Louisiana STUDENT STANDARDS
MATHEMATICS

Grade 7

Louisiana Student Standards: Companion Document for Teachers 2.0

This document is designed to assist educators in interpreting and implementing the Louisiana Student Standards for Mathematics. Found here are descriptions of each standard which answer questions about the standard's meaning and application to student understanding. Also included are the intended level of rigor and coherence links to prerequisite and corequisite standards. Examples are samples only and should not be considered an exhaustive list.

Additional information on the Louisiana Student Standards for Mathematics, including how to read the standards' codes, a listing of standards for each grade or course, and links to additional resources, is available on the Louisiana Department of Education K-12 Math Planning Page. Please direct any questions to STEM@la.gov.

Updated August 15, 2022

DEPARTMENT of EDUCATION
Louisiana Believes

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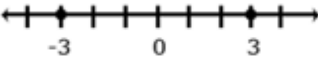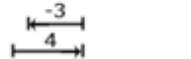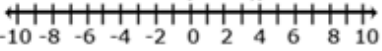
How-to-Read Guide

The diagram below provides an overview of the information found in all companion documents. Definitions and more complete descriptions are provided on the next page.

Domain Name and Abbreviation

Cluster Letter and Description

The Number System (NS)

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

In this cluster, the terms students should learn to use with increasing precision are **rational numbers, integers,** and **additive inverse.**

7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their

Component(s) of Rigor: Conceptual Understanding(1,1a, 1b, 1c, 1d), Procedural Skill and Fluency (1, 1d)

Remediation - Previous Grade(s) Standard: 5.NF.A.1 6.NS.C.5

7th **Grade Standard Taught in Advance:** none

7th **Grade Standard Taught Concurrently:** none

Students add and subtract rational numbers. Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with these operations. In sixth grade, students found the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction is finding the distance between two numbers on a number line. This standard allows for adding and subtracting of negative fractions and decimals and interpreting solutions in given context.

Examples:

- Have students substitute rational numbers for p and q and use a number line to find $p - q$ and $p + (-q)$, repeating this multiple times with different numbers. Students should see a pattern that they end up at the same point on the number line. Inductively, students should conclude that $p - q = p + (-q)$.

- -3 and 3 are shown to be opposites on the number line because they are equal distance from zero and therefore have the same absolute value and the sum of the number and its opposite is zero.

- $4 + (-3) = 1$ or $(-3) + 4 = 1$

- Use a number line to add $-5\frac{1}{2} + 7$.

- Use a number line to subtract: $-6 - (-\frac{2}{3})$

Component(s) of Rigor

Prior grade(s) standards. Click hyperlink to access standard's text.

Current grade standards taught prior to or with this standard

Information and samples to exemplify the standard.

Text of the standard

★ **Shading of Standard Codes:** ■ **Major Work,** ☐ **Supporting Work,** ○ **Additional Work**

1. **Domain Name and Abbreviation:** A grouping of standards consisting of related content that are further divided into clusters. Each domain has a unique abbreviation and is provided in parentheses beside the domain name.
2. **Cluster Letter and Description:** Each cluster within a domain begins with a letter. The description provides a general overview of the focus of the standards in the cluster.
3. **Previous Grade(s) Standards:** One or more standards that students should have mastered in previous grades to prepare them for the current grade standard. If students lack the pre-requisite knowledge and remediation is required, the previous grade standards provide a starting point.
4. **Standards Taught in Advance:** These current grade standards include skills or concepts on which the target standard is built. These standards are best taught before the target standard.
5. **Standards Taught Concurrently:** Standards which should be taught with the target standard to provide coherence and connectedness in instruction.
6. **Component(s) of Rigor:** See full explanation on components of rigor.
7. **Sample Problem:** The sample provides an example how a student might meet the requirements of the standard. Multiple examples are provided for some standards. However, sample problems should not be considered an exhaustive list. Explanations, when appropriate, are also included.
8. **Text of Standard:** The complete text of the targeted Louisiana Student Standards of Mathematics is provided.

Classification of Major, Supporting, and Additional Work

Students should spend the large majority of their time on the ■ major work of the grade. ☐Supporting work and, where appropriate, ○additional work can engage students in the major work of the grade. Each standard is color-coded to quickly and simply determine how class time should be allocated. Furthermore, standards from previous grades that provide foundational skills for current grade standards are also color-coded to show whether those standards are classified as ■major, ☐supporting, or ○additional in their respective grades.

Components of Rigor

The K-12 mathematics standards lay the foundation that allows students to become mathematically proficient by focusing on conceptual understanding, procedural skill and fluency, and application.

Conceptual Understanding refers to understanding mathematical concepts, operations, and relations. It is more than knowing isolated facts and methods. Students should be able to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful. It also allows students to connect prior knowledge to new ideas and concepts.

Procedural Skill and Fluency is the ability to apply procedures accurately, efficiently, and flexibly. It requires speed and accuracy in calculation while giving students opportunities to practice basic skills. Students' ability to solve more complex application tasks is dependent on procedural skill and fluency.

Application provides a valuable content for learning and the opportunity to solve problems in a relevant and a meaningful way. It is through real-world application that students learn to select an efficient method to find a solution, determine whether the solution makes sense by reasoning, and develop critical thinking skills.

Standards for Mathematical Practice

The Louisiana Standards for Mathematical Practice are expected to be integrated into every mathematics lesson for all students in grades K-12. Below are a few examples of how these practices may be integrated into tasks that students in grade 7 complete.

Louisiana Standards for Mathematical Practice (MP)	
Louisiana Standard	**Explanations and Examples**
7.MP.1 Make sense of problems and persevere in solving them.	In grade 7, students solve problems involving ratios and rates and discuss how they solved them. Students solve real-world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"
7.MP.2 Reason abstractly and quantitatively.	In grade 7, students represent a wide variety of real-world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
7.MP.3 Construct viable arguments and critique the reasoning of others.	In grade 7, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (e.g., box plots, dot plots, histograms). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?", and "Does that always work?" They explain their thinking to others and respond to others' thinking.
7.MP.4 Model with mathematics.	In grade 7, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real-world contexts and connect symbolic and graphical representations. Students explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (e.g., box plots and histograms) to draw inferences, make comparisons and formulate predictions. Students use experiments or simulations to generate data sets and create probability models. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.

Louisiana Standard	Explanations and Examples
7.MP.5 Use appropriate tools strategically.	Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 7 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms.
7.MP.6 Attend to precision.	In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations or inequalities.
7.MP.7 Look for and make use of structure.	Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (e.g., $6 + 2x = 2 (3 + x)$ by distributive property) and solve equations (e.g. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality; $c=6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real-world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities.
7.MP.8 Look for and express regularity in repeated reasoning.	In grade 7, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ and construct other examples and models that confirm their generalization. They extend their thinking to include complex fractions and rational numbers. Students formally begin to make connections between covariance, rates, and representations showing the relationships between quantities. They create, explain, evaluate, and modify probability models to describe simple and compound events.

Ratios and Proportional Relationships (RP)

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

In this cluster, the terms students should learn to use with increasing precision are **rates, unit rates, ratios, proportional relationships, constant of proportionality, complex fractions, percent, simple interest, rate, principal, tax, discount, markup, markdown, gratuity, commissions, fees, and percent of error**.

Louisiana Standard	Explanations and Examples
■7.RP.A.1 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 ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.*	**Component(s) of Rigor:** Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** ■6.RP.A.2 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none Students continue to work with ratios from sixth grade; however, the associated units rates can now include computations with complex fractions. The ratios can come from quantities with like or different units. **Example:** If $\frac{1}{2}$ gallon of paint covers $\frac{1}{6}$ of a wall, then how much paint is needed for the entire wall? *Solution:* $\frac{1}{2}$ *gal /* $\frac{1}{6}$ *wall.* *3 gallons per 1 wall*

7.RP.A.2 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.

b. 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.

c. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

d. 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*.

Component(s) of Rigor: Conceptual Understanding (2, 2a, 2b, 2c, 2d), Procedural Skill and Fluency (2, 2a, 2c)
Remediation - Previous Grade(s) Standard: 6.RP.A.2, 6.RP.A.3
**7th Grade Standard Taught in Advance:** 7.RP.A.1
7th Grade Standard Taught Concurrently: none

This standard focuses on the representations of proportional relationships. Solving problems using proportional relationships is addressed in **7.RP.A.3**. Students create tables and graphs of proportional or non-proportional relationships. Graphing proportional relationships represented in a table helps students recognize that the graph is a line through the origin (0,0).

Examples:

- A student is making trail mix. Using the table below, create a graph to show the relationship between cups of fruit and cups of nuts. Is this a proportional relationship? If the graph does not show a proportional relationship, then explain why not. If the graph shows a proportional relationship, then determine the constant of proportionality and explain how it relates to both the table and graph.

Serving Size	1	2	3	4
Cups of Nuts (x)	1	2	3	4
Cups of Fruit (y)	2	4	6	8
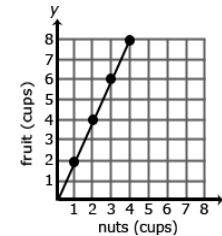
The graph shows a proportional relationship. For each serving size, there are 2 cups of fruit for every 1 cup of nuts (2:1). The constant of proportionality is 2 and can be seen on the graph at the coordinate point (1, 2). The constant of proportionality can be seen in the table as the value by which you multiply the number of cups of nuts to get the number of cups of fruit for each serving size.

- The table below gives the price for different numbers of books. Is the price proportional to the number of books?

| Number of Books	Price
1	3
3	9
4	12
7	18

7.RP.A.2 *continued*	No, the price is not proportional to the number of books. If the relationship was proportional, the price per book would be $3 as indicated by the ordered pair (1, 3). However, the ordered pair (7, 18) does not indicate a price per book of $3. A proportional relationship would require a constant that allows you to calculate the price for any number books, i.e., a constant of proportionality.

- The graph below represents the cost of gum packs as a rate of $2 dollars for every pack of gum, represented as $2/pack. Represent the relationship using a table and an equation.

Table:

Number of Packs of Gum (*g*)	Cost in Dollars (*d*)
0	0
1	2
2	4
3	6
4	8
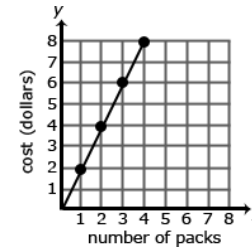
Equation: *d = 2g*, where *d* is the cost in dollars and *g* is the number of packs of gum. The unit rate and constant of proportionally, 2, can be read from the graph at the coordinate point (1, 2). The constant of proportionality, 2, can be seen in the table as the value by which you multiply the number of packs of gum to get the cost in dollars

A common error is to reverse the position of the variables when writing equations. Students may find it useful to use variables specifically related to the quantities rather than using x and y. Describing the relationship verbally or in writing may be helpful. A student might describe the situation as "the number of packs of gum times the cost for each pack is the total cost in dollars." They can use this verbal model to construct the equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost.

7.RP.A.3 Use proportional relationships to solve multi-step ratio and percent problems of simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, and percent error.	**Component(s) of Rigor:** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 6.RP.A.3 **7th Grade Standard Taught in Advance:** 7.RP.A.2 **7th Grade Standard Taught Concurrently:** none
	Students should be able to explain or show their work using a representation (numbers, words, pictures, physical objects, or equations) and verify that their answer is reasonable. Models help students to identify the parts of the problem and how the values are related. For percent increase and decrease, students first identify the whole amount for which the percent is defined in order to understand the meaning of the percent of increase/decrease. **Examples:** - Gas prices are projected to increase 124% within the next year. A gallon of gas currently costs $1.85. What is the projected cost of a gallon of gas? A student might say: "The original cost of a gallon of gas is $1.85. An increase of 100% means that the cost will double. I will also need to add another 24% to figure out the final projected cost of a gallon of gas. Since 24% of $1.85 is about $0.44, the projected cost of a gallon of gas should be around $4.14." $1.85 + 1.85 + (0.24 • 1.85) = 2.24 x 1.85 <table><tr><td>100%</td><td>100%</td><td>24%</td></tr><tr><td>$1.85</td><td>$1.85</td><td>??</td></tr></table> - A sweater is marked down 33%. Its original price was $37.50. What is the price of the sweater before sales tax? <table><tr><td colspan="2">37.50</td></tr><tr><td>33% of 37.50</td><td>67% of 37.50</td></tr></table> The sale price is the original price minus the discount ($37.50 - $37.50 × 0.33) or $37.50(1–0.33) or $37.50 × 0.67. Students should recognize that if the original price is decreased by 33%, then a person pays 67% of the original price. Finding the percent error is the process of expressing the size of the error (or deviation) between two measurements. To calculate the percent error, students determine the absolute deviation (positive difference) between an expected measurement and the actual measurement and then divide by the actual measurement. Multiplying by 100 will give the percent error. (Note the similarity between percent error and percent of increase or decrease.) **It is important the students understand this connection rather than just applying the formula.** This can be done by asking students how they think the size of an error can be determined. $$\text{" \% error } = \frac{|\text{amount of error}|}{\text{actual measurement}} \times 100\%\text{"}$$

7.RP.A.3 continued	**Examples:**
	• Jamal needs to purchase a countertop for his kitchen. Jamal measured the countertop as 5 ft. The actual measurement is 4.5 ft. What is Jamal's percent error? *Solution:* % error = $\frac{\mid 5\ ft - 4.5\ ft \mid}{4.5\ ft}$ x 100% % error = $\frac{0.5\ ft}{4.5\ ft}$ x 100 ≈ 11% • A shirt is on sale for 40% off. The sale price is $12. What was the original price? What was the amount of the discount? | Discount 40% of original	Sale Price → $12 60% of original
Original Price (*p*)		 The sale price is 60% of the original price. This reasoning can be expressed as 12 = 0.60*p*. Dividing both sides of the equation by 60 gives an original price of $20. • At a certain store, 48 television sets were sold in April. The manager at the store wants to encourage the sales team to sell more TVs and is going to give all the sales team members a bonus if the number of TVs sold increases by 30% in May. How many TVs must the sales team sell in May to receive the bonus? Justify your solution. • A salesperson set a goal to earn $2,000 in May. He receives a base salary of $500 as well as a 10% commission for all sales. How much merchandise will he have to sell to meet his goal? • After eating at a restaurant, your bill before tax is $52.60. The sales tax rate is 8%. You decide to leave a 20% tip for the waiter based on the pre-tax amount. How much is the tip you leave for the waiter? How much will the total bill be, including tax and tip?

The Number System (NS)

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

In this cluster, the terms students should learn to use with increasing precision are **rational numbers, integers,** and **additive inverse**.

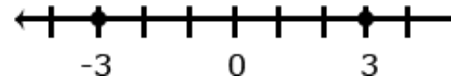|	
■**7.NS.A.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.	**Component(s) of Rigor:** Conceptual Understanding(1,1a, 1b, 1c, 1d), Procedural Skill and Fluency (1, 1d) **Remediation - Previous Grade(s) Standard:** ■5.NF.A.1, ■6.NS.C.5 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none

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.*

b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real world contexts.
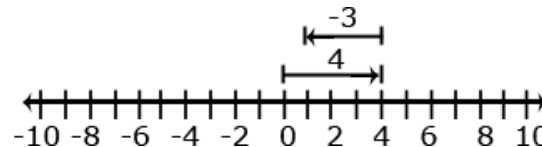
Students add and subtract rational numbers. Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with these operations. In sixth grade, students found the distance of horizontal and vertical segments on the coordinate plane. In seventh grade, students build on this understanding to recognize subtraction is finding the distance between two numbers on a number line. This standard allows for adding and subtracting of negative fractions and decimals and interpreting solutions in given context.
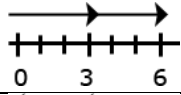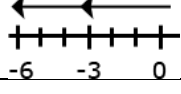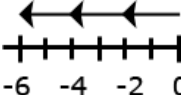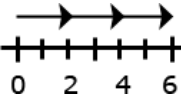
Examples:

- Have students substitute rational numbers for p and q and use a number line to find $p - q$ and $p + (-q)$, repeating this multiple times with different numbers. Students should see a pattern that they end up at the same point on the number line. Inductively, students should conclude that $p - q = p + (-q)$.

- -3 and 3 are shown to be opposites on the number line because they are equal distance from zero and therefore have the same absolute value and the sum of the number and its opposite is zero.

- $4 + (-3) = 1$ or $(-3) + 4 = 1$

- Use a number line to add $-5\frac{1}{2} + 7$.

- Use a number line to subtract: $-6 - (-\frac{2}{3})$

7.NS.A.1 *continued* d. Apply properties of operations as strategies to add and subtract rational numbers.	
7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (−1)(−1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.	**Component(s) of Rigor:** Conceptual Understanding (2, 2a, 2b, 2c, 2d), Procedural Skill and Fluency (2, 2c, 2d) **Remediation - Previous Grade(s) Standard:** 5.NF.B.3, 5.NF.B.4, 6.NS.A.1 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none Students understand that multiplication and division of integers is an extension of multiplication and division of whole numbers. Students recognize that when division of rational numbers is represented with a fraction bar, the numerator and denominator signs affect the value of the fraction. Using long division from 6.NS.B.2, students understand the difference between terminating and repeating decimals. This understanding is foundational for the work with rational and irrational numbers in eighth grade. • Examine the family of equations in the table below. What patterns are evident? Create a model and context for each of the products.

Equation	Number Line Model	Context
2 • 3 = 6		Selling two packages of apples at $3.00 per pack
2 • -3 = -6		Spending 3 dollars each on 2 packages of apples
-2 • 3 = -6		Owing 2 dollars to each of your three friends
-2 • -3 = 6		Forgiving 3 debts of $2.00 each

7.NS.A.2 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.
 	
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.
 	
.
	• Which of the following fractions is equivalent to $\frac{-4}{5}$? Explain your reasoning.
	
	  a. $\frac{4}{-5}$　　b. $\frac{-16}{20}$　　c. $\frac{-4}{-5}$
	
	• Using long division, express the following fractions as decimals. Which of the following fractions will result in terminating decimals; which will result in repeating decimals?
	
	  a) $\frac{7}{8}$　　b) $\frac{4}{11}$　　c) $4\frac{5}{16}$　　d) $\frac{2}{9}$

| **7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers.* *Computations with rational numbers extend the rules for manipulating fractions to complex fractions.	**Component(s) of Rigor:** Procedural Skill and Fluency, Application
	Remediation - Previous Grade(s) Standard: ■ 4.OA.A.3, ●6.NS.B.3
	7th Grade Standard Taught in Advance: none
	7th Grade Standard Taught Concurrently: none
	Students use order of operations from sixth grade and multiple grouping symbols (parentheses, braces, and brackets) to write and solve problems with all rational numbers.
	Examples:
	• Calculate: [-10(-0.9)] – [(-10) • 0.11] *Solution*: 10.1
	• Jim's cell phone bill company is automatically deducting $32 from his bank account every month. How much will the cell phone bill deductions affect this bank account over a year? *Solution:* -$384 (decreases amount by $384)
	• It took a submarine 20 seconds to drop to 100 feet below sea level from the surface. What was the rate of the descent? *Solution: -5 feet per second*
	• A newspaper reports these changes in the price of a stock over four days: – 0.125, –0.625, 0.375, –1.125. What is the average daily change? *Solution: –0.375*

Expressions and Equations (EE)	
A. Use properties of operations to generate equivalent expressions.	
In this cluster, the terms students should learn to use with increasing precision are **coefficients, like terms, distributive property, factor** and **linear expression.**	
Louisiana Standard	**Explanations and Examples**
■**7.EE.A.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients to include multiple grouping symbols (e.g., parentheses, brackets, and braces).	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** ■6.EE.A.3, ■6.EE.A.4 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** ■7.EE.A.2<hr>**Examples:** - Simplify the expression $3(x +5) – 2$. *Solution: 3x + 13* - Suzanne says the two expressions $2(3a – 2) + 4a$ and $10a – 2$ are equivalent. Is she correct? Explain why or why not? *Solution: No, 2(3a – 2) + 4a is equivalent to 10a – 4. You must multiply 2(3a – 2) and get 6a-4 and then add 4a to 6a.* - Factor the expression $3a + 12$. *Solution: 3(a + 4)*
■**7.EE.A.2** 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."*	**Component(s) of Rigor**: Conceptual Understanding **Remediation - Previous Grade(s) Standard**: none **7th Grade Standard Taught in Advance**: none **7th Grade Standard Taught Concurrently**: ■7.EE.A.1<hr>Students understand the reason for rewriting an expression in terms of a contextual situation. For example, students understand that a 20% discount is the same as finding 80% of the cost, c, which is equivalent to 0.80c. **Examples:** - All varieties of a certain brand of cookies are $3.50. A person buys peanut butter cookies and chocolate chip cookies. Susan wrote two different expressions that represent the total cost of the cookies if p represents the number of peanut butter cookies and c represents the number of chocolate chip cookies. - One of the expressions Susan wrote was $3.50p + $3.50c. Explain what Susan's expression means. - What is another expression Susan could have written to represent the cost? Explain what the expression means. - Solution: All types of cookies cost $3.50. In her first expression, Susan is multiplying the cost times the number of peanut butter cookies, multiplying the same cost times the number of chocolate chip cookies, and then adding the two products. Susan could also have written the expression $3.50(p + q). Since the cookies all

7.EE.A.2 *continued*	cost the same, she is first finding the total number of cookies she bought and the multiplying that number of cookies times the cost per cookie.

- Jamie and Ted both get paid an equal hourly wage of $9 per hour. This week, Ted made an additional $27 dollars in overtime. Write an expression that represents the weekly wages of both if J represents the number of hours that Jamie worked this week and T represents the number of hours Ted worked this week? Can you write the expression in another way?
- Students may create several different expressions depending upon how they group the quantities in the problem.
  - One student might say: "To find the total wage, I would first multiply the number of hours Jamie worked by 9. Then I would multiply the number of hours Ted worked by 9. I would add these two values with the $27 overtime to find the total wages for the week." The student would write the expression 9 J + 9T +27.
  - Another student might say: "To find the total wages, I would add the number of hours that Ted and Jamie worked. I would multiply the total number of hours worked by 9. I would then add the overtime to that value to get the total wages for the week." The student would write the expression 9(J + T) + 27.
  - A third student might say: "To find the total wages, I would need to figure out how much Jamie made and add that to how much Ted made for the week. To figure out Jamie's wages, I would multiply the number of hours she worked by 9. To figure out Ted's wages, I would multiply the number of hours he worked by 9 and then add the $27 he earned in overtime. My final step would be to add Jamie and Ted wages for the week to find their combined total wages." The student would write the expression 9J + (9T + 27).
- Write and interpret an expression that represents the area of Anna's room.
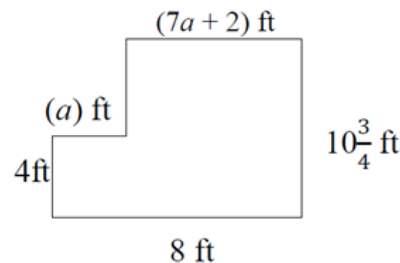
Anna's Room

Solution 1: Student divides figure into two rectangles and finds the sum.
$10\frac{3}{4}(7a + 2) + 4a$ *square feet or equivalent.*

Solution 2: Student assumes there is one large rectangle and subtracts the area of the "missing" rectangle in the upper left hand corner.
$8\left(10\frac{3}{4}\right) - \left(10\frac{3}{4} - 4\right)a$ *square feet or equivalent*

Expressions and Equations (EE)	
B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.	
In this cluster, the terms students should learn to use with increasing precision are **numeric expressions, algebraic expressions, maximum,** and **minimum**.	
Louisiana Standard	**Explanations and Examples**

■**7.EE.B.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.*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency, Application
	 Remediation - Previous Grade(s) Standard: none
	 7th Grade Standard Taught in Advance: ■7.NS.A.3
	 7th Grade Standard Taught Concurrently: none
	
	 Students solve contextual problems and mathematical problems using rational numbers. Students convert between fractions, decimals, and percents as needed to solve the problem. Students use estimation to justify the reasonableness of answers. Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to:
	
	 • front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts),
	
	 • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate),
	
	 • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values),
	
	 • using friendly or compatible numbers such as factors (students seek to fit numbers together - e.g., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and
	
	 • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate).
	
	 Examples:
	 • Calculate: $\left(-\frac{3}{2} + 4\frac{1}{5}\right) - \frac{2}{5}\left(-2.17 + 4.67\right)$
	 • Three students conduct the same survey about the number of hours people sleep at night. The results of the number of people who sleep 8 hours a nights are shown below. In which person's survey did a higher proportion sleep 8 hours?
	     o Susan reported that 18 of the 48 people she surveyed get 8 hours sleep a night
	     o Kenneth reported that 36% of the people he surveyed get 8 hours sleep a night
	     o Jamal reported that 0.365 of the people he surveyed get 8 hours sleep a night

7.EE.B.4 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?*
 	
b. Solve word problems leading to inequalities of the form *px+q>r, px + q ≥ r, 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.*
	Component(s) of Rigor: Conceptual Understanding, Procedural Skill and Fluency, Application
	Remediation - Previous Grade(s) Standard: 6.EE.B.6, 6.EE.B.7, 6.EE.B.8
	7th Grade Standard Taught in Advance: 7.NS.A.3
	7th Grade Standard Taught Concurrently: 7.RP.A.2
	
	Students write an equation or inequality to model the situation. Students explain how they determined whether to write an equation or inequality and the properties of the real number system that were used to find a solution. In contextual problems, students define the variable and use appropriate units. In part a, students use the arithmetic from the problem to generalize an algebraic solution. In part b, students solve and graph inequalities and make sense of the inequality in context. Rational numbers may include any type of rational numbers, including negatives. Students may be asked to find a maximum or minimum value in context. Furthermore, it is appropriate for students to sometimes use exact answers (i.e., leaving answers in terms of π).
	
	Examples:
	
	• Solve each equation for x.
	
	    o $\frac{2}{3}x - 7 = 13$
	
	    o $\frac{1}{2}(x - 13) = -5$ **Teacher Note:** Students should recognize that this equation can be solved **without** using the distributive property.
	
	• Amie had $26 dollars to spend on school supplies. After buying 10 pens, she had $14.30 left. How much did each pen cost?
	
	• The sum of three consecutive even numbers is 48. What is the smallest of these numbers?
	
	• Florencia has at most $60 to spend on clothes. She wants to buy a pair of jeans for $22 dollars and spend the rest on t-shirts. Each t-shirt costs $8. Write an inequality for the number of t-shirts she can purchase.
	
	• Steven has $25 dollars. He spent $10.81, including tax, to buy a new DVD. He needs to set aside $10.00 to pay for his lunch next week. If peanuts cost $0.38 per package including tax, what is the maximum number of packages that Steven can buy?
	
	  Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number system that you used to find a solution.
	
	• The youth group is going on a trip to the state fair. The trip costs $52. Included in that price is $11 for a concert ticket and the cost of 2 passes, one for the rides and one for the game booths. Each of the passes cost the same price. Write an equation representing the cost of the trip and determine the price of one pass.

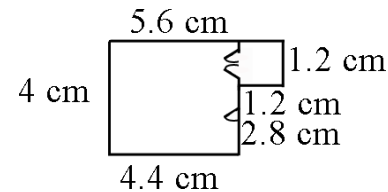| Geometry (G)	
A. Draw, construct, and describe geometrical figures and describe the relationships between them.	
In this cluster, the terms students should learn to use with increasing precision are **scale drawing, dimensions, scale factor, plane sections, right rectangular prism, right rectangular pyramids, parallel, perpendicular, scalene triangle, obtuse triangle, equilateral triangle,** and **right triangle**.	
Louisiana Standard	**Explanations and Examples**
7.G.A.1 Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	**Component(s) of Rigor:** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 6.G.A.1 **7th Grade Standard Taught in Advance:** 7.RP.A.2 **7th Grade Standard Taught Concurrently:** none
	Students 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 identify the scale factor given two figures. Using a given scale drawing, students reproduce the drawing at a different scale. Students understand that the lengths will change by a factor equal to the product of the magnitude of the two size transformations. **Example**: • Julie showed you the scale drawing of her room. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie's room? Reproduce the drawing at 3 times its current size. 5.6 cm 1.2 cm 4 cm 1.2 cm 2.8 cm 4.4 cm • If the rectangle below is enlarged using a scale factor of 1.5, what will be the perimeter and area of the new rectangle? 7 in. 2 in.

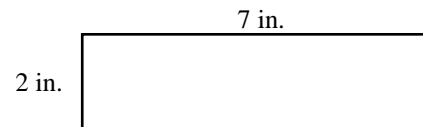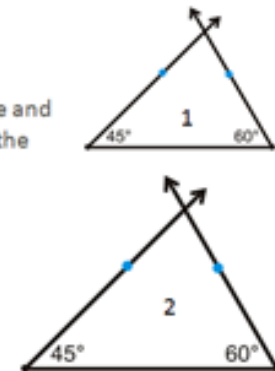| **7.G.A.2** Draw (freehand, with ruler and protractor, or with technology) geometric shapes with given conditions. (Focus is on triangles from three measures of angles or sides, noticing when the conditions determine one and only one triangle, more than one triangle, or no triangle.)	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency **Remediation - Previous Grade(s) Standard:** none **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none
	Students draw geometric shapes with given parameters. Conditions could involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity. Being able to successfully master this standard depends on several facts that grade 7 students have not learned in the past. Teachers should allow students to investigate these rather than providing students the information. 1. The sum of the angles in a triangle is 180°. https://illuminations.nctm.org/Activity.aspx?id=3546 2. An infinite number of triangles can be created using the same three angle measures (e.g., there are many triangles with angles whose measures are 45°, 60°, and 75°). Below is a sample investigation which can be repeated multiple times to show that multiple triangles can be created using these angles. 3. To form a triangle using side lengths, the sum of any two sides must be greater than the length of the third side. Manipulative Lesson: http://www.cpalms.org/Public/PreviewResourceLesson/Preview/40261 Technology Investigation: https://www.geogebra.org/m/tx8ckqXg 4. When #3 is true, only one triangle can be made using a given set of 3 side lengths. Use the Manipulative Lesson for #3. After step 2, have the students compare their triangles to show that each student made the same triangle.

🟡**7.G.A.2** *continued*	**Examples:**
	• Draw a triangle with angles that are 60 degrees. Is this a unique triangle? Why or why not?
	• Draw an isosceles triangle with only one 80 degree angle. Is this the only possibility or can you draw another triangle that will also meet these conditions?
	• Can you draw a triangle with sides that are 13 cm, 5 cm and 6cm? Why or why not?
	• Draw a quadrilateral with one set of parallel sides and no right angles.
	• Is it possible to draw more than one triangle with angles of 45, 35, and 100 degrees? Show that this is possible or indicate why it would be impossible.
🟡**7.G.A.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.	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** none **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none
	Students need to describe the resulting face shape from cuts made parallel and perpendicular to the bases of right rectangular prisms and pyramids. • Cross sections of right rectangular prisms can be found at: https://www.youtube.com/watch?v=NrJKGVjr9cs or https://learnzillion.com/lesson_plans/7809-describe-2-dimensional-cross-sections-of-right-rectangular-prisms • Cross sections of right rectangular pyramids can be found at http://intermath.coe.uga.edu/dictnary/descript.asp?termID=95

| Geometry (G)	
B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.	
In this cluster, the terms students should learn to use with increasing precision are **inscribed, circumference, radius, diameter, pi, ∏, supplementary, vertical, adjacent, complementary, pyramids, face,** and **base.**	
Louisiana Standard	**Explanations and Examples**
⬤**7.G.B.4** Know the formulas for the area and circumference of a circle and solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** ▢6.G.A.1 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none
	Students understand the relationship between radius and diameter. Students also understand the ratio of circumference to diameter can be expressed as Pi. Building on these understandings, students generate the formulas for circumference and area. "Know the formula" does not mean memorization of the formula. To "know" means to have an understanding of **why** the formula works and how the formula relates to the measure (area and circumference) and the figure. This understanding should be for *all* students. Students solve problems (mathematical and real-world) involving circles or semi-circles. **Note:** Because Pi is an irrational number that neither repeats nor terminates, the measurements are approximate when 3.14 is used in place of π. Furthermore, it is appropriate for students to sometime use exact answers (i.e., leaving answers in terms of π).
	Examples: • Students measure the circumference and diameter of several circular objects in the room (clock, trash can, door knob, wheel, etc.). Students organize their information and discover the relationship between circumference and diameter by noticing the pattern in the ratio of the measures. Students write an expression that could be used to find the circumference of a circle with any diameter and check their expression on other circles. • The illustration shows the relationship between the circumference and area. If a circle is cut into wedges and laid out as shown, a parallelogram results. Half of an end wedge can be moved to the other end a rectangle results. The height of the rectangle is the same as the radius of the circle. The base length is $\frac{1}{2}$ the circumference (2∏r). The area of the rectangle (and therefore the circle) is found by the following calculations: Area = Base x Height Area = ½ (2πr) x *r* Area = πr x *r* Area = πr^2
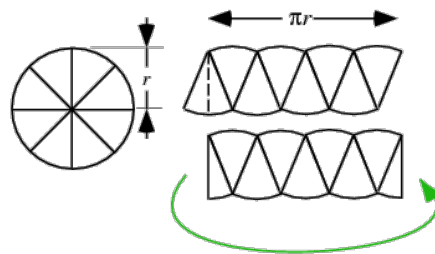
7.G.B.4 *continued*	• The seventh grade class is building a mini golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size?
	• If a circle is cut from a square piece of plywood as shown, how much plywood would be left over?
	• The center of the circle is at (2, -3). What is the area of the circle?
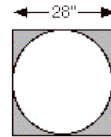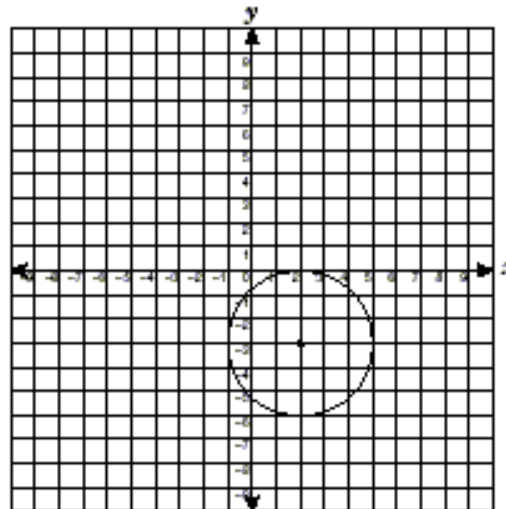
7.G.B.4 *continued*	• What is the perimeter of the inside of the track?
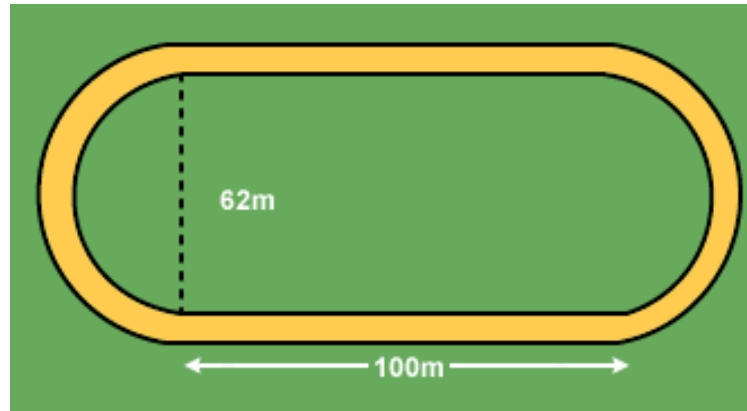
7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency
	Remediation - Previous Grade(s) Standard: 4.MD.C.7
	7th Grade Standard Taught in Advance: none
	7th Grade Standard Taught Concurrently: none
	Students use understandings of angles and deductive reasoning to write and solve equations. Teachers should use/create problems that require grade-level equations as defined in 7.EE.B.4.
	Examples: (Figures may not be to scale.)
	• Write and solve an equation to find the measure of angle *x*.
	• Write and solve an equation to find the measure of angle *x*.
	• Find the measure of angle *b*.
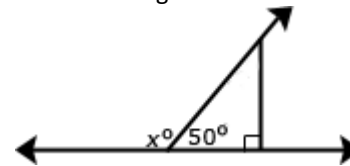
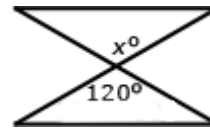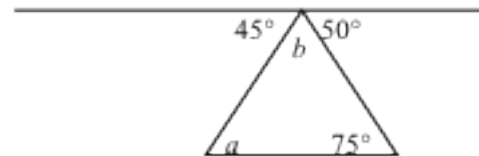|	
7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. (Pyramids limited to surface area only.)	**Component(s) of Rigor:** Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** 6.G.A.1; 6.G.A.2, 6.G.A.4 **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none
	Students continue work from fifth and sixth grades to find area, volume and surface area of two-dimensional and three-dimensional objects using composite shapes. Students will not work with cylinders, as circles are not polygons. At this level, students determine the dimensions of the figures given the area or volume. "Know the formula" does not mean memorization of the formula. To "know" means to have an understanding of **why** the formula works and how the formula relates to the measure (area and volume) and the figure. This understanding should be for *all* students. Surface area formulas are not the expectation with this standard. Building on work with nets in the sixth grade, students should recognize that finding the area of each face of a three-dimensional figure and adding the areas will give the surface area. No nets will be given at this level; however, students could create nets to aid in surface area calculations. Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students solve for missing dimensions, given the area or volume. Students determine the surface area of pyramids. **Examples**: • Choose one of the figures shown below and write a step by step procedure for determining the area. Find another person that chose the same figure as you did. How are your procedures the same and different? Would the procedures used by you and your partner give the same result? • The surface area of a cube is 96 in^2. What is the volume of the cube?
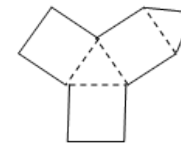
7.G.B.6 *continued*	• Find the area of the trapezoid shown below.
	Teacher Note: Students should decompose the trapezoid into a rectangle and two triangles to find the area. The formula for the area of a trapezoid is not provided on the Grade 7 reference sheet.
	• Jennie purchased a box of crackers from the deli. The box is in the shape of a triangular prism (see diagram below). If the volume of the box is 3,240 cubic centimeters, what is the height of the triangular face of the box? How much packaging material was used to construct the cracker box? Explain how you got your answer.
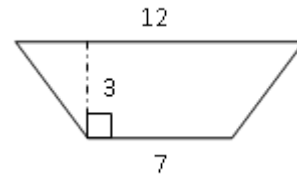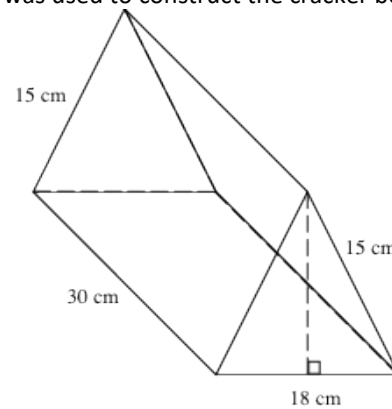
Statistics and Probability (SP)	

A. Use random sampling to draw inferences about a population.

In this cluster, the terms students should learn to use with increasing precision are **random sampling, population, representative sample,** and **inferences**.

Louisiana Standard	Explanations and Examples

☐**7.SP.A.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.	**Component(s) of Rigor:** Conceptual Understanding
	Remediation - Previous Grade(s) Standard: ⬤6.SP.A.1, ⬤6.SP.A.2
	7ᵗʰ Grade Standard Taught in Advance: ☐7.SP.C.5
	7ᵗʰ Grade Standard Taught Concurrently: none
	
	Students recognize that it is difficult to gather statistics on an entire population. Instead a random sample can be representative of the total population and will generate valid predictions. Students use this information to draw inferences from data. A random sample must be used in conjunction with the population to get accuracy. For example, a random sample of elementary students cannot be used to give a survey about the senior prom.
	
	Example:
	
	• The school food service wants to increase the number of students who eat hot lunch in the cafeteria. The student council has been asked to conduct a survey of the student body to determine the students' preferences for hot lunch. They have determined two ways to do the survey. The two methods are listed below. Identify the type of sampling used in each survey option. Which survey option should the student council use and why?
	
	   o Write all of the students' names on cards and randomly select 20 students to complete the survey.
	
	   o Survey the first 20 students that enter the lunch room.

☐**7.SP.A.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.*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** none **7th Grade Standard Taught in Advance:** ☐7.SP.A.1 **7th Grade Standard Taught Concurrently:** none
	Students collect and use multiple samples of data to make generalizations about a population. Issues of variation in the samples should be addressed. **Example**: • Below is the data collected from two random samples of 100 students regarding students' school lunch preferences. Make at least two inferences based on the results. **Lunch Preferences** <table><tr><td>student sample</td><td>hamburgers</td><td>tacos</td><td>pizza</td><td>total</td></tr><tr><td>#1</td><td>12</td><td>14</td><td>74</td><td>100</td></tr><tr><td>#2</td><td>12</td><td>11</td><td>77</td><td>100</td></tr></table> Possible responses: Most students prefer pizza. More people prefer pizza than hamburgers and tacos combined.

Statistics and Probability (SP)

**B. Draw informal comparative inferences about two populations.**

In this cluster, the terms students should learn to use with increasing precision are **variation/variability, distribution, measures of center,** and **measures of variability**.

Louisiana Standard	Explanations and Examples

🟡**7.SP.B.3** Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities using quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency
	Remediation - Previous Grade(s) Standard: 🟩5.NF.B.4, 🟩6.NS.A.1, 🟦6.SP.A.1
	7th Grade Standard Taught in Advance: none
	7th Grade Standard Taught Concurrently: none
	
	This is the students' first experience with comparing two data sets. Students build on their understanding of graphs, mean, median, and interquartile range from sixth grade. Students understand that
	     1. a full understanding of the data requires consideration of the measures of variability as well as mean or median.
	     2. variability is responsible for the overlap of two data sets and that an increase in variability can increase the overlap. .
	     3. median is paired with the interquartile range and mean is paired with the mean absolute deviation.
	
	Example:
	
	• Jason wanted to compare the mean height of the players on his favorite basketball and soccer teams. He thinks the mean height of the players on the basketball team will be greater but doesn't know how much greater. He also wonders if the variability of heights of the athletes is related to the sport they play. He thinks that there will be a greater variability in the heights of soccer players as compared to basketball players. He used the rosters and player statistics from the team websites to generate the following lists.
	
	Basketball Team – Height of Players in inches for 2010-2011 Season
	
	75, 73, 76, 78, 79, 78, 79, 81, 80, 82, 81, 84, 82, 84, 80, 84
	
	Soccer Team – Height of Players in inches for 2010
	
	73, 73, 73, 72, 69, 76, 72, 73, 74, 70, 65, 71, 74, 76, 70, 72, 71, 74, 71, 74, 73, 67, 70, 72, 69, 78, 73, 76, 69
	
	To compare the data sets, Jason creates a two dot plots on the same scale. The shortest player is 65 inches and the tallest players are 84 inches.

7.SP.B.3 *continued*

Height of Soccer Players (in)
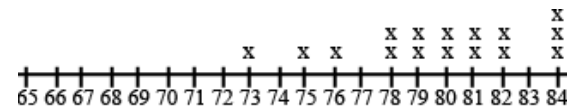
Height of Basketball Players (in)

In looking at the distribution of the data, Jason observes that there is some overlap between the two data sets. Some players on both teams have heights between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets.

The mean height of the basketball players is 79.75 inches as compared to the mean height of the soccer players at 72.07 inches, a difference of 7.68 inches.

The mean absolute deviation (MAD) is calculated by taking the mean of the absolute deviations for each data point. The difference between each data point and the mean is recorded in the second column of the table. The difference between each data point and the mean is recorded in the second column of the table. Jason used rounded values (80 inches for the mean height of basketball players and 72 inches for the mean height of soccer players) to find the differences. The absolute deviation, absolute value of the deviation, is recorded in the third column. The absolute deviations are summed and divided by the number of data points in the set.

The mean absolute deviation is 2.14 inches for the basketball players and 2.53 for the soccer players. These values indicate moderate variation in both data sets.

There is slightly more variability in the height of the soccer players.

7.SP.B.3 *continued*

Soccer Players (n = 29)			Basketball Players (n = 16)		
Height (in)	Deviation from Mean (in)	Absolute Deviation (in)	Height (in)	Deviation from Mean (in)	Absolute Deviation (in)
65	-7	7	73	-7	7
67	-5	5	75	-5	5
69	-3	3	76	-4	4
69	-3	3	78	-2	2
69	-3	3	78	-2	2
70	-2	2	79	-1	1
70	-2	2	79	-1	1
70	-2	2	80	0	0
71	-1	1	80	0	0
71	-1	1	81	1	1
71	-1	1	81	1	1
72	0	0	82	2	2
72	0	0	82	2	2
72	0	0	84	4	4
72	0	0	84	4	4
73	+1	1	84	4	4
73	+1	1			
73	+1	1			
73	+1	1			
73	+1	1			
73	+1	1			
74	+2	2			
74	+2	2			
74	+2	2			
74	+2	2			
76	+4	4			
76	+4	4			
76	+4	4			
78	+6	6			
Σ = 2090		Σ = 62	Σ = 1276		Σ = 40

Mean = 2090 ÷ 29 = 72 inches   Mean = 1276 ÷ 16 = 80 inches
MAD = 62 ÷ 29 = 2.14 inches   MAD = 40 ÷ 16 = 2.53 inches

〇**7.SP.B.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.*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency, Application **Remediation - Previous Grade(s) Standard:** none **7th Grade Standard Taught in Advance:** ☐7.SP.A.2, 〇7.SP.B.3 **7th Grade Standard Taught Concurrently:** none

	Students compare two sets of data using measures of center (mean and median) and variability (MAD and IQR).
	
	Example:
	
	The two data sets below depict random samples of the management salaries in two companies. Based on the salaries below which measure of center will provide the most accurate estimation of the salaries for each company?
	    • Company A: 1.2 million, 242,000, 265,500, 140,000, 281,000, 265,000, 211,000
	    • Company B: 5 million, 154,000, 250,000, 250,000, 200,000, 160,000, 190,000
	
	Solution:
	The median would be the most accurate measure since both companies have one value in the million that is far from the other values and would affect the mean.

Statistics and Probability (SP)

C. Investigate chance processes and develop, use, and evaluate probability models.

Mathematically proficient students communicate precisely by engaging in discussion about their reasoning using appropriate mathematical language. The terms students should learn to use with increasing precision with this cluster are **sample spaces**, **probability, chance event, frequency, simple event, compound event, probability model (uniform and not), theoretical probability,** and **empirical (experimental) probability.**

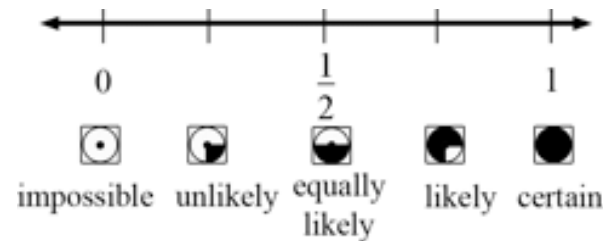| Louisiana Standard	Explanations and Examples
☐**7.SP.C.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	**Component(s) of Rigor:** Conceptual Understanding **Remediation - Previous Grade(s) Standard:** none **7th Grade Standard Taught in Advance:** none **7th Grade Standard Taught Concurrently:** none This is the students' first formal introduction to probability. Students recognize that the probability of any single event can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1, inclusive, as illustrated on the number line below. The closer the fraction is to 1, the greater the probability the event will occur. Larger numbers indicate greater likelihood. For example, if someone has 10 oranges and 3 apples, you have a greater likelihood of randomly selecting an orange. Students can use simulations such as Marble Mania on AAAS or the Random Drawing Tool on NCTM's Illuminations to generate data and examine patterns. Marble Mania: http://www.sciencenetlinks.com/interactives/marble/marblemania.html Random Drawing Tool: http://illuminations.nctm.org/activitydetail.aspx?id=67

☐**7.SP.C.5** *continued*	**Example**:
	• The container below contains 2 gray, 1 white, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a white marble? A gray marble? A black marble? Justify each of your predictions.

☐**7.SP.C.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.*	**Component(s) of Rigor:** Conceptual Understanding, Procedural Skill and Fluency
	Remediation - Previous Grade(s) Standard: none
	7th Grade Standard Taught in Advance: ☐7.RP.A.3, ☐7.SP.C.5
	7th Grade Standard Taught Concurrently: none

Students collect data from a probability experiment, recognizing that as the number of trials increase, the experimental probability approaches the theoretical probability. The focus of this standard is relative frequency -- The relative frequency is the observed number of successful events for a finite sample of trials. Relative frequency is the observed proportion of successful events, expressed as the value calculated by dividing the number of times an event occurs by the total number of times an experiment is carried out.

Example:

- Each group receives a bag that contains 4 green marbles, 6 red marbles, and 10 blue marbles. Each group performs 50 pulls, recording the color of marble drawn and replacing the marble into the bag before the next draw. Students compile their data as a group and then as a class. They summarize their data as experimental probabilities and make conjectures about theoretical probabilities (How many green draws would you expect if you were to conduct 1000 pulls? 10,000 pulls?).

  Students create another scenario with a different ratio of marbles in the bag and make a conjecture about the outcome of 50 marble pulls with replacement. (An example would be 3 green marbles, 6 blue marbles, 3 blue marbles.)

  Students try the experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.

7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
 	
a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *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.*
 	
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?*
	Component(s) of Rigor: Conceptual Understanding (7, 7a,7b), Procedural Skill and Fluency (7, 7a, 7b)
	Remediation - Previous Grade(s) Standard: none
	7th Grade Standard Taught in Advance: 7.RP.A.3, 7.SP.C.6
	7th Grade Standard Taught Concurrently: none
	
	Probabilities are useful for predicting what will happen over the long run. Using theoretical probability, students predict frequencies of outcomes. Students 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.
	
	Students need multiple opportunities to perform probability experiments and compare these results to theoretical probabilities. Critical components of the experiment process are making predictions about the outcomes by applying the principles of theoretical probability, comparing the predictions to the outcomes of the experiments, and replicating the experiment to compare results. Experiments can be replicated by the same group or by compiling class data. Experiments can be conducted using various random generation devices including, but not limited to, bag pulls, spinners, number cubes, coin toss, and colored chips. Students can collect data using physical objects or graphing calculator or web-based simulations.
	
	Examples:
	
	• Jason is tossing a fair coin. He tosses the coin ten times and it lands on heads eight times. If Jason tosses the coin an eleventh time, what is the probability that it will land on heads? *Solution:* ½ The result of the eleventh toss does not depend on the previous results.
	
	• Conduct an experiment using a Styrofoam cup by tossing the cup and recording how it lands.
	
	    o How many trials were conducted?
	    o How many times did it land right side up?
	    o How many times did it land upside down?
	    o How many times did it land on its side?
	    o Determine the probability for each of the above results

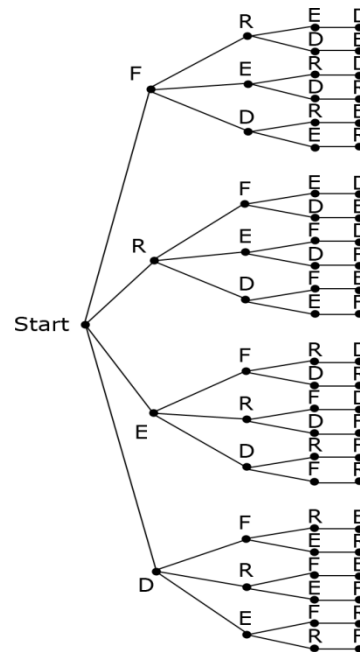| **☐7.SP.C.8** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.	**Component(s) of Rigor:** Conceptual Understanding (8, 8a, 8b, 8c), Procedural Skill and Fluency (8, 8b, 8c), Application (8, 8c)
	Remediation - Previous Grade(s) Standard: none
	7th Grade Standard Taught in Advance: ■7.RP.A.3, ☐7.SP.C.7
	7th Grade Standard Taught Concurrently: none
a. 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.	Students use tree diagrams, frequency tables, and organized lists, and simulations to determine the probability of compound events.
	Examples:
b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.	• Students conduct a bag pull experiment. A bag contains 5 marbles. There is one red marble, two blue marbles and two purple marbles. Students will draw one marble without replacement and then draw another. What is the sample space for this situation? Explain how you determined the sample space and how you will use it to find the probability of drawing one blue marble followed by another blue marble.
	• Show all possible arrangements of the letters in the word FRED using a tree diagram. If each of the letters is on a tile and drawn at random, what is the probability that you will draw the letters F-R-E-D in that order? What is the probability that your "word" will have an F as the first letter?
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?*	

Grade 4 Standards

4.OA.A.3 Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. *Example: Twenty-five people are going to the movies. Four people fit in each car. How many cars are needed to get all 25 people to the theater at the same time? Return to* 7.NS.A.3

4.MD.C.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a letter for the unknown angle measure. *Return to* 7.G.B.5

Grade 5 Standards

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
Return to 7.NS.A.1

5.NF.B.3 Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie? Return to* 7.NS.A.2

5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
   a. Interpret the product (m/n) x q as m parts of a partition of q into n equal parts; equivalently, as the result of a sequence of operations, m x q ÷ n. For example, use a visual fraction model to show understanding, and create a story context for (m/n) x q.
   b. Construct a model to develop understanding of the concept of multiplying two fractions and create a story context for the equation. [In general, (m/n) x (c/d) = (mc)/(nd).]
   c. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths.
   d. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Return to 7.NS.A.2, 7.SP.B.3

Grade 6 Standards

■**6.RP.A.2** Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $3/4$ cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* *Return to* ■7.RP.A.1, ■7.RP.A.2

■**6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

    a.   Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

    b.   Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what unit rate were lawns being mowed?*

    c.   Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $30/100$ times the quantity); solve problems involving finding the whole, given a part and the percent.

    d.   Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Return to ■7.RP.A.2, ■7.RP.A.3

■**6.NS.A.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$-cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?* *Return to* ■7.NS.A.2, 7.SP.B.3

○**6.NS.B.3** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. *Return to* ■7.NS.A.3

■**6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. *Return to* ■7.NS.A.1

■**6.EE.A.3** Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* *Return to* ■7.EE.A.1

6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* *Return to* 7.EE.A.1

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *Return to* 7.EE.B.4

6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations and inequalities of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. Inequalities will include <, >, ≤, and ≥. *Return to* 7.EE.B.4

6.EE.B.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. *Return to* 7.EE.B.4

6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. *Return to* 7.G.A.1, 7.G.B.4, 7.G.B.6

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\,w\,h$ and $V = b\,h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. *Return to* 7.G.B.6

6.G.A.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. *Return to* 7.G.B.6

6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* *Return to* 7.SP.A.1, 7.SP.B.3

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape. *Return to* 7.SP.A.1