7th Grade

The seven standards listed below are the key content competencies students will be expected to master in seventh grade. Additional clarity and details are provided through the classroom-level learning objectives and evidence of student learning details for each grade-level standard found on subsequent pages of this document. As teachers are planning instruction and assessing mastery of the content at the grade level, the focus should remain on the key competencies listed in the table below.

SEVENTH GRADE STANDARDS
7.MP: **Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.**
7.NR.1: **Solve relevant, mathematical problems, including multi-step problems, involving the four operations with rational numbers and quantities in any form (integers, percentages, fractions, and decimal numbers).**
7.PAR.2: **Use properties of operations, generate equivalent expressions and interpret the expressions to explain relevant situations.**
7.PAR.3: **Represent authentic situations using equations and inequalities with variables; solve equations and inequalities symbolically, using the properties of equality.**
7.PAR.4: **Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations.**
7.GSR.5: **Solve practical problems involving angle measurement, circles, area of circles, surface area of prisms and cylinders, and volume of cylinders and prisms composed of cubes and right prisms.**
7.PR.6: **Using mathematical reasoning, investigate chance processes and develop, evaluate, and use probability models to find probabilities of simple events presented in authentic situations.**

Georgia's K-12 Mathematics Standards – 2021

7TH Grade

NUMERICAL REASONING *– integers, percentages, fractions, decimal numbers*

7.NR.1: Solve relevant, mathematical problems, including multi-step problems, involving the four operations with rational numbers and quantities in any form (integers, percentages, fractions, and decimal numbers).

<table>
<tr><th colspan="2">Expectations</th><th colspan="4">Evidence of Student Learning
(not all inclusive; see Grade Level Overview for more details)</th></tr>
<tr><td>7.NR.1.1</td><td>Show that a number and its opposite have a sum of 0 (are additive inverses). Describe situations in which opposite quantities combine to make 0.</td><td colspan="2">Terminology
In the equation 3 + −3 = 0, 3 and −3 are additive inverses of each other.</td><td colspan="2">Example
Your bank account balance is − $25.00. You deposit $25.00 into your account. The net balance is $0.00.</td></tr>
<tr><td>7.NR.1.2</td><td>Show and explain 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. Interpret sums of rational numbers by describing applicable situations.</td><td colspan="2">Strategies and Methods Students should be able to add and subtract integers and other rational numbers presented within relevant, mathematical problems, using strategic thinking and a variety of tools.</td><td colspan="2">Example 6 + (– 4) is 4 units to the left of 6 on a horizontal number line or 4 units down from 6 on a vertical number line.</td></tr>
<tr><td>7.NR.1.3</td><td>Represent addition and subtraction with rational numbers on a horizontal or a vertical number line diagram to solve authentic problems.</td><td colspan="4">Strategies and Methods
Students should represent a variety of types of rational numbers on a number line diagram presented both horizontally and vertically.</td></tr>
<tr><td>7.NR.1.4</td><td>Show and explain 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 contextual situations.</td><td colspan="4">Examples
Find the distance between a submarine submerged at a depth of $27\frac{3}{4}$ feet below sea level and an airplane flying at an altitude of $1262\frac{1}{2}$ feet above sea level.
$-\frac{1}{2}$ – (–2) is the same expression as $-\frac{1}{2}$ + – (–2), which is 2 units to the right of $-\frac{1}{2}$ on a horizontal number line or 2 units up from $-\frac{1}{2}$ on a vertical number line.</td></tr>
<tr><td>7.NR.1.5</td><td>Apply properties of operations, including part-whole reasoning, as strategies to add and subtract rational numbers.</td><td>Fundamentals
Students should be allowed to explore the signs of integers and what they really mean to discover integer rules.</td><td>Strategies and Methods
Students should be able to use the Commutative and Associative properties to combine more than two rational numbers flexibly.</td><td>Terminology
Part-whole reasoning refers to how numbers can be split into parts to add and subtract numbers more efficiently.</td><td>Example
(–8) + 5 + (–2) may be solved as (–8) +(–2) + 5 to first make –10 by using the Commutative Property.</td></tr>
</table>

<table>
<tr><td>7.NR.1.6</td><td>Make sense of multiplication of rational numbers using realistic applications.</td><td colspan="2">Strategies and Methods
Student should have opportunities to use concepts of repeated addition and the meaning of a negative sign as the “opposite of,” with both models and representations, leading to deriving the rules for multiplying signed numbers.
Models may include, but are not limited to, number lines and counters.</td><td>Examples
4 * (–5) is 4 groups of (–5) and (–4) * (–3) is the opposite of 4 * (–3).
If yellow counters represent positive amounts and red counters represent negative amounts, you can model 3 * (–2) as three groups of two red counters.
David has a $0.00 balance in his bank account. He makes three withdrawals of $1.46 each. What is his bank account balance after the three withdrawals?</td></tr>
<tr><td>7.NR.1.7</td><td>Show and explain that integers can be divided, assuming the divisor is not zero, and every quotient of integers is a rational number.</td><td colspan="2">Fundamentals
If p and q are integers (q ≠ 0), then $-\left(\frac{p}{q}\right) = \frac{(-p)}{q} = \frac{p}{(-q)}$.</td><td>Example
$-\left(\frac{20}{5}\right) = -4$ is the same as $\frac{(-20)}{5} = -4$ and $\frac{20}{(-5)} = -4$</td></tr>
<tr><td>7.NR.1.8</td><td>Represent the multiplication and division of integers using a variety of strategies and interpret products and quotients of rational numbers by describing them based on the relevant situation.</td><td>Fundamentals
Students should be allowed to explore the signs of integers and what they really mean to discover integer rules.</td><td>Strategies and Methods
Students can represent multiplication and division using number lines, counters, etc.</td><td>Example
Create a model and realistic situations for each of the products. Write and model the family of equations related to 2 × 3 = 6.
<table><tr><th>Equation</th><th>Number Line Model</th><th>Context</th></tr><tr><td>$2 \times 3 = 6$</td><td>  </td><td>Selling two packages of apples at $3.00 per pack</td></tr><tr><td>$2 \times -3 = -6$</td><td>  </td><td>Spending 3 dollars each on 2 packages of apples</td></tr><tr><td>$-2 \times 3 = -6$</td><td>  </td><td>Owing 2 dollars to each of your three friends</td></tr><tr><td>$-2 \times -3 = 6$</td><td>  </td><td>Forgiving 3 debts of $2.00 each</td></tr></table></td></tr>
<tr><td>7.NR.1.9</td><td>Apply properties of operations as strategies to solve multiplication and division problems involving rational numbers represented in an applicable scenario.</td><td colspan="2">Fundamentals
Students should be allowed to explore the signs of integers and what they really mean to discover integer rules.
Students should be able to reason about direction on a number line when representing multiplication and division using the tool.</td><td>Strategies and Methods
Students should be able to use the Commutative and Associative properties to combine more than two rational numbers flexibly.</td><td>Example
(– 8) * 2 * (–5) may be solved as (– 8) * (2*(–5)) to multiply by negative ten, using the Associative Property.</td></tr>
<tr><td>7.NR.1.10</td><td>Convert rational numbers between forms to include fractions, decimal numbers and percentages, using understanding of the part divided by the whole. Know that the decimal form of a rational number terminates in 0s or eventually repeats.</td><td colspan="2">Fundamentals
This is an extension of previous understanding from 6th grade of writing common fractions as decimal numbers and percentages.</td><td colspan="2">Age/Developmentally Appropriate
Students should know that every rational number can be written as the ratio of two integers, terminating decimal numbers, or repeating decimal numbers.</td></tr>
</table>

7.NR.1.11	Solve multi-step, contextual problems involving rational numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.	***Example*** ● If Sara makes $25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or $2.50, for a new salary of $27.50.

PATTERNING & ALGEBRAIC REASONING *– linear expressions with rational coefficients, complex unit rates, proportional relationships*

7.PAR.2: Use properties of operations, generate equivalent expressions and interpret the expressions to explain relevant situations.

Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)	
7.PAR.2.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	***Fundamentals*** ● Building on work in Grade 6, where students used conventions about the order of operations to rewrite simple expressions such as 2(3 + 8x) as 6 + 16x and 10p - 2 as 2(5p-1), students now encounter linear expressions with more operations that require an understanding of integers, such as 7 - 2(3 - 8x).	***Examples*** ● A rectangle is twice as long as it is wide. One way to write an expression to find the perimeter would be w + w + 2w + 2w. Write the expression in two other ways. ● Write an equivalent expression for 9 – 7(2x + 4).
7.PAR.2.2	Rewrite an expression in different forms from a contextual problem to clarify the problem and show how the quantities in it are related.	***Example*** ● If Madison and Brenda both get paid a wage of $11 per hour, but Madison was paid an additional $55 for overtime, the expression 11(M+B) + 55 may be more clearly interpreted as 11M+55+11B for purposes of understanding Brenda's pay separated from Madison's pay.	

7.PAR.3: Represent authentic situations using equations and inequalities with variables; solve equations and inequalities symbolically, using the properties of equality.

Expectations		Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)				
7.PAR.3.1	Construct algebraic equations to solve practical problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Interpret the solution based on the situation.	***Strategies and Methods*** ● Students should be able to represent relationships in various practical, mathematical situations with equations involving variables and positive and negative rational numbers and explain the	***Fundamentals*** ● Students should be able to fluently solve equations of the specified forms presented in	***Terminology*** ● Fluently/Fluency – Students choose flexibly among methods and strategies to solve mathematical problems accurately and efficiently.	***Age/Developmentally Appropriate*** ● Continue to build on 6th grade objectives of writing and solving one-step equations from a problem situation to multi-step	***Examples*** • Vicky and Bob went to a store to buy school supplies. Vicky spent a total of $22 on school supplies. She spent $13 on a book and spent the rest of the money on notebooks. The store sells notebooks for $1.50 each. Without using a variable,

		meaning of the solution based on the situation. ● Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.	the learning objective. ● Students should use the properties of equality to solve for the value of a variable.		problem situations. This is another opportunity for students to practice using rational numbers including: integers, and positive and negative fractions and decimal numbers.	determine the number of notebooks Vicky bought. • Write an equation that can be used to find the number of notebooks Vicky bought. Use the variable v for the number of notebooks. Solve the equation. Explain the similarities and differences between finding the number of notebooks Vicky bought with and without a variable, paying attention to the sequence of your operations.
7.PAR.3.2	Construct algebraic inequalities to solve problems, leading to inequalities of the form $px \pm q > r$, $px \pm q < r$, $px \pm q \leq r$, or $px \pm q \geq r$, where p, q, and r are specific rational numbers. Graph and interpret the solution based on the realistic situation that the inequalities represent.	***Strategies and Methods*** ● Students should be able to represent relationships in various authentic, mathematical situations with inequalities involving variables and positive and negative rational numbers. ● Students should be able to fluently solve inequalities of the specified forms. To achieve fluency, students should be able to choose flexibly among methods and strategies to solve mathematical problems accurately and efficiently. ● Students should use the properties of inequality to solve for the value of a variable. ● When identifying a specific value for p, q, and r, any rational number can be used. ● Students should be able to graph and interpret the solution of an inequality used as a model to explain real phenomena.			***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.	

7.PAR.4: Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations.

Expectations		Evidence of Student Learning **(not all inclusive; see Grade Level Overview for more details)**	
7.PAR.4.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units presented in realistic problems.	***Strategies and Methods*** ● Students should be able to solve problems involving unit rate presented in practical, everyday situations.	***Example*** ● If a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $(\frac{1}{2})/(\frac{1}{4})$ miles per hour, equivalently 2 miles per hour.

7.PAR.4.2	Determine the unit rate (constant of proportionality) in tables, graphs (1, r), equations, diagrams, and verbal descriptions of proportional relationships to solve realistic problems.	***Age/Developmentally Appropriate*** ● In seventh grade, students are expected to understand that unit rate and constant of proportionality are the same.	***Examples*** ● Jennifer rides on a train for 6 hours and travels 360 miles. How many miles per hour does she travel? ● Mary deposits $115 into her bank account every month, represented by the equation d = 115m. Identify the unit rate from this situation.
7.PAR.4.3	Determine whether two quantities presented in authentic problems are in a proportional relationship.	***Strategies and Methods*** ● Students should be able to analyze and make decisions about relationships using proportional reasoning strategies, which may include but not limited to graphing on a coordinate plane and/or observing whether a graph is a straight line passing through the origin.	***Examples*** ● If Tina uses 2 eggs to make 6 pancakes and Allison uses 4 eggs to make 12 pancakes, is this proportional? ● Jane runs 12 miles in 2.5 hours. Sarah runs 14 miles 3.5 hours. Are Jane and Sarah running at the same rate? Justify your answer.
7.PAR.4.4	Identify, represent, and use proportional relationships.	***Strategies and Methods*** ● Student should be able to identify, represent, and use proportional relationships between quantities using verbal descriptions, tables of values, equations, and graphs to model applicable, mathematical problems: translate from one representation to another. ● Students should be able to model authentic, mathematical relationships involving constant rates where the initial condition starts at 0 using tables of values and graphs. ● Students should be able to represent proportional relationships using equations.	***Example*** ● If the 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 = np.
7.PAR.4.5	Use context to 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.	***Example*** ● Erik feeds stray cats near his house. A graph shows different amounts of cat food he puts out based on the number of cats near his house. Erik graphs point P to represent the unit rate. What does point P mean in terms of the situation? Cups of cat food per cat.	
7.PAR.4.6	Solve everyday 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.	***Strategies and Methods*** ● Students should have opportunities to use proportional reasoning to compute unknown lengths by setting up proportions in tables or equations, or they can reason about how the lengths compare multiplicatively. ● Students should be able to determine the dimensions of figures when given a scale and identify the impact of a scale on actual length (one-dimension) and area (two–dimensions). Students should be able to identify the scale factor given two figures.	***Fundamentals*** ● Students should be given opportunities to explore the concept of similarity informally when learning about scale drawings of geometric figures. They should be able to make informal connections between scale drawings and similarity.

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

Using a given scale drawing, students should be able to reproduce the drawing at a different scale. Students should understand that the lengths will change by a factor equal to the product of the magnitude of the two size transformations.
Students should be given opportunities to explore the concept of similarity by exploring the congruence of corresponding angles and the proportions of corresponding side lengths of geometric figures using hands-on, concrete tools to understand similarity (i.e., patty paper, geometric software).

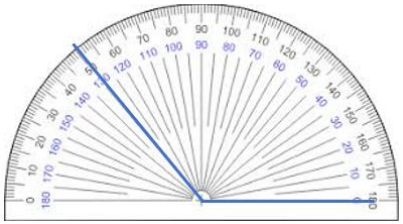
</td><td></td></tr>
<tr><td>7.PAR.4.7</td><td>Use similar triangles to explain why the slope, m, is the same between any two distinct points on a non-vertical line in the coordinate plane.</td><td colspan="3">Strategies and Method
Students should be able to use proportional reasoning to explain why the slope, m, is the same between any two distinct points.</td></tr>
<tr><td>7.PAR.4.8</td><td>Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.</td><td>Fundamentals
Students should demonstrate a conceptual understanding of slope.
Students should be able to use graphical reasoning to represent proportional relationships. The proportional relationships explored by students should represent practical, realistic situations.</td><td colspan="2">Examples
Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
Mark was looking to fertilize his lawn, which is 432 sq. ft. He read the packages of 2 different fertilizer bags to see how much should be used. Bag A stated 2 ounces per 4 square feet and Bag B can be represented using the table below:
<table>
<tr><td>Ounces</td><td>2</td><td>4</td><td>12</td></tr>
<tr><td>Square Feet</td><td>3</td><td>6</td><td>18</td></tr>
</table>
What is the unit rate for each bag? Which bag should Mark purchase for his lawn? Why?</td></tr>
<tr><td>7.PAR.4.9</td><td>Use proportional relationships to solve multi-step ratio and percent problems presented in applicable situations.</td><td>Strategies and Methods
Students may use flexible strategies such as a + 0.05a = 1.05a with the understanding that adding a 5% tax to a total is the same as multiplying the total by 1.05.</td><td colspan="2">Terminology
Simple interest – a quick and easy method of calculating the interest charge on a loan. Simple interest is determined by multiplying the daily interest rate by the principal by the number of days that elapse between payments. Simple Interest = (principal) * (rate) * (# of periods)
Tax – money that people must pay to the government
Markups and markdowns - increase and decrease in the amount of a quantity
Gratuities - a tip given to a waiter, taxicab driver, etc.
Commissions - a fee paid to an agent as compensation for completing a transaction</td></tr>
<tr><td>7.PAR.4.10</td><td>Predict characteristics of a population by examining the characteristics of a representative sample. Recognize the potential limitations and scope of the sample to the population.</td><td colspan="3">Strategies and Methods
Students can generate questions about things they notice and wonder from a relevant situation. Questions posed should be ones that requires data that will vary.
Students should have opportunities to create and answer statistical investigative questions about a population by collecting data from a representative sample, using random sampling techniques to collect the data.
Students should be able to create a statistical investigative question that can be answered by gathering data from practical situations and determine strategies for gathering data to answer the statistical investigative question.
Potential limitations may include how the sample was selected and/or how the questions were asked.</td></tr>
</table>

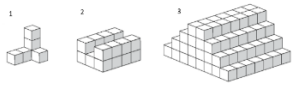
7.PAR.4.11	Analyze sampling methods and conclude that random sampling produces and supports valid inferences.	***Strategies and Methods*** ● Students should have opportunities to critique examples of sampling techniques. ● Students should conclude when conditions of sampling methods may be biased, random, and not representative of the population.	
7.PAR.4.12	Use data from repeated random samples to evaluate how much a sample mean is expected to vary from a population mean. Simulate multiple samples of the same size.	***Fundamentals*** ● Students should use sample data collected to draw inferences.	***Examples*** ● Estimate the mean word length in a book by randomly sampling words from the book. Gauge how far off the estimate is from the actual mean. ● Predict the winner of a school election based on randomly sampled survey data. Gauge how far off the prediction might be.

GEOMETRIC & SPATIAL REASONING *– vertical, adjacent, complementary, and supplementary angles, circumference and area of circles, area and surface area, volume of cubes, right prisms, and cylinders*

7.GSR.5: Solve practical problems involving angle measurement, circles, area of circles, surface area of prisms and cylinders, and volume of cylinders and prisms composed of cubes and right prisms.

Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**			
7.GSR.5.1	Measure angles in whole non-standard units.	***Fundamentals*** ● Students should be able to recognize angles as geometric shapes formed when two rays share a common endpoint. In previous grades, students learned to draw and measure right, acute, and obtuse angles. ● To understand measurement, students should measure in non-standard units, such as unit angles or wedges, before being introduced to tools with abstract units such as degrees. ● Students should also be able to explore this learning objective by investigating angles within circles.			***Example*** ● Fold a circle of patty paper or waxed paper in half four times to create an angle measuring tool with 16 wedges. This protractor can be used to determine the number of units (wedges) in an angle.
7.GSR.5.2	Measure angles in whole number degrees using a protractor.	***Age/Developmentally Appropriate*** ● Students should be able to use a 180° protractor to draw or measure an angle to the nearest whole degree.	***Fundamentals*** ● In previous grades, students measured angles in reference to a circle with the center at the common endpoint of two rays. They should be able to use this knowledge to determine an angle's measure in relation to the 360	***Strategies and Methods*** ● Students should be able to use hand-held and virtual protractors. ● Student should be able to use angle measurement tools that help them connect non-standard units (wedges, unit angles, etc.) to standard units of angle measurement (degrees).	***Examples*** ● Students may be given angles to find precise measurements of angles. Here is an example of how students may use a protractor and measurement reasoning to determine precise angle measurements.

			degrees in a circle through division or as a missing factor problem.		 *Sample student response:* *The angle measures 130 degrees.*
7.GSR.5.3	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve equations for an unknown angle in a figure.	***Age and Developmentally Appropriate*** ● Students should be able to use a 180° protractor to draw or measure an angle to the nearest whole degree to write and solve equations. ● Reflex angles are not an expectation at this grade level.	***Fundamentals*** ● In previous grades, students have studied angles by type according to size: acute, obtuse, and right, and their role as an attribute in polygons. Now angles are considered based upon the special relationships that exist among them: supplementary, complementary, vertical, and adjacent angles. ● Students should be able to use relationships to write and solve equations for multi-step problems.		***Terminology*** ● Supplementary angles – two angles add up to 180 degrees ● Complementary angles – two angles add up to 90 degrees ● Vertical angles – angles opposite each other when two lines intersect. ● Adjacent angles – Two angles that have a common side and a common vertex (corner point), and do not overlap.
7.GSR.5.4	Explore and describe the relationship between pi, radius, diameter, circumference, and area of a circle to derive the formulas for the circumference and area of a circle.	***Strategies and Methods*** ● Students should use proportional reasoning to explain the relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π in order to derive the formulas for the circumference and area of a circle.	***Age/Developmentally Appropriate*** ● Square roots are an 8th grade expectation.		***Terminology*** ● ***Special Note:*** The terms pi, radius, diameter, and circumference are new academic vocabulary for students. ● Pi - The ratio of a circle's circumference to its diameter. ● Radius - The distance from the center to the circumference of a circle. ● Diameter - The distance from one point on a circle through the center to another point on the circle. ● Circumference - The distance around the edge of a circle.
7.GSR.5.5	Given the formula for the area and circumference of a circle, solve problems that exist in everyday life.	***Age/Developmentally Appropriate*** ● Students should be given the formula for area and circumference of a circle when solving problems.	***Example*** ● The seventh-grade class is building a mini golf game for the school carnival. 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: $A = \pi r^2$ OR $C = 2\pi r$?		

7.GSR.5.6	Solve realistic problems involving surface area of right prisms and cylinders.	***Age/Developmentally Appropriate*** ● Students should solve problems involving surface areas of prisms with triangles, rectangles, and other polygons as bases. ● Students are not expected to memorize formulas to solve problems involving surface area.	***Strategies and Methods*** ● Students should have an opportunity to solve single to multi-step authentic, mathematical problems. ● Students should have opportunities to apply knowledge of the area of triangles, rectangles, and other polygons to solve problems involving surface area of prisms. ● Students should have opportunities to discover the surface area of a cylinder by decomposing the figure into circles and rectangles. ● Students should use geometric and spatial reasoning to solve problems involving surface area.	***Terminology*** ● Cylinder – any three-dimensional figure with two congruent, opposite faces called bases connected by adjacent curved or flat faces (bases can include circles, triangles, rectangles, or other shapes). The bases can be connected by two lines that are parallel to each other. ● Right prism – any three-dimensional figure with two polygons for bases that are opposite, congruent, and perpendicular to the adjacent faces ● The inclusive definition of a cylinder classifies prisms as special types of cylinders used to derive formulas that apply to all types of cylinders and prisms alike (Van de Walle, Karp, & Bay-Williams, 2010). ● All prisms are cylinders, but not all cylinders are prisms (Van de Walle, Karp, Lovett & Bay-Williams, 2010).	***Example*** ● Cole is planning to cover a cylindrical drum in leather. The diameter of the drum is 10 inches, and its height is 16 inches. What is the minimum amount of leather Cole will need? 
7.GSR.5.7	Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in the plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.	***Age/Developmentally Appropriate*** ● Cross-sections should be limited to horizontal and vertical slices.	***Strategies and Methods*** ● Students should have opportunities to explore models of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres that can be sliced. ● Students should determine the different planes that can be created with the slices.	***Fundamentals*** ● Students should conclude the resulting two-dimensional shape created after the slice is not the entire three-dimensional shape that remains. ● In seventh grade, cross sections should be limited to horizontal and vertical slices.	***Terminology*** ● Prism – a solid figure that has the same cross section all along its length
7.GSR.5.8	Explore volume as a measurable attribute of cylinders and right prisms. Find the volume of these geometric figures using concrete problems.	***Strategies and Methods*** ● Students should apply knowledge of cross sections as a strategy for revealing a base of cylinders including right prisms.	***Terminology*** ● Cylinder – any three-dimensional figure with two congruent, opposite faces called bases connected by adjacent curved or flat	***Age/Developmentally Appropriate*** ● Cylinders explored in Grade 7 should be limited to right circular	***Examples*** ● Identical toy building cubes were used to make the stacks shown below. 

		• Students should apply reasoning about the volume of rectangular prisms to explore the volume of cylinders and other three-dimensional objects composed of cubes and right prisms. • Students should apply their knowledge of area of a circle when finding the volume of a cylinder. • Students should use the formula Volume = area of the base times height or V = B x h to find the volume of a cylinder.	faces (bases can include circles, triangles, rectangles, or other shapes). The bases can be connected by two lines that are parallel to each other. • Right prism – any three-dimensional figure with two polygons for bases that are opposite, congruent, and perpendicular to the adjacent faces. • The inclusive definition of a cylinder classifies prisms as special types of cylinders used to derive formulas that apply to all types of cylinders and prisms alike. (Van de Walle, et.al., 2010) • All prisms are cylinders, but not all cylinders are prisms. (Van de Walle, Karp, Lovett & Bay-Williams, 2010) • The formula for volume used in Grade 7 is V = B (area of the base) x h (height), where B=area of the base, h = height.	cylinders. Right circular cylinders are three-dimensional solid figures with two congruent, parallel, circular bases that are connected by a curved face that is perpendicular to each base. • Students should explore experimentally and conceptually the hierarchy of cylinders and prisms.	Which stack takes up the least space? Which stack takes up the most space? Order the stacks from the one that takes up the least space to the one that takes up the most space. • A farmer is storing ground corn in a silo during the winter months. What is the maximum capacity of the cylindrical part of each silo that has a 20-foot diameter and a 55-foot height for which the farmer can store the ground corn? 

PROBABILITY REASONING *– likelihood, theoretical and experimental probability*				
7.PR.6: Using mathematical reasoning, investigate chance processes and develop, evaluate, and use probability models to find probabilities of simple events presented in authentic situations.				
Expectations		**Evidence of Student Learning** **(not all inclusive; see Grade Level Overview for more details)**		
7.PR.6.1	Represent the probability of a chance event as a number between 0 and 1 that expresses the likelihood of the event occurring. Describe that a probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	***Strategies and Methods*** ● Students should be able to represent the probability as a fraction, decimal numbers, or percentage.	***Terminology*** ● Descriptions may include impossible, unlikely, equally likely, likely, and certain.	
7.PR.6.2	Approximate the probability of a chance event by collecting data on an event and observing its long-run relative frequency will approach the theoretical probability.	***Strategies and Methods*** ● Students should be able to predict the approximate, relative frequency given the theoretical probability.	***Example*** ● When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.	
7.PR.6.3	Develop a probability model and use it to find probabilities of simple events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy.	***Strategies and Methods*** ● Probability models may include various random generation devices including, but not limited to, bag pulls, spinners, number cubes, coin toss, and colored chips. ● Students should have multiple opportunities to collect data using physical objects, graphing calculators, or web-based simulations.	***Example*** ● Kim calculates the probability of landing on heads when tossing a coin to be 50%. She uses this to predict that when Tiffany tosses a coin 20 times, the coin will land on heads 10 times. When Tiffany performed the experiment, the coin landed on heads 7 times. Explain possible reasons why Kim's prediction and Tiffany's results do not match.	
7.PR.6.4	Develop a uniform probability model by assigning equal probability to all outcomes and use the model to determine probabilities of events.	***Example*** ● If a student is selected at random from a class, find the probability a student with long hair will be selected.		
7.PR.6.5	Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.	***Terminology*** ● Uniform probability models are those where the likelihood of each outcome is equal.	***Examples*** ● Find the approximate probability of each outcome in a spinner with unequal sections. ● 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?	
7.PR.6.6	Use appropriate graphical displays and numerical summaries from data distributions with categorical or quantitative (numerical) variables as probability models to draw	***Strategies and Methods*** ● Students should use side by side bar graphs or segmented bar graphs to compare categorical data distributions	***Age/Developmentally Appropriate*** ● Limit category counts to be less than or equal to ten.	***Example*** ● Compare the heights of the basketball and the tennis teams.

	informal inferences about two samples or populations.	of samples from two populations. ● Students should compare data of two samples or populations displayed in box plots and dot plots to make inferences using probabilistic reasoning. ● Students should be able to draw inferences using measures of central tendency (mean, median, mode) and/or variability (range, mean absolute deviation and interquartile range) from random samples. ● Conclusions should be made related to a population, using a random sample, by describing a distribution using measures of central tendency (mean, median, mode) and/or variability (range, mean absolute deviation, and interquartile range). ● Students should be given multiple opportunities to compare quantitative data distributions of samples from two populations.	● Limit quantitative variables to less than or equal to 20.	Basketball team's heights (in inches): 72, 75, 76, 76, 79, 79, 80, 80, 81, 81, 81 Tennis team's height (in inches): 67, 67, 68, 70, 70, 71, 72, 75, 76, 76, 77 1) How much taller is the basketball team than the tennis team? 2) Two students are trying out for the basketball team. What is the probability their height will be greater than 79 inches?