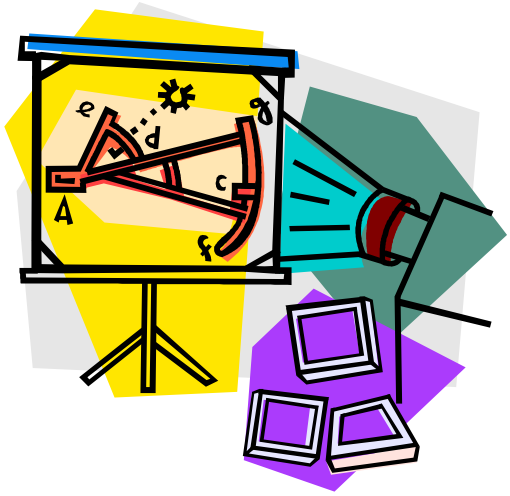
Mathematics

Curriculum
Grade Seven
Accelerated



COMMON CORE STATE STANDARDS IN CONNECTICUT

CCSS Aligned DRAFT 1 6/20/2012

Overview:
This curriculum is aligned to the Common Core State Standards for Mathematics.
Standards are coded (see below). For each standard, or cluster of standards, activities are listed that are specific to those standards. Extensions, technology and other support materials (including those found in the teachers' manuals) are listed to help with differentiation of math instruction.

Standards for Mathematical Practice: The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. The Mathematical Practices should be used when planning lessons. (See Appendix A for a full description of each standard with explanations and examples for your grade level.)

Standards for Mathematical Content: Examples and Explanations of each content standard can be found in Appendix A in a document titled *MATHEMATICS: Arizona Academic Content Standards.*

Glossary of Terms: Key terms needed to understand the units of study can be found in Appendix A.

Vocabulary:
A list of important mathematical vocabulary can be found at the end of each unit. Students need to become fluent with vocabulary so that they can communicate effectively in mathematics. It is suggested that math vocabulary be posted for each unit, and that students have opportunities to "define" terms using words, numbers, pictures, examples and by making connections to their lives or other areas of mathematics.

Pacing Guide: Refer to the pacing guide for a sequence of units of study.

Key to Coding:

Standards define what students should understand and be able to do.
Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.
Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.

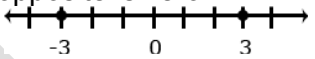
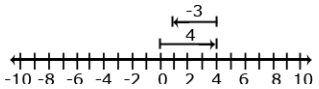
Example:
CC.7.EE.1 refers to Common Core, Grade 7, Expressions and Equations, standard 1.
CC.8.EE.1 refers to Common Core, Grade 8, Expressions and Equations, standard 1.

Domain and clusters for Grade 7 Accelerated can be found on the next page. Standards are listed in the text of the curriculum.

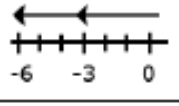
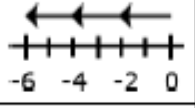
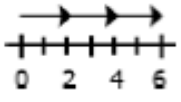
UNIT OF STUDY 1: Algebraic Reasoning with Integers

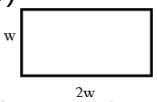
Pacing: 30 days (plus 4 days for reteaching/enrichment)

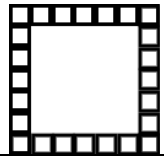
Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Domain and Standards Overview
Number System • Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. **Expressions and Equations** • Use properties of operations to generate equivalent expressions. • Solve real-life and mathematical problems using numerical and algebraic expressions and equations

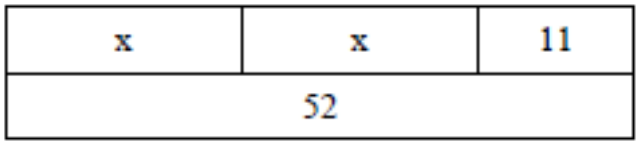
Priority and Supporting **CCSS**	**Explanations and Examples***
7.NS. 1. APPLY and EXTEND previous understandings of addition and subtraction to ADD and SUBTRACT rational numbers; REPRESENT addition and subtraction on a horizontal or vertical number line diagram. **a. DESCRIBE situations in which opposite quantities combine to make 0. *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.** **d. APPLY properties of operations as strategies to add and subtract rational numbers.**	**7.NS. 1.** Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with the operations. Examples: • Use a number line to illustrate: o *p - q* o *p + (- q)* o Is this equation true *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 it's opposite is zero.  You have $4 and you need to pay a friend $3. What will you have after paying your friend? 4 + (-3) = 1 or (-3) + 4 = 1 
7.NS.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.)	7.NS.3. Examples: • Your cell phone bill is automatically deducting $32 from your bank account every month. How much will the deductions total for the year? -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 = 12 (-32) • It took a submarine 20 seconds to drop to 100 feet below sea level from the surface. What was the rate of the descent? $\frac{-100 \text{ feet}}{20 \text{ seconds}} = \frac{-5 \text{ feet}}{1 \text{ second}} = -5 \text{ ft/sec}$

Priority and Supporting Common Core State Standards	**Explanation and Examples**
7.NS.2. APPLY and EXTEND previous understandings of multiplication and division and of fractions to MULTIPLY and DIVIDE rational numbers. **a. UNDERSTAND that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. INTERPRET products of rational numbers by describing real- world contexts.** **b. UNDERSTAND that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then –(*p*/*q*) = (–*p*)/*q* = *p*/(–*q*). INTERPRET quotients of rational numbers by describing real-world contexts.** **c. APPLY properties of operations as strategies to multiply and divide rational numbers.** **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.**	. **7.NS.2.** Multiplication and division of integers is an extension of multiplication and division of whole numbers. Examples: • Examine the family of equations. What patterns do you see? Create a model and context for each of the products. Write and model the family of equations related to 3 x 4 = 12.

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

Priority and Supporting Common Core State Standards	Explanation and Examples
7.EE.1. APPLY properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	7.EE.1. Examples: • Write an equivalent expression for $3(x + 5) – 2$ • Suzanne thinks the two expressions $2(3a – 2)$ and $10a – 2$ are equivalent? Is she correct? Explain why or why not? • Write equivalent expressions for $3a + 12$. Possible solutions might include factoring as in $3(a + 4)$, or other expressions such as $a + 2a + 7 + 5$. • A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w$. Write the expression in two other ways. Solution: 6w OR $2(w) + 2(2w)$  • An equilateral triangle has a perimeter of $6x + 15$. What is the length of each of the sides of the triangle? Solution: $2(2x + 5)$, therefore each side is $2x + 5$ units long.

Priority and Supporting Common Core State Standards	Explanation and Examples
7.EE.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 percent" is the same as "multiply by 1.05."*	. 7.EE.2. Examples: • 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 = the number of hours that Jamie worked this week and T = 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. $9J + 9T + 27$. 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 $(9J) + (9T + 27)$. • Given a square pool as shown in the picture, write four different expressions to find the total number of tiles in the border. Explain how each of the expressions relates to the diagram and demonstrate that the expressions are equivalent. Which expression do you think is most useful? Explain your thinking. 

Priority and Supporting Common Core State Standards	Explanation and Examples
7.EE.3. SOLVE multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. APPLY properties of operations to calculate with numbers in any form; CONVERT between forms as appropriate; and ASSESS the reasonableness of answers US(E)ing mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10percent 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.*	. **7.EE.3.** 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 - i.e., 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). Example: • 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.  $2x + 11 = 52$ $2x = 41$ $x = \$20.5$

Priority and Supporting Common Core State Standards	Explanation and Examples
7.EE.4 (emphasis on) 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 equations of the form *px + q > r or px + q < r,* where *p, q, and r* are specific rational numbers. GRAPH the solution set of the inequality and interpret it in the context of the problem.** *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.*	. 7.EE.4 Examples: • 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? • Solve: $\frac{1}{4}n + 5 = 20$ • 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. • Solve $\frac{1}{2}x + 3 > 2$ and graph your solution on a number line.

Grade 7 ACCELERATED Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels

• Addition and Subtraction of positive and negative numbers (begin with integers and extend to rational number)
  ○ Number Line
• Equivalent Forms
• Opposite Quantities
  ○ Additive Inverses
  ○ Number Line
• Absolute Value
  ○ Number Line
• Properties of Operations
• Mental Computation Strategies
• Estimation Strategies
• Variables
• Simple equations
  ○ form $px + q = r$ and $p(x + q) = r$, where $p, q,$ and r are specific rational numbers
• Simple Inequalities
  ○ form $px + q > r$ or $px + q < r$, where $p, q,$ and r are specific rational numbers.
• Algebraic solution
• Arithmetic solution
• Solution set of an inequality
• Properties of operations
• Linear expressions
• Rational coefficients
• Expressions in different forms
• Quantities in a problem are related
	• ADD and SUBTRACT (rational numbers)
	• REPRESENT (on number lines)
	• DESCRIBE (opposites quantities)
	• UNDERSTAND (positive or negative direction)
	• SHOW (additive inverses)
	• INTERPRET (sums in context)
	• UNDERSTAND (subtraction as additive inverses)
	• SHOW (absolute value)
	• APPLY (absolute value principle in context)
	• APPLY (properties of operations as strategies)
	• SOLVE (with and without context)
	• USE (variables)
	• CONSTRUCT (simple equations and inequalities)
	• SOLVE (problems in context)
	  ○ Simple equations
	  ○ Simple inequalities
	  ○ Rational coefficients
	• REASON (about quantities)
	• COMPARE (solutions – algebraic to arithmetic)
	• GRAPH (inequality)
	• APPLY (properties of operations)
	  ○ ADD (Linear expressions with rational coefficients)
	  ○ SUBTRACT (Linear expressions with rational coefficients)
	  ○ FACTOR (Linear expressions with rational coefficients)
	  ○ EXPAND (Linear expressions with rational coefficients)
	• WRITE (an expression in different forms)
	  UNDERSTAND (how rewriting an expression in different forms can show how the quantities in a problem are related)
		3
		3
		1
		2
		1
		2
		2
		2
		3
		3
		3,4
		3
		3
		5
		
		4
		2
		3
		2
		2
		2
		
		3
		3
		3
		2

Essential Questions

In what ways can rational numbers be useful?

How can algebraic expressions and equations be used to model, analyze and solve mathematical situations?

Corresponding Big Ideas

Rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole.

Algebraic expressions and equations are used to model real-life problems and represent quantitative relationships, so that the numbers and symbols can be manipulated to read a solution or make sense of the quantitative relationship.

Learning Activities

OBJECTIVE	RESOURCES/PAGE	NOTES
Review algebraic concepts: Students will • review order of operations and translating phrases into expressions • review properties of operations • review expressions and equations • review evaluating expression containing variables • review using an expression or equation to model a real-world problem • review finding a solution to a one-step equation	PA1-2, PA1-3, PA1-4, PA1-5	

OBJECTIVE	RESOURCES/PAGES	NOTES
Working with Integers Students will: • review integers and absolute value • compare and order integers and find absolute value • add, subtract, multiply and divide integerswith counters, number lines, and develop and apply rules) • plotting points on a coordinate plane • graph algebraic relationships by making a table of values • use distributive property to simplify algebraic expressions • use models to solve one- and two-step equations • solve verbal problems by writing one- and two-step equations • find terms of arithmetic sequences • solve problems using formulas • write and solve equations using bar diagrams	PA2-1, PA2-2, PA2-3, PA2-4, PA2-5,PA 2-6, PA3-1, PA3-2, PA3-3, PA3-4, PA3-5,PA 3-6, PA3-7,PA 3-8, Gr. 7 CCSS Lesson 7 Mathscape Language of Algebra Lesson 3-7	Refer to 1-6 to review vocabulary MUST DO Language of Algebra Lesson 4 before administering the Performance Task.

UNIT 1 VOCABULARY:
absolute value, additive identity property of zero, additive inverse, algebraic expression, associative property of addition/multiplication, commutative property of addition/multiplication, coordinate plane, coefficient, constant, distributive property, equation, equivalent expressions/ equations, evaluate, formula, integer, inverse operations, like terms, negative number, numerical expression, ordered pair, origin, order of operations, positive number, properties of operations, quadrants, solution, variable, x-axis, y-axis
Assessment:
Ledyard Assessment Unit 1 Performance Task for Unit 1 Mathscape Language of Algebra Lesson 8 Presenting a Picture

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Differentiated Instruction: Refer to suggestions and leveled lesson resources at the beginning of each lesson in *Math Connects.*

Instructional Strategies: See Appendix A for research-based Instructional and Differentiated Strategie

21st Century Learning Skills: See Appendix A for explanations.

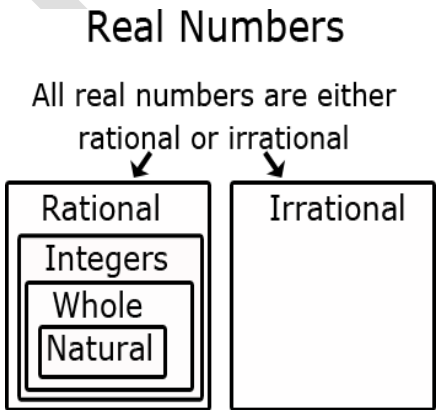
Technology and Electronic Resources:
http://www.graniteschools.org/depart/teachinglearning/curriculuminstruction/math/Documents/Vocabulary%20Documents/Vocabulary%20Cards%207th%20Grade%20A%20thru%20M.pdf Illustrated vocabulary

UNIT OF STUDY 2: Algebraic Reasoning with Rational Numbers and Exponents

Pacing: 25 days (plus 4 days for reteaching/enrichment)

Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Domain and Standards Overview
Number System • Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. • Know that there are numbers that are not rational, and approximate them by rational numbers. **Expressions and Equations** • Use properties of operations to generate equivalent expressions. • Work with radicals and integer exponents • Analyze and solve linear equations in one variable.

Priority and Supporting **CCSS**	**Explanations and Examples***
7.NS. 1. APPLY and EXTEND previous understandings of addition and subtraction to ADD and SUBTRACT rational numbers; REPRESENT addition and subtraction on a horizontal or vertical number line diagram. **a. DESCRIBE situations in which opposite quantities combine to make 0. *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.** **d. APPLY properties of operations as strategies to add and subtract rational numbers** **7.NS.2. APPLY and EXTEND previous understandings of multiplication and division and of fractions to MULTIPLY and DIVIDE rational numbers.** **a. UNDERSTAND that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. INTERPRET products of rational numbers by describing real- world contexts.** **b. UNDERSTAND that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $–(p/q) = (–p)/q = p/(–q)$. INTERPRET quotients of rational numbers by describing real-world contexts.** **c. APPLY properties of operations as strategies to multiply and divide rational numbers.** **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.** 7.NS.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.)	See examples on pages 4 and 5 of this document

Priority and Supporting **CCSS**	**Explanations and Examples***
8.NS.1. KNOW that numbers that are not rational are called irrational. UNDERSTAND informally that every number has a decimal expansion; for rational numbers SHOW that the decimal expansion repeats eventually, and CONVERT a decimal expansion which repeats eventually into a rational number.	**8.NS.1.** Students can use graphic organizers to show the relationship between the subsets of the real number system. 
7.EE.1. APPLY properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	See examples on page 6 of this document
8.EE.1. KNOW and APPLY the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27.$	8.EE.1. Examples: $\frac{4^3}{5^2} = \frac{64}{25}$ $\frac{4^3}{4^7} = 4^{3-7} = 4^{-4} = \frac{1}{256}$ $\frac{4^{-3}}{5^2} = 4^{-3} \times \frac{1}{5^2} = \frac{1}{4^3} \times \frac{1}{5^2} = \frac{1}{64} \times \frac{1}{25} = \frac{1}{16{,}000}$

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

8.EE.7. SOLVE linear equations in one variable.

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

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

8.EE.7. As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions.

When the equation has one solution, the variable has one value that makes the equation true as in $12 - 4y = 16$. The only value for y that makes this equation true is -1.

When the equation has infinitely many solutions, the equation is true for all real numbers as in $7x + 14 = 7(x+2)$. As this equation is simplified, the variable terms cancel leaving $14 = 14$ or $0 = 0$. Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution.

When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in $5x - 2 = 5(x+1)$. When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or $-2 = 1$. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution.

- Solve for x:
  - $-3(x+7) = 4$
  - $3x - 8 = 4x - 8$
  - $3(x+1) - 5 = 3x - 2$

- Solve:
  - $7(m-3) = 7$
  - $\frac{1}{4} - \frac{2}{3}y = \frac{3}{4} - \frac{1}{3}y$

Grade 7 ACCELERATED Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels

• Addition and Subtraction of positive and negative numbers (begin with integers and extend to rational number)
  ○ Number Line
• Equivalent Forms
• Opposite Quantities
  ○ Additive Inverses
  ○ Number Line
• Absolute Value
  ○ Number Line
• Properties of Operations
• Mental Computation Strategies
• Estimation Strategies
• Irrational numbers
• Decimal expansions
• Properties of integer exponents
• Equivalent numerical expressions
• Scientific notation
• Linear equations
	• ADD and SUBTRACT (rational numbers)
	• REPRESENT (on number lines)
	• DESCRIBE (opposites quantities)
	• UNDERSTAND (positive or negative direction)
	• SHOW (additive inverses)
	• INTERPRET (sums in context)
	• UNDERSTAND (subtraction as additive inverses)
	• SHOW (absolute value)
	• APPLY (absolute value principle in context)
	• APPLY (properties of operations as strategies)
	• SOLVE (with and without context)
	• USE (variables)
	• KNOW (irrational numbers)
	• CONVERT (decimal expansion into a rational number)
	• KNOW (properties of integer exponents)
	• APPLY (properties of integer exponents)
	• GENERATE (equivalent numerical expressions)
	• ESTIMATE (very large/small numbers)
	USE (scientific notation)
	• SOLVE (linear equations)
	• GIVE (examples with one, none, or infinitely many solutions)
		3
		3
		1
		2
		1
		2
		2
		2
		3
		3
		3,4
		3
		3
		4
		2
		2
		2
		2
		3
		6
		2
		2
		4
		2

Essential Questions
In what ways can rational numbers be useful?
Corresponding Big Ideas
Rational numbers can be represented in multiple ways and are useful when examining situations involving numbers that are not whole.

Learning Activities		
OBJECTIVE	**RESOURCES/PAGE**	**NOTES**
Exponents and Scientific Notation Students will • Write and evaluate expressions containing exponents • Use the distributive property to factor algebraic expressions • Simplify algebraic fractions • Use properties of exponents to multiply and divide • Write and evaluate expressions containing negative exponents • Convert between numbers expressed in standard form and scientific notation • Compare and order numbers written in scientific notation • Interpret scientific notation when using technology	PA4-1, PA4-2, PA4-3, Gr 7 CCSS Lessons 5-6, 4-4, 4-5, 4-6, 4-7 Gr. 8 CCSS Lessons 1-2	Section 4-2, review prime factorization, focus on factoring Section 4-3, focus on factoring expressions
Algebraic Reasoning using rational numbers Students will • Write fractions as terminating or repeating decimals • Compare fractions and decimals • Writing rational numbers as fractions • Identify and classify rational numbers • Multiply and divide rational numbers • Add and subtract rational numbers • Solving equations with rational numbers	PA5-1, PA5-2, PA5-3, PA5-4, PA5-5, PA5-7, PA5-8	All rational numbers can be positive or negative

UNIT 2 VOCABULARY:
base, bar notation, factor, greatest common factor, monomial, multiplicative inverse, rational number, repeating decimal, reciprocal, scientific notation, standard form, terminating decimal

Assessment
Ledyard Assessment Unit 2 Performance Task for Unit 2 TBD

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Differentiated Instruction: Refer to suggestions and leveled lesson resources at the beginning of each lesson in *Math Connects.*

Instructional Strategies: See Appendix A for research-based Instructional and Differentiated Strategie

21st Century Learning Skills: See Appendix A for explanations.

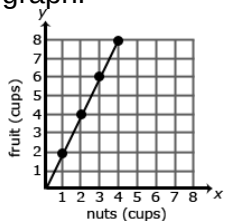
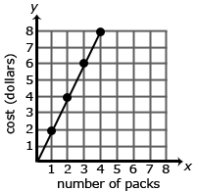
Technology and Electronic Resources:
http://www.graniteschools.org/depart/teachinglearning/curriculuminstruction/math/Documents/Vocabulary%20Documents/Vocabulary%20Cards%207th%20Grade%20A%20thru%20M.pdf Illustrated vocabulary

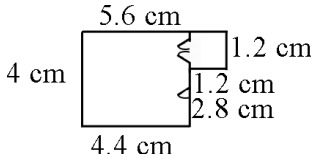
UNIT OF STUDY 3: Proportionality and Linear Relationships

Pacing: 35 days (plus 4 days for reteaching/enrichment)

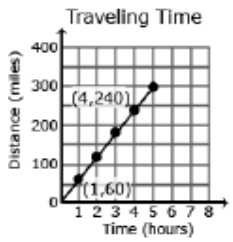
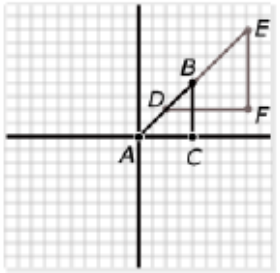
Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Domain and Standards Overview
Ratios and Proportional Relationships • Analyze proportional relationships and use them to solve real-world and mathematical problems. **Expressions and Equations** • Solve real-life and mathematical problems using numerical and algebraic expressions and equations. • Work with radicals and integer exponents • Understand the connections between proportional relationships, lines, and linear equations. • Analyze and solve linear equations and pairs of simultaneous linear equations. **Statistics and Probability** • Investigate patterns of association in bivariate data.

Priority and Supporting **CCSS**	**Explanations and Examples***
7.RP.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 OBSERV(E)ing whether the graph is a straight line through the origin.** **b. IDENTIFY the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.** **c. REPRESENT proportional relationships by equations.** *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*. **d. EXPLAIN what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate.**	7.RP.2. Students may use a content web site and/or interactive white board to 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) with a constant of proportionality equal to the slope of the line. Examples: • A student is making trail mix. Create a graph to determine if the quantities of nuts and fruit are proportional for each serving size listed in the table. If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how you determined the constant of proportionality and 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 relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1). The constant of proportionality is shown in the first column of the table and by the slope of the line on the graph. • The graph below represents the cost of gum packs as a unit rate of $2 dollars for every pack of gum. The unit rate is represented as $2/pack. Represent the relationship using a table and an equation. Table: Number of Packs of Gum (*g*): 0, 1, 2, 3, 4 Cost in Dollars (*d*): 0, 2, 4, 6, 8  continued on next page

Priority and Supporting CCSS	Explanations and Examples*
7.RP.1. COMPUTE unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½ to ¼ miles per hour, equivalently 2 miles per hour.*	Equation: $d = 2g$, where d is the cost in dollars and g is the packs of gum 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. Constructing verbal models can also 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.3 USE proportional relationships to SOLVE multi-step ratio and percent problems.	7.RP.3 Examples include simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.
7.G.1. SOLVE problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	7.G.1. 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. 

Priority and Supporting Common Core State Standards	Explanation and Examples
7.EE.4 (emphasis on) 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. **c. 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?* **d. SOLVE word problems leading to equations of the form *px + q > r or px + q < r,* where *p, q, and r* are specific rational numbers. GRAPH the solution set of the inequality and interpret it in the context of the problem.** *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.*	. 7.EE.4 Examples: • 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? • Solve: $\frac{1}{4}n + 5 = 20$ • 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. • Solve $\frac{1}{2}x + 3 > 2$ and graph your solution on a number line.

Priority and Supporting Common Core State Standards	Explanation and Examples
8.EE.4. PERFORM operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. USE scientific notation and CHOOSE units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). INTERPRET scientific notation that has been generated by technology.	8.EE.4. Students can convert decimal forms to scientific notation and apply rules of exponents to simplify expressions. In working with calculators or spreadsheets, it is important that students recognize scientific notation. Students should recognize that the output of 2.45E+23 is 2.45×10^{23} and 3.5E-4 is 3.5×10^{-4}. Students enter scientific notation using E or EE (scientific notation), * (multiplication), and ^ (exponent) symbols
8.EE.5. GRAPH proportional relationships, interpreting the unit rate as the slope of the graph. COMPARE two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	**8.EE.5.** Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs. Example: • Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation. Scenario 1:  Scenario 2: $y = 50x$ x is time in hours y is distance in miles
8.EE.6. USE similar triangles to EXPLAIN why the slope *m* is the same between any two distinct points on a non-vertical line in the coordinate plane; DERIVE the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at *b*..	8.EE.6. Example: • Explain why ΔACB is similar to ΔDFE, and deduce that $\overline{AB}$ has the same slope as $\overline{BE}$. Express each line as an equation. 

Priority and Supporting Common Core State Standards	Explanation and Examples
8.EE.7. SOLVE linear equations in one variable. **a. GIVE examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. SHOW which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers).** **b. SOLVE linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.**	**8.EE.7.** As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions. When the equation has one solution, the variable has one value that makes the equation true as in 12 - 4*y* =16. The only value for y that makes this equation true is -1. When the equation has infinitely many solutions, the equation is true for all real numbers as in 7*x* + 14 = 7(*x*+2). As this equation is simplified, the variable terms cancel leaving 14 = 14 or 0 = 0. Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution. When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in 5*x* - 2 = 5(*x*+1). When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or -2 = 1. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution. Examples: • Solve for x: ○ $-3(x+7)=4$ ○ $3x-8=4x-8$ ○ $3(x+1)-5=3x-2$ • Solve: ○ $7(m-3)=7$ ○ $\frac{1}{4}-\frac{2}{3}y=\frac{3}{4}-\frac{1}{3}y$

Priority and Supporting Common Core State Standards	Explanation and Examples
8.SP.1. CONSTRUCT and INTERPRET scatter plots for bivariate measurement data to INVESTIGATE patterns of association between two quantities. DESCRIBE patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	8.SP.1. Students build on their previous knowledge of scatter plots examine relationships between variables. They analyze scatter plots to determine positive and negative associations, the degree of association, and type of association. Students examine outliers to determine if data points are valid or represent a recording or measurement error. Students can use tools such as those at the National Center for Educational Statistics to create a graph or generate data sets. (http://nces.ed.gov/nceskids/createagraph/default.aspx) Examples: • Data for 10 students' Math and Science scores are provided in the chart. Describe the association between the Math and Science scores. • Data for 10 students' Math scores and the distance they live from school are provided in the table below. Describe the association between the Math scores and the distance they live from school. • Data from a local fast food restaurant is provided showing the number of staff members and the average time for filling an order are provided in the table below. Describe the association between the number of staff and the average time for filling an order. • The chart below lists the life expectancy in years for people in the United States every five years from 1970 to 2005. What would you expect the life expectancy of a person in the United States to be in 2010, 2015, and 2020 based upon this data? Explain how you determined your values.

Student	1	2	3	4	5	6	7	8	9	10
Math	64	50	85	34	56	24	72	63	42	93
Science	68	70	83	33	60	27	74	63	40	96

Student	1	2	3	4	5	6	7	8	9	10
Math score	64	50	85	34	56	24	72	63	42	93
Dist from school (miles)	0.5	1.8	1	2.3	3.4	0.2	2.5	1.6	0.8	2.5

Number of staff	3	4	5	6	7	8
Average time to fill order (seconds)	180	138	120	108	96	84

Date	1970	1975	1980	1985	1990	1995	2000	2005
Life Expectancy (in years)	70.8	72.6	73.7	74.7	75.4	75.8	76.8	77.4

Priority and Supporting Common Core State Standards	Explanation and Examples
8.SP.2 KNOW that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally FIT a straight line, and informally ASSESS the model fit by judging the closeness of the data points to the line.	8.SP.2 Examples: • The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas are left in the tank. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not? What is the average fuel efficiency of the car in miles per gallon?

Miles Traveled	0	75	120	160	250	300
Gallons Used	0	2.3	4.5	5.7	9.7	10.7

Grade 7 ACCELERATED Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels

• Proportional relationships
• Unit rates
• Equivalent ratios
  ○ In a table
  ○ Straight line through the origin when graphing on a coordinate plane
  ○ Equation
• Constant of proportionality (unit rate)
  ○ Tables
  ○ Graphs
  ○ Equations
  ○ Diagrams
  ○ Verbal descriptions
• Point (x,y) in terms of situation
  ○ (0, 0)
  ○ (1, *r)* where *r* is the unit rate
• Multi-step problems
  ○ Ratio
  ○ Percent
• Scale drawings
  ○ Scale
  ○ Actual lengths and areas
• Scientific notation
• Similar triangles
• Slope (m)
• Y-intercept (*b*)
• Linear equations ($y = mx$ and $y = mx + b$)
  ○ Rational Number Coefficients
  ○ One variable
  ▪ One solution
  ▪ Infinitely many solutions
  ▪ No solutions
	• RECOGNIZE (proportional relationships)
	• REPRESENT (proportional relationships in a variety of ways, including equations)
	• DECIDE (proportional relationship)
	  ○ TEST (equivalent ratios)
	  ○ OBSERVE (graph)
	• IDENTIFY (constant of proportionality)
	• REPRESENT (proportional relationships by equations)
	• EXPLAIN [point (x,y)]
	• COMPUTE (unit rates)
	• USE (proportional relationships)
	• SOLVE (multi-step ratio and percent problems)
	• SOLVE (problems with scale drawings)
	  ○ COMPUTE (actual lengths/areas from scale drawings
	• USE (scientific notation)
	• PERFORM (operations with numbers written in scientific notation)
	• INTERPRET (scientific notation generated by technology
	• GRAPH (proportional relationships)
	• INTERPRET (unit rate as slope)
	• COMPARE (proportional relationships)
	• EXPLAIN (why slope is the same between any two points on a non-vertical line)
	• DERIVE (linear equations ($y = mx$ and $y = mx + b$)
	• SOLVE (linear equations)
	• GIVE (example of linear equations)
	• TRANSFORM (equations)
	• EXPAND (expressions)
	  ○ Use (distributive property)
	  ○ Collect (like terms)
	• CONSTRUCT (scatter plots)
	• INTERPRET (scatter plots)
	• INVESTIGATE (patterns)
		1
		2
		5
		5
		1
		1
		2
		3
		2
		4
		2
		4
		3
		4
		2
		3
		2
		4
		2
		2
		3
		3
		4
		2
		3
		3
		3
		2
		4

Equations into simple forms ○ Expanding Expressions ○ Distributive property ○ Combining Like terms • Scatterplots • Line of best fit • Patterns ○ Clusterting ○ Outliers ○ Positive or Negative ○ Linear ○ Nonlinear	• DESCRIBE (patterns) • KNOW (straight lines model relationships between two quantitative variables) • FIT (informally, draw line of best fit) • ASSESS (informally, fit by judging closeness of data points to line	1 1 3 5

Essential Questions
How can ratios and proportional relationships be used to determine unknown quantities?
Corresponding Big Ideas
Ratios and proportional relationships are used to express how quantities are related and how quantities change in relation to each other

Learning Activities		
OBJECTIVE	**RESOURCES/PAGE**	**NOTES**
Review ratios and compute unit rates associated with fractions: Students will • write ratios as fractions in simplest form • determine unit rate • simplify complex fractions and find unit rates • identify proportional and non-proportional relationships in tables and graphs and by graphing on the coordinate plane • use proportions to solve real world problems (percent increase/decrease, simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent error) • use proportions to solve problems including scale drawings • use online maps to reproduce a scale drawing at a different scale • use percents to estimate	PA6-1, Gr 7 CCSS Lesson 1, PA6-2, Gr 7 CCSS Lesson 2, PA6-3, PA6-4, Gr. 7 CCSS Lesson 10, PA6-5, PA6-6, PA6-7, PA6-8, PA6-9, PA-CS pg. 750 (percent error)	
Proportional relationships: Students will • find rates of change and solve problems with rates of change • find rate of change from a graph, chart or table • identify proportional relationships by finding a constant rate of change • Find the slope of a line • Construct scatter plots • Analyze trends in scatter plots • Draw lines of best fit • Use lines of best fit to make predictions	PA7-3, Gr. 8 CCSS Lesson 7, PA7-4, PA7-5, PA1-7 and PA7-8,	Ignore direct variation in this section Lines of best fit – students draw but do not find the equation for the line of best fit
Solving more complex equations and inequalities: Students will • Solve equations with variables on both sides • Solve equations that involve grouping symbols • Identify equations that have no solutions or infinite solutions • Use properties of equality to solve multi-step equations • write and graph inequalities • Solve inequalites	PA8-1,PA 8-2, Gr. 7 CCSS Lessons 8 and 9, Gr 8 CCSS Lesson 3, Mathscape gr 7 Language of Algebra: Lessons, 1-2 PA8-3, PA8-4, PA8-5	

UNIT 3 VOCABULARY:
commission, compound interest, constant rate of change, constant of proportionality, corresponding (sides/angles), discount, equivalent ratios, line of best fit, origin, percent, proportion, proportional relationship, rate, rate of change, ratio, scale, scale drawing, scatter plot, scientific notation, similar figure, simple interest, slope, tax, unit rate

Assessment:
Ledyard Assessment Unit 3 Performance Task for Unit 3 TBD

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Differentiated Instruction: Refer to suggestions and leveled lesson resources at the beginning of each lesson in *Math Connects.*

Instructional Strategies: See Appendix A for research-based Instructional and Differentiated Strategie

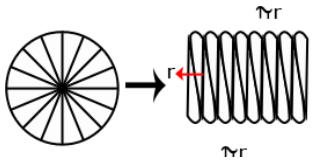
21st Century Learning Skills: See Appendix A for explanations.

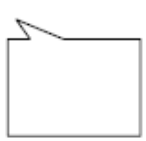
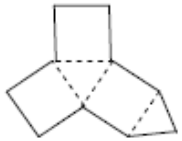
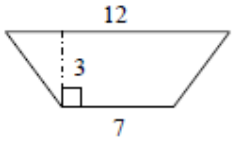
Technology and Electronic Resources:
http://www.graniteschools.org/depart/teachinglearning/curriculuminstruction/math/Documents/Vocabulary%20Documents/Vocabulary%20Cards%207th%20Grade%20A%20thru%20M.pdf Illustrated vocabulary

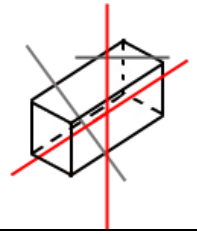
UNIT OF STUDY 4: Creating, Comparing and Analyzing Geometric Figures

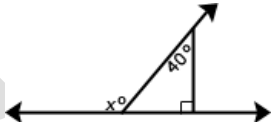
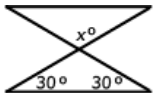
Pacing: 40 days (plus 4 days for reteaching/enrichment)

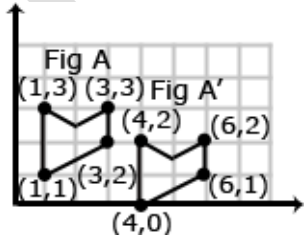
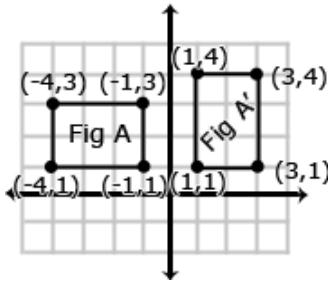
Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Domain and Standards Overview
Geometry • Draw, construct, and describe geometrical figures and describe the relationships between them. • Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. • Understand congruence and similarity using physical models, transparencies or geometry software. • Understand and apply the Pythagorean Theorem • Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

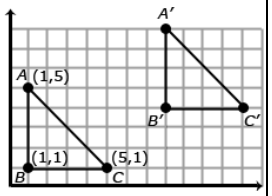
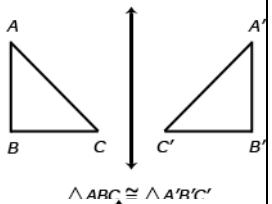
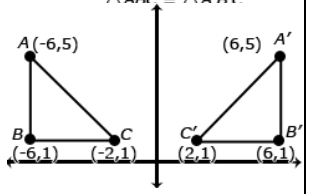
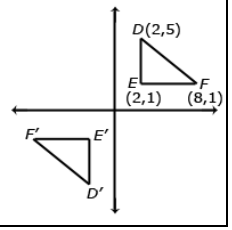
Priority and Supporting **CCSS**	**Explanations and Examples***
7.G.4. KNOW the formulas for the area and circumference of a circle and USE them to solve problems; GIVE an informal derivation of the relationship between the circumference and area of a circle.	7.G.4. Examples: • The seventh grade class 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? • 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. • Students will use a circle as a model to make several equal parts as you would in a pie model. The greater number the cuts, the better. The pie pieces are laid out to form a shape similar to a parallelogram. Students will then write an expression for the area of the parallelogram related to the radius (note: the length of the base of the parallelogram is half the circumference, or πr, and the height is r, resulting in an area of πr^2. Extension: If students are given the circumference of a circle, could they write a formula to determine the circle's area or given the area of a circle, could they write the formula for the circumference? 

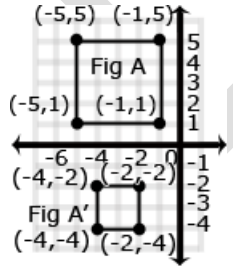
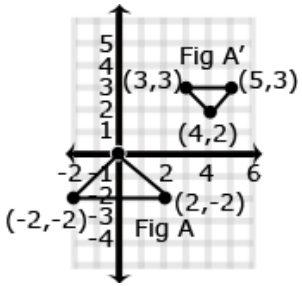
Priority and Supporting **CCSS**	**Explanations and Examples***
7.G.6. SOLVE real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	7.G.6. Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations. 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? Do they yield the same result?   • A cereal box is a rectangular prism. What is the volume of the cereal box? What is the surface area of the cereal box? (Hint: Create a net of the cereal box and use the net to calculate the surface area.) Make a poster explaining your work to share with the class. • Find the area of a triangle with a base length of three units and a height of four units. • Find the area of the trapezoid shown below using the formulas for rectangles and triangles. 

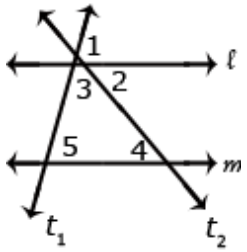
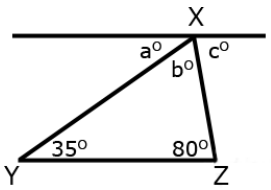
Priority and Supporting **CCSS**	**Explanations and Examples***
7.G.2. DRAW (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle or no triangle.	7.G.2. Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity. Examples: Is it possible to draw a triangle with a 90˚ angle and one leg that is 4 inches long and one leg that is 3 inches long? If so, draw one. Is there more than one such triangle? • 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? • Draw a quadrilateral with one set of parallel sides and no right angles.
7.G.3. DESCRIBE the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	7.G.3. Example: • Using a clay model of a rectangular prism, describe the shapes that are created when planar cuts are made diagonally, perpendicularly, and parallel to the base. 

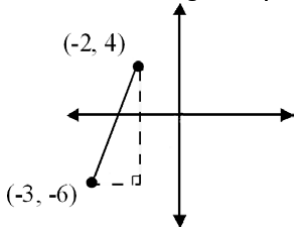
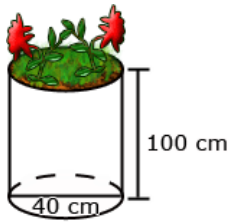
Priority and Supporting **CCSS**	**Explanations and Examples***
7.G.5. USE facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to WRITE and SOLVE simple equations for an unknown angle in a figure.	7.G.5. Angle relationships that can be explored include but are not limited to: • Same-side (consecutive) interior and same-side (consecutive) exterior angles are supplementary. Examples: • Write and solve an equation to find the measure of angle *x* .  • Write and solve an equation to find the measure of angle *x.* 

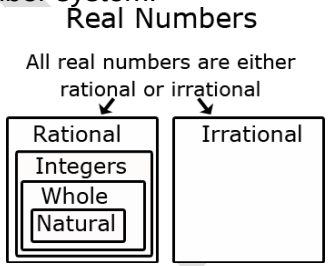
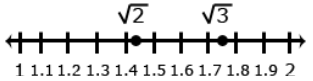
Priority and Supporting Common Core State Standards	Explanation and Examples
8.G.1 VERIFY experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. **8.G.2. UNDERSTAND that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections and translations; given two congruent figures, DESCRIBE a sequence that exhibits the congruence between them.**	. 8.G.1 Examples: Students need multiple opportunities to explore the transformation of figures so that they can appreciate that points stay the same distance apart and lines stay at the same angle after they have been rotated, reflected, and/or translated. Students are not expected to work formally with properties of dilations until high school. **8.G.2.** Examples: • Is Figure A congruent to Figure A'? Explain how you know.  • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'. 

Priority and Supporting Common Core State Standards	Explanation and Examples
8.G.3. DESCRIBE the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	.8.G.3. examples Dilation: A dilation is a transformation that moves each point along a ray emanating from a fixed center, and multiplies distances from the center by a common scale factor. In dilated figures, the dilated figure is *similar* to its pre-image.  Translation: A translation is a transformation of an object that moves the object so that every point of the object moves in the same direction as well as the same distance. In a translation, the translated object is *congruent* to its pre-image. Δ*ABC* has been translated 7 units to the right and 3 units up. To get from A (1,5) to A' (8,8), move A 7 units to the right (from $x = 1$ to $x = 8$) and 3 units up (from $y = 5$ to $y = 8$). Points B + C also move in the same direction (7 units to the right and 3 units up). Reflection: A reflection is a transformation that flips an object across a line of reflection (in a coordinate grid the line of reflection may be the x or y axis). In a rotation, the rotated object is *congruent* to its pre-image.  When an object is reflected across the y axis, the reflected x coordinate is the opposite of the pre-image x coordinate.  Rotation: A rotated figure is a figure that has been turned about a fixed point. This is called the center of rotation. A figure can be rotated up to 360˚. Rotated figures are congruent to their pre-image figures.  Consider when Δ*DEF* is rotated 180˚ clockwise about the origin. The coordinates of Δ*DEF* are D(2,5), E(2,1), and F(8,1). When rotated 180˚, Δ*D'E'F'* has new coordinates D'(-2,-5), E'(-2,-1) and F'(-8,-1). Each coordinate is the opposite of its pre-image.

Priority and Supporting Common Core State Standards	Explanation and Examples
8.G.4. UNDERSTAND that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, DESCRIBE a sequence that exhibits the similarity between them.	. **8.G.4.** Examples: • Is Figure A similar to Figure A'? Explain how you know.  • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'. 

Priority and Supporting Common Core State Standards	Explanation and Examples
8.G.5. USE informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	8.G.5. Examples: Students can informally prove relationships with transversals. Show that m∠3 + *m*∠4 + *m*∠5 = 180˚ if *l* and *m* are parallel lines and t1 & t2 are transversals. ∠1 + ∠2 + ∠3 = 180˚. Angle 1 and Angle 5 are congruent because they are corresponding angles (∠5 ≅ ∠1). ∠1 can be substituted for ∠5. ∠4 ≅ ∠2 because alternate interior angles are congruent. ∠4 can be substituted for ∠2. Therefore m∠3 + m∠4 +m∠5 = 180˚  Students can informally conclude that the sum of a triangle is 180º (the angle-sum theorem) by applying their understanding of lines and alternate interior angles. In the figure below, line x is parallel to line *yz*:  $\overline{X} \parallel \overline{YZ}$ Angle *a* is 35º because it alternates with the angle inside the triangle that measures 35º. Angle *c* is 80º because it alternates with the angle inside the triangle that measures 80º. Because lines have a measure of 180º, and angles *a* + *b* + *c* form a straight line, then angle *b* must be 65 º (180 – 35 + 80 = 65). Therefore, the sum of the angles of the triangle are 35º + 65 º + 80 º

Priority and Supporting Common Core State Standards	Explanation and Examples
8.G.7. APPLY the Pythagorean Theorem to DETERMINE unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.G.6. EXPLAIN a proof of the Pythagorean Theorem and its converse. 8.G.8. APPLY the Pythagorean Theorem to FIND the distance between two points in a coordinate system. **8.G.9. KNOW the formulas for the volumes of cones, cylinders and spheres and USE them to SOLVE real-world and mathematical problems.**	. **8.G.7.** Through authentic experiences and exploration, students should use the Pythagorean Theorem to solve problems. Problems can include working in both two and three dimensions. Students should be familiar with the common Pythagorean triplets. 8.G.6. Students should verify, using a model, that the sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle. Students should also understand that if the sum of the squares of the 2 smaller legs of a triangle is equal to the square of the third leg, then the triangle is a right triangle. 8.G.8. Example: • Students will create a right triangle from the two points given (as shown in the diagram below) and then use the Pythagorean Theorem to find the distance between the two given points.  8.G.9. Example: • James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the measurements in the diagram below to determine the planter's volume.  cylindrical planter

Priority and Supporting **CCSS**	**Explanations and Examples***
8.NS.1. KNOW that numbers that are not rational are called irrational. UNDERSTAND informally that every number has a decimal expansion; for rational numbers SHOW that the decimal expansion repeats eventually, and CONVERT a decimal expansion which repeats eventually into a rational number.	**8.NS.1.** Students can use graphic organizers to show the relationship between the subsets of the real number system. 
8.NS.2. USE rational approximations of irrational numbers to COMPARE the size of irrational numbers, LOCATE them approximately on a number line diagram, and ESTIMATE the value of expressions (e.g., √2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*	8.NS.2. Students can approximate square roots by iterative processes. Examples: • Approximate the value of √5 to the nearest hundredth. Solution: Students start with a rough estimate based upon perfect squares. √5 falls between 2 and 3 because 5 falls between $2^2 = 4$ and $3^2 = 9$. The value will be closer to 2 than to 3. Students continue the iterative process with the tenths place value. √5 falls between 2.2 and 2.3 because 5 falls between $2.2^2 = 4.84$ and $2.3^2 = 5.29$. The value is closer to 2.2. Further iteration shows that the value of √5 is between 2.23 and 2.24 since 2.23^2 is 4.9729 and 2.24^2 is 5.0176. • Compare √2 and √3 by estimating their values, plotting them on a number line, and making comparative statements.  Solution: Statements for the comparison could include: √2 is approximately 0.3 less than √3 √2 is between the whole numbers 1 and 2 √3 is between 1.7 and 1.8

Priority and Supporting Common Core State Standards	Explanation and Examples
8.EE.2 USE square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. EVALUATE square roots of small perfect squares and cube roots of small perfect cubes. KNOW that $\sqrt{2}$ is irrational.	8.EE.2 Examples: • $3^2 = 9$ and $\sqrt{9} = \pm 3$ • $\left(\frac{1}{3}\right)^3 = \left(\frac{1^3}{3^3}\right) = \frac{1}{27}$ and $\sqrt[3]{\frac{1}{27}} = \frac{\sqrt[3]{1}}{\sqrt[3]{27}} = \frac{1}{3}$ • Solve $x^2 = 9$ Solution: $x^2 = 9$ $\sqrt{x^2} = \pm\sqrt{9}$ $x = \pm 3$ • Solve $x^3 = 8$ Solution: $x^3 = 8$ $\sqrt[3]{x^3} = \sqrt[3]{8}$ $x = 2$

Essential Questions
How does geometry help to describe objects better?
Corresponding Big Ideas
Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Grade 7 ACCELERATED Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels

• Formulas
  ○ Area of circle
  ○ Circumference of circle
• Relationship between circumference and area of a circle
• Geometric conditions (points, line segments, angles, parallelism, congruence, and perpendicularity.)
• Plane sections of three-dimensional figures
• Angle relationships
  ○ Supplementary
  ○ Complementary
  ○ Vertical
  ○ Adjacent
• Area
  ○ Triangles
  ○ Quadrilaterals
  ○ Polygons
• Volume
  ○ Cubes
  ○ Right prisms
• Surface Area
  ○ Cubes
  ○ Right prisms
  • Rotation
  • Reflection
  • Translation
  • Dilation
  • Congruence
  • Similarity
  • Informal proof
  • Angle sum and exterior angle of triangles
  • Parallel lines cut by a transversal
  ○ Angles formed
• Angle-angle criterion for similar triangles
	• KNOW/DEVELOP (formulas)
	• SOLVE (problems using formulas)
	• GIVE/DERIVE (informally the relationship between circumference and area of a circle)
	• SOLVE (with and without context)
	• DRAW/CONSTRUCT (geometric shapes with given conditions)
	• USE (ruler, protractor, technology)
	• DESCRIBE (two-dimensional figures that result from plane sections of three-dimensional figures)
	• WRITE/SOLVE (problems using equations to find an unknown angle in a figure)
	• SOLVE (problems with scale drawings)
	  ○ REPRODUCE a scale drawing using a different scale
	  • UNDERSTAND (Congruence)
	  ○ DESCRIBE (Sequence of rotations, reflections, translations)
	  • VERIFY (Experimentally properties of)
	  ○ Rotations
	  ○ Reflections
	  ○ Translations
	  ○ Dilations
	  • UNDERSTAND (Similarity)
	  ○ DESCRIBE (Sequence of rotations, reflections, translations, dilations)
	• DESCRIBE (effect of dilations, translations, rotations and reflections using coordinates)
	• USE(informal arguments)
	  ○ angle relationships in parallel lines cut by a transversal
	  ○ sum of angles in a triangle = 180°
		2,3
		3
		4
		4
		3
		3
		2
		4
		4
		6
		2
		2
		2
		2
		2
		2
		2
		3

• Pythagorean Theorem
  ○ Proof of and its converse
• Right triangles
• Coordinate system
• Square root
• Perfect square
• Cube root
• Perfect cube
	• APPLY (Pythagorean Theorem)
	  ○ DETERMINE (unknown side lengths in right triangles)
	  ○ FIND (distance between two points in a coordinate system)
	• EXPLAIN (a proof of the Pythagorean Theorem and its converse)
	• USE
	  ○ (square root and cube root symbols)
	  ▪ REPRESENT (solutions to equations)
	• EVALUATE
	  ○ (square roots of perfect squares)
	  ○ (cube roots of perfect cubes)
		3
		3
		1
		4
		2
		2
		3

Learning Activities		
OBJECTIVE	**RESOURCES/PAGE**	**NOTES**
Real numbers and right triangles: Students will • find and estimate square roots and cube roots • solve equations by finding square roots • identify and compare numbers in the real number system • review classification of triangles andfind missing angle measures of a triangle • use Pythagorean Theorem to find length of a side of a right triangle • use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle • use the distance formula to determine lengths on a coordinate plane • use proportions to find the measures of similar figures	PA9-1, PA9-2, MC Gr.8 LA pgs12-14, PA9-3, PA9-4 Explore, PA9-4, Gr. 8 CCSS Lesson 14, PA9-6 Geometer's Sketchpad lessons TBD	Add simple cube roots from Course 3 LA pgs 12-14 Pythagorean Theorem – may use dot paper to develop Pick's Theorem See Appendix In section 9-4, include 3D examples when studying 3D figures In section 9-6, solve using proportions, section 9-7 will address the 8th grade standard using transformations

2D figures (focus on triangles): Students will • identify relationships of angles formed by two parallel lines and a transversal • identify congruent triangle and the corresponding parts of congruent triangles • draw transformation (translations, reflections, rotations and dilations) on the coordinate plane • describe the effect of transformations using coordinates • review properties of quadrilaterals • review classification and attributes of polygons • find area of parallelograms, triangles and trapezoids • find circumference and area of circles and give an informal derivation of formulas • find area of composite figures	PA10-1, PA10-2, PA10-3, PA10-3 extended, Gr. 8 CCSS Lessons 10, 11, 12 13 PA10-4, PA10-5, PA10-6, PA10-7, PA10-8	In section 10-4, focus on drawing quadrilaterals given attributes In section 10-5, finding sum of angles is optional
3 D: Students will • know and use formulas to find volumes of prisms, cylinders, cones and spheres • use formulas to solve problems • find surface area of cubes and right prisms • describe 2D figures that result from slicing 3D figures	PA11-2, PA11-3, PA11-4, Gr 7 CCSSLesson 12 www.learner.org geometry session 9 http://www.mhhe.com/math/ltbmath/applets/ch9/ Gr. 8 Mathscape Shapes and Space Lesson 2	In section 11-3, skip pyramids In section 11-4, skip cylinders

UNIT 4 VOCABULARY:
acute triangle, adjacent angle, alternate exterior/interior angle, altitude, area, base, complementary angle, cone, congruent, converse, composite figure, circle, circumference, corresponding angles, cross-section, cube, cylinder, diameter, dilation, dimension, edge, equilateral triangle, face, height, hypotenuse, irrational number, isosceles triangle, legs, length, line segment, obtuse triangle, parallel, parallelogram, perpendicular, perfect square, pi, plane, polygon, quadrilateral, radius, radical sign, real numbers, rectangular prism ,reflection, rhombus, right prism, right triangle, rotation, scalene triangle, sides, similar figures, solid, square root, straight angle, supplementary angle, surface area, transformation, translation, trapezoid, triangle, triangular prism, vertical angle, vertex, volume, width

Assessment
Ledyard Assessment Unit 4 Performance Task for Unit 4 TBD

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Differentiated Instruction: Refer to suggestions and leveled lesson resources at the beginning of each lesson in *Math Connects.*

Instructional Strategies: See Appendix A for research-based Instructional and Differentiated Strategie

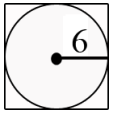
21st Century Learning Skills: See Appendix A for explanations.

Technology and Electronic Resources:
http://www.graniteschools.org/depart/teachinglearning/curriculuminstruction/math/Documents/Vocabulary%20Documents/Vocabulary%20Cards%207th%20Grade%20A%20thru%20M.pdf Illustrated vocabulary

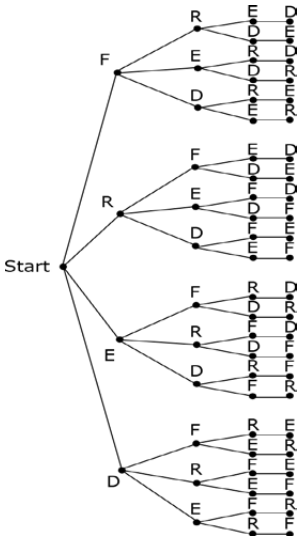
UNIT OF STUDY 5: Introduction to Sampling and Inference

Pacing: 25 days (plus 4 days for reteaching/enrichment)

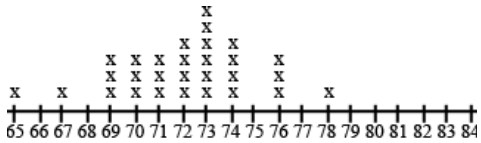
Mathematical Practices
Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Domain and Standards Overview
Statistics and Probability • Use random sampling to draw inferences about a population. • Draw informal comparative inferences about two populations. • Investigate chance processes and develop, use, and evaluate probability models. • Investigate patterns of association in bivariate data.

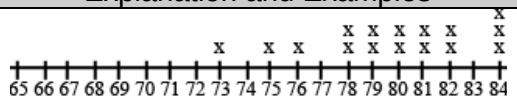
Priority and Supporting **CCSS**	**Explanations and Examples***
7.SP.7. DEVELOP a probability model and USE it to FIND probabilities of events. COMPARE probabilities from a model to observed frequencies; if the agreement is not good, EXPLAIN possible sources of the discrepancy. **a. DEVELOP a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.** *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?*	7.SP.7 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. Students can also develop models for geometric probability (i.e. a target). Example: • If you choose a point in the square, what is the probability that it is not in the circle? 

Priority and Supporting **CCSS**	**Explanations and Examples***
7.SP.5. UNDERSTAND that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	7.SP.5. Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line. 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 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.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.*	7.SP.6. Students can collect data using physical objects or graphing calculator or web-based simulations. Students can perform experiments multiple times, pool data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies. 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.

Priority and Supporting **CCSS**	**Explanations and Examples***
7.SP.8 FIND probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **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. **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 events. **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 percent 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*	7.SP.8 Examples: • 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 

Priority and Supporting Common Core State Standards	Explanation and Examples
7.SP.1. UNDERSTAND that statistics can be USEd to gain information about a population by EXAMIN(E)ing 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.	7.SP.1. • 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? 1. Write all of the students' names on cards and pull them out in a draw to determine who will complete the survey. 2. Survey the first 20 students that enter the lunch room.
7.SP.2. USE data from a random sample to DRAW inferences about a population with an unknown characteristic of interest. GENERATE multiple samples (or simulated samples) of the same size to GUAGE 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.*	7.SP.2. Example: Below is the data collected from two random samples of 100 students regarding student's school lunch preference. Make at least two inferences based on the results. Lunch Preferences student sample / hamburgers / tacos / pizza / total #1: 12 / 14 / 74 / 100 #2: 12 / 11 / 77 / 100
7.SP.4. USE measures of center and measures of variability for numerical data from random samples to DRAW informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*	7.SP.4. Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range. Example: • The two data sets below depict random samples of the housing prices sold in the King River and Toby Ranch areas of Arizona. Based on the prices below which measure of center will provide the most accurate estimation of housing prices in Arizona? Explain your reasoning. o King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000} o Toby Ranch homes {5million, 154000, 250000, 250000, 200000, 160000, 190000}

Priority and Supporting Common Core State Standards	Explanation and Examples
7.SP.3. Informally ASSESS the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*	7.SP.3. Students can readily find data as described in the example on sports team or college websites. Other sources for data include American Fact Finder (Census Bureau), Fed Stats, Ecology Explorers, USGS, or CIA World Factbook. Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations. 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.  Height of Soccer Players (in) Continued on next page

Priority and Supporting Common Core State Standards	Explanation and Examples
	 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 players between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets. Jason sets up a table for each data set to help him with the calculations. 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. 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. The difference between the heights of the teams is approximately 3 times the variability of the data sets (7.68 ÷ 2.53 = 3.04). Continued on next page

Priority and Supporting Common Core State Standards	Explanation and Examples

Soccer Players (n = 29)		
Height (in)	Deviation from Mean (in)	Absolute Deviation (in)
65	-7	7
67	-5	5
69	-3	3
69	-3	3
69	-3	3
70	-2	2
70	-2	2
70	-2	2
71	-1	1
71	-1	1
71	-1	1
72	0	0
72	0	0
72	0	0
72	0	0
73	+1	1
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

Mean = 2090 ÷ 29 =72 inches
MAD = 62 ÷ 29 = 2.13 inches

Basketball Players (n = 16)		
Height (in)	Deviation from Mean (in)	Absolute Deviation (in)
73	-7	7
75	-5	5
76	-4	4
78	-2	2
78	-2	2
79	-1	1
79	-1	1
80	0	0
80	0	0
81	1	1
81	1	1
82	2	2
82	2	2
84	4	4
84	4	4
84	4	4
Σ = 1276		Σ = 40

Mean = 1276 ÷ 16 =80 inches
MAD = 40 ÷ 16 = 2.5 inches

Priority and Supporting Common Core State Standards	Explanation and Examples
8.SP.4. UNDERSTAND that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. CONSTRUCT and INTERPRET a two-way table summarizing data on two categorical variables collected from the same subjects. USE relative frequencies calculated for rows or columns to DESCRIBE possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew.*	8.SP.4. Example: • The table illustrates the results when 100 students were asked the survey questions: Do you have a curfew? and Do you have assigned chores? Is there evidence that those who have a curfew also tend to have chores? Curfew / Chores Yes: Yes = 40, No = 10 No: Yes = 10, No = 40 Solution: Of the students who answered that they had a curfew, 40 had chores and 10 did not. Of the students who answered they did not have a curfew, 10 had chores and 40 did not. From this sample, there appears to be a positive correlation between having a curfew and having chores.

Grade 7 ACCELERATED Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels

• Probability model
  ○ uniform
  ○ not uniform
• probabilities
• events
  ○ compound
• frequencies
• outcomes
• data
• chance
  ○ process
  ○ event
• Probability of a chance event
• Relative frequency
• Organized list
• Tables
• Tree diagram
• Simulation
• Sample space
• Two-way table
• Relative frequencies
	• DEVELOP/USE
	  ○ (a uniform probability model)
	  ○ (a probability model which may not be uniform)
	• FIND
	  ○ (probabilities of simple events)
	  ○ (probability of compound events using organized lists, tables, tree diagrams and simulation)
	  ○ (frequencies for compound events)
	• COMPARE (probabilities from a model to observed frequencies)
	• EXPLAIN (possible sources of the discrepancy)
	• OBSERVE/PREDICT (frequencies in data)
	• UNDERSTAND
	  ○ (probability of a chance event is a number between 0 and 1)
	  ○ (probability of a compound event is the fraction of outcomes in the sample space)
	• REPRESENT (sample spaces for compound events using various methods, e.g., organized lists, tables, tree diagrams)
	• APPROXIMATE (probability of a chance event)
	• PREDICT (approximate relative frequency)
	• DESIGN/USE (simulation)
	• CONSTRUCT (two-way table)
	• INTERPRET (two-way table)
	• DESCRIBE (association in variables)
		3
		3
		2
		2
		2
		2
		2
		3
		2
		6, 3
		3
		2
		1

Grade 7 ACCELERATED Mathematics

Essential Questions
How is probability used to make informed decisions about uncertain events?
Corresponding Big Ideas
The rules of probability can lead to more valid and reliable predictions about the likelihood of an even occurring.

Learning Activities		
Objective	**Resource/page**	**Notes**
Sampling and Inferences: Students will • Determine the validity of a sample and predict actions of a larger group • Review types of graphs and measures of central tendency and variation • Select the appropriate display for a set of data • Construct and interpret two-way tables • Analyze the visual overlap of two numerical data distributions	PA6-10, Gr. 7 CC Clinic Lesson 3,7 PA12-1, PA12-2, PA12-3, PA12-4, CC Clinic Lessons 4, 5, 6, 7 PA12-5, Gr. 8 CCSS Lesson 16, Gr. 8 Coach Lesson 36 Gr. 7 CCSS Lesson 14, 15	In section 6-10, focus on is the sample valid. Technology note: 12-3 extend, 12-4 extend are graphing calculator labs Technology TBD – students go online to find data on a topic of interest. They create a spreadsheet and choose the appropriate way to represent their data and explain.
Probability models: Students will • Find probability of simple events and use a sample to predict the actions of a larger group • Distinguish between experimental and theoretical probability • Use strategies to count outcomes and find the probability of an event • Use combinations and permutations to determine outcomes • Find the probability of compound events • Design and use a simulation to generate frequencies for compound events and analyze the results	PA12-7 Gr. 7 CC Clinic Lesson 1 PA12-8, PA12-9, PA12-10, Gr. 7 CC Clinic Lesson 2 PA12-10 Extend	Double die investigation using sums – see appendix

UNIT 5 VOCABULARY:
absolute value, biased sample, box plot (box and whiskers plot), combination, compound (composite) events, dependent events, double box and whiskers, experimental probability, lower quartile, mean, mean absolute deviation, median, measures of central tendency, measures of variation, mode, mutually exclusive events, outcomes, outlier, permutation, population, probability, quartiles, random sample, range, relative frequency, representative sample, sample, sample space, simple event, simulation, stem and leaf plot, theoretical probability, tree diagram, two-way table, upper quartile

Assessment:
Ledyard Assessment Unit 5 Performance Task for Unit 5 TBD

Standardized Assessment Correlations (State, College and Career)
Expectations for Learning (in development) This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Differentiated Instruction: Refer to suggestions and leveled lesson resources at the beginning of each lesson in *Math Connects.*

Instructional Strategies: See Appendix A for research-based Instructional and Differentiated Strategie

21st Century Learning Skills: See Appendix A for explanations.

Technology and Electronic Resources:
http://www.graniteschools.org/depart/teachinglearning/curriculuminstruction/math/Documents/Vocabulary%20Documents/Vocabulary%20Cards%207th%20Grade%20A%20thru%20M.pdf Illustrated vocabulary