by the height of the cylinder ($V = \pi r^2 h = Bh$).	• How are volume and surface area related? Volume is a measure of the amount a container holds while surface area is the sum of the areas of the surfaces on the container. • How does the volume of a rectangular prism change when one of the attributes is increased? There is a direct relationship between the volume of a rectangular prism increasing when the length of one of the attributes of the prism is changed by a scale factor.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Determine if a practical problem involving a rectangular prism or cylinder represents the application of volume or surface area. • Find the surface area of a rectangular prism. • Solve practical problems that require finding the surface area of a rectangular prism. • Find the surface area of a cylinder. • Solve practical problems that require finding the surface area of a cylinder. • Find the volume of a rectangular prism. • Solve practical problems that require finding the volume of a rectangular prism. • Find the volume of a cylinder. • Solve practical problems that require finding the volume of a cylinder. • Describe how the volume of a rectangular prism is affected when one measured attribute is multiplied by a scale factor. Problems will be limited to changing attributes by scale factors only. • Describe how the surface area of a rectangular prism is affected when one measured attribute is multiplied by a scale factor. Problems will be limited to changing attributes by scale factors only.

7M-MG1 The student will

a) find the area of a rectangle given the length and width using a model.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• There is a direct relationship between changing one measured attribute of a rectangular prism by a scale factor and its volume. For example, doubling the length of a prism will double its volume. This direct relationship does not hold true for surface area.		

7M-MG2 The student will

a) draw or classify and recognize basic two-dimensional geometric shapes without a model (circle, triangle, rectangle/square).

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• A rotation of a geometric figure is a turn of the figure around a fixed point. The point may or may not be on the figure. The fixed point is called the *center of rotation*. • A translation of a geometric figure is a slide of the figure in which all the points on the figure move the same distance in the same direction. • A reflection is a transformation that reflects a figure across a line in the plane. • A dilation of a geometric figure is a transformation that changes the size of a figure by scale factor to create a similar figure. • The image of a polygon is the resulting polygon after the transformation. The preimage is the polygon before the transformation. • A transformation of preimage point A can be denoted as the image A' (read as "A prime").	• How does the transformation of a figure affect the size, shape and position of that figure? Translations, rotations and reflections do not change the size or shape of a figure. A dilation of a figure and the original figure are similar. Reflections, translations and rotations usually change the position of the figure.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Identify the coordinates of the image of a right triangle or rectangle that has been translated either vertically, horizontally, or a combination of a vertical and horizontal translation. • Identify the coordinates of the image of a right triangle or rectangle that has been rotated 90° or 180° about the origin. • Identify the coordinates of the image of a right triangle or a rectangle that has been reflected over the x- or y-axis. • Identify the coordinates of a right triangle or rectangle that has been dilated. The center of the dilation will be the origin. • Sketch the image of a right triangle or rectangle translated vertically or horizontally. • Sketch the image of a right triangle or rectangle that has been rotated 90° or 180° about the origin. • Sketch the image of a right triangle or rectangle that has been reflected over the x- or y-axis. • Sketch the image of a dilation of a right triangle or rectangle limited to a scale factor of $\frac{1}{4}$, $\frac{1}{2}$, 2, 3 or 4.

7M-PSPFA1 The student will

a) describe the probability of events occurring as possible or impossible.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Theoretical probability of an event is the expected probability and can be found with a formula. • Theoretical probability of an event = $\frac{\text{number of possible favorable outcomes}}{\text{total number of possible outcomes}}$ • The experimental probability of an event is determined by carrying out a simulation or an experiment. • The experimental probability = $\frac{\text{number of times desired outcomes occur}}{\text{number of trials in the experiment}}$ • In experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability (Law of Large Numbers).	• What is the difference between the theoretical and experimental probability of an event? Theoretical probability of an event is the expected probability and can be found with a formula. The experimental probability of an event is determined by carrying out a simulation or an experiment. In experimental probability, as the number of trials increases, the experimental probability gets closer to the theoretical probability.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Determine the theoretical probability of an event. • Determine the experimental probability of an event. • Describe changes in the experimental probability as the number of trials increases. • Investigate and describe the difference between the probability of an event found through experiment or simulation versus the theoretical probability of that same event.

7M-PSPFA2 The student will

a) use the relationship within addition and/or multiplication to illustrate that two expressions are equivalent.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• An expression is a name for a number. • An expression that contains a variable is a variable expression. • An expression that contains only numbers is a numerical expression. • A verbal expression is a word phrase (e.g., "the sum of two consecutive integers"). • A verbal sentence is a complete word statement (e.g., "The sum of two consecutive integers is five."). • An algebraic expression is a variable expression that contains at least one variable (e.g., $2x - 5$). • An algebraic equation is a mathematical statement that says that two expressions are equal (e.g., $2x + 1 = 5$). • To evaluate an algebraic expression, substitute a given replacement value for a variable and apply the order of operations. For example, if a = 3 and b = -2 then 5a + b can be evaluated as: 5(3) + (-2) = 15 + (-2) = 13.	• How can algebraic expressions and equations be written? Word phrases and sentences can be used to represent algebraic expressions and equations.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representation to** • Write verbal expressions as algebraic expressions. Expressions will be limited to no more than 2 operations. • Write verbal sentences as algebraic equations. Equations will contain no more than 1 variable term. • Translate algebraic expressions and equations to verbal expressions and sentences. Expressions will be limited to no more than 2 operations. • Identify examples of expressions and equations. • Apply the order of operations to evaluate expressions for given replacement values of the variables. Limit the number of replacements to no more than 3 per expression.

7M-PSPFA3 The student will
a) compare fractions to fractions and decimals to decimals using rational numbers less than one.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The commutative property for addition states that changing the order of the addends does not change the sum (e.g., 5 + 4 = 4 + 5). • The commutative property for multiplication states that changing the order of the factors does not change the product (e.g., 5 · 4 = 4 · 5). • The associative property of addition states that regrouping the addends does not change the sum [e.g., 5 + (4 + 3) = (5 + 4) + 3]. • The associative property of multiplication states that regrouping the factors does not change the product [e.g., 5 · (4 · 3) = (5 · 4) · 3]. • Subtraction and division are neither commutative nor associative. • The distributive property states that the product of a number and the sum (or difference) of two other numbers equals the sum (or difference) of the products of the number and each other number [e.g., 5 · (3 + 7) = (5 · 3) + (5 · 7), or 5 · (3 – 7) = (5 · 3) – (5 · 7)]. • Identity elements are numbers that combine with other numbers without changing the other numbers. The additive identity is zero (0). The multiplicative identity is one (1). There are no identity elements for subtraction and division.	• Why is it important to apply properties of operations when simplifying expressions? Using the properties of operations with real numbers helps with understanding mathematical relationships.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Identify properties of operations used in simplifying expressions. • Apply the properties of operations to simplify expressions.

7M-PSPFA3 The student will
a) compare fractions to fractions and decimals to decimals using rational numbers less than one.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The additive identity property states that the sum of any real number and zero is equal to the given real number (e.g., $5 + 0 = 5$). • The multiplicative identity property states that the product of any real number and one is equal to the given real number (e.g., $8 \cdot 1 = 8$). • Inverses are numbers that combine with other numbers and result in identity elements [e.g., $5 + (–5) = 0$; $\frac{1}{5} \cdot 5 = 1$]. • The additive inverse property states that the sum of a number and its additive inverse always equals zero [e.g., $5 + (–5) = 0$]. • The multiplicative inverse property states that the product of a number and its multiplicative inverse (or reciprocal) always equals one (e.g., $4 \cdot \frac{1}{4} = 1$). • Zero has no multiplicative inverse. • The multiplicative property of zero states that the product of any real number and zero is zero. • Division by zero is not a possible arithmetic operation. Division by zero is undefined.		