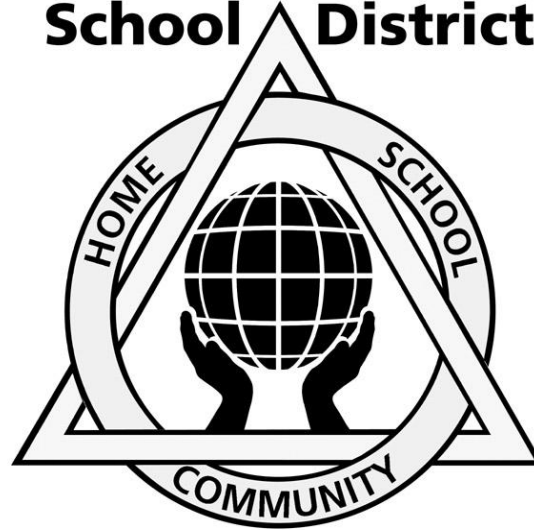


Pre-Algebra 7 Mathematics Curriculum

**Francis Howell
School District**



LEARNING TOGETHER

**Board Approved:
July 17, 2014**

Curriculum Committee

Sarah Bartis	Saeger Middle School
Jennifer Darr	Bryan Middle School
Kristin Luparell	Saeger Middle School
Cindy McGrail	Barnwell Middle School
Lisa Stearns	Francis Howell Middle School
Andrea White	Barnwell Middle School

Middle School Department Chairs

Sue Dodson	Hollenbeck Middle School
Jennifer Fredrick	Bryan Middle School
Kristin Luparell	Saeger Middle School
Cindy McGrail	Barnwell Middle School
Lisa Stearns	Francis Howell Middle School

Secondary Content Leader	Karen Hill
Director of Student Learning	Dr. Chris Greiner
Chief Academic Officer	Dr. Mary Hendricks-Harris
Superintendent	Dr. Pam Sloan

Francis Howell School District

Mission Statement

Francis Howell School District is a learning community where all students reach their full potential.

Vision Statement

Francis Howell School District is an educational leader that builds excellence through a collaborative culture that values students, parents, employees, and the community as partners in learning.

Values

Francis Howell School District is committed to:

- Providing a consistent and comprehensive education that fosters high levels of academic achievement for all
- Operating safe and well-maintained schools
- Promoting parent, community, student, and business involvement in support of the school district
- Ensuring fiscal responsibility
- Developing character and leadership

Francis Howell School District Graduate Goals

Upon completion of their academic study in the Francis Howell School District, students will be able to:

1. Gather, analyze and apply information and ideas.
2. Communicate effectively within and beyond the classroom.
3. Recognize and solve problems.
4. Make decisions and act as responsible members of society.

Mathematics Graduate Goals

Upon completion of their mathematics study in the Francis Howell School District, students will be able to:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Course Rationale

In order to be effective citizens in the 21st century, students need to understand mathematics. Students often encounter problem situations that require reasoning, computation, and communication. We regularly study the most efficient methods for reaching solutions, but also realize that examining different solution methods help develop more flexible solving skills. The instruction and assessment is focused on instilling students with enduring understandings of mathematics. Math 7 seeks to help students develop a strong foundation for future mathematics courses and conceptual understanding in real-life problem solving.

Course Description for Pre-Algebra 7

This course is a compacted course designed to prepare students for Algebra in 8th grade. It contains both Math 7 and Math 8 Missouri Learning Standards. This course is designed to provide students with a strong foundation for future mathematics courses and conceptual understanding in real-life problem solving. The focus is on six critical areas: 1) developing understanding of and applying proportional relationships; 2) developing understanding of operations with rational numbers as well as formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; 3) grasping the concept of a function and using functions to describe quantitative relationships; 4) solving problems involving scale drawings and informal geometric constructions by finding the scale factor and relating the scale factor to proportional reasoning; 5) working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume as well as analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem; and 6) drawing inferences about populations based on samples and investigate chance processes as well as develop, use, and evaluate probability models.

Francis Howell School District Pre-Algebra 7 Curriculum Map

Note: This course is a compacted course designed to prepare students for Algebra in 8th grade.

Black indicates 7th grade Missouri Learning Standards.

Purple indicates 8th grade Missouri Learning Standards.

Unit	Standard	Description	Textbook Reference
Semester 1			
The Number System	7.NS.A.1	Apply and extend previous understandings of addition and subtraction of rational numbers	2.1/2.2/3.2/3.5
	7.NS.A.2	Apply and extend previous understandings of multiplication and division of rational numbers (includes integers)	2.3/3.3/3.4
	7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers – extends to rules for manipulation of fractions to complex fractions	3.6
	8.NS.A.1	Know that numbers that are not rational are called irrational (convert decimal expansion)	3.10

	8.NS.A.2	Use rational approximations of irrational numbers to compare the size of the irrational numbers – locate on the number line	3.10
Expressions and Equations	7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.	1.1-1.4 2.4/3.6
	7.EE.A.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how quantities are related. For example, $a + 1.05 = 1.05a$ means that “increased by 5%”.	8.1 – 8.3
	7.EE.B.3 8.EE.A.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers. Scientific notation to express how many times as much one is than the other.	2.4/3.6/10.1
	7.EE.B.4 8.EE.A.4	Use variables to represent quantities in real-world or mathematical problems ($px + pq = r$ and $p(x+q) = r$). Perform operations with scientific notation and choose units of appropriate size for measurements of very large or very small quantities.	10.1-10.3
	8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships.	11.1/11.2
	8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line (use $y = mx + b$)	11.3
	8.EE.C.7	Solve linear equations in one variable. Solve with rational number coefficient.	10.1-10.3
	8.EE.C.8	Analyze and solve pairs of simultaneous linear equations algebraically and estimating solutions graphically	10.1-10.3
Ratios and Proportional Relationships	7.RP.A.1	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities.	7.1-7.2
	7.RP.A.2	Recognize and represent proportional relationships between quantities. Decide whether two quantities are in a proportional relationship in table or graphing and observing whether the graph is a straight line through the origin. Identify the constant of proportionality in tables, graphs, equations, diagrams and verbal descriptions	7.1-7.4 11.1-11.3
	7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.	8.4-8.7
Semester 2			

Ratios and Proportional Relationships (continued)	8.F.A.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is a set of ordered pairs consisting of an input and the corresponding output.	12.4
	8.F.A.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)	11.1/11.2/11.3
	8.F.A.3	Interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear	11.1/11.2/11.3
	8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table, or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	12.4/12.5 Refer to 12.6/12.7
	8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally	12.4/12.5 Refer to 12.6/12.7
Geometry	7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing	7.5-7.8
	7.G.A.2	Draw (freehand, with ruler and protractor and with technology) geometric shapes with given conditions	Supplement
	7.G.A.3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids	Supplement
	7.G.B.4	Know the formulas for area and circumference of a circle and use them to solve problems.	6.4
	7.G.B.5	Use facts about supplementary, complimentary, vertical and adjacent angles. Write and solve equations to find missing angle measurements	5.1-5.4
	7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area in two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms	6.6-6.10
	8.G.A.3	Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates	5.7/7.5

	8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of transformations. Describe similarity	5.7/7.5
	8.G.B.7	Apply the Pythagorean Theorem to determine unknown sides lengths for right triangles	6.3
	8.G.B.8	Apply the Pythagorean Theorem to determine distance between two points in coordinate system.	6.3
Statistics & Probability	7SP.A.1	Understand that statistics can be used to gain information about a population by examining a sample of the population.	4.1
	7SP.A.2	Use data from a random sample to draw inferences about a population with an unknown characteristic	4.1
	7SP.B.3	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities	4.5
	7SP.B.4	Use measures of center and measures of variability for numerical data from random samples to draw inferences about two populations	4.3
	7SP.C.5	Understand the probability of a chance event is a number between 0 and 1 that expresses the likelihood of an event occurring	9.1
	7SP.C.6	Approximate the probability of a chance event by collecting data	9.2
	7SP.C.7	Develop a probability model and use it to find probability of events. Compare probabilities	9.4
	7SP.C.8	Find probabilities of compound events using organized lists, tables, tree diagrams and simulations	9.5-9.7

Content Area: Math	Course: Pre-Algebra 7	UNIT 1: The Number System
Unit Description: Students will be able to add, subtract, multiply, and divide rational numbers fluently as well as solve real-world and mathematical problems. In this unit, students will represent their calculations using number line models, equations and expressions in real world applications.		Unit Timeline: 4 weeks

DESIRED RESULTS
<p><u>Transfer Goal</u> - <i>Students will be able to independently use their learning to...</i></p> <ul style="list-style-type: none"> ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – *Students will understand that... (Big Ideas)*

1. Rational numbers use the same properties as whole numbers.
2. Rational numbers can be used to represent and solve real-life situation problems.
3. Rational numbers can be represented with visuals (including distance models), language, and real-life contexts.
4. A number line model can be used to represent the unique placement of any number in relation to other numbers.
5. There are precise terms and sequence to describe operations with rational numbers.
6. Numbers that do not repeat in their decimal form are called irrational.

Essential Questions: *Students will keep considering...*

- How are rational numbers used and applied in real-life and mathematical situations?
- What is the relationship between properties of operations and types of numbers?
- How do you use scientific notation?
- How do use a number line to compare the size of two irrational numbers?

Students Will Know...	Standard	Students Will Be Able to ...	Standard
<p><i>See Vocabulary at the end of this unit.</i></p>		<p><u>Mathematical Practices</u></p> <p>Make sense of problems and persevere in solving them.</p> <p>Reason abstractly and quantitatively.</p> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Model with mathematics.</p> <p>Use appropriate tools strategically.</p> <p>Attend to precision.</p> <p>Look for and make use of structure.</p> <p>Look for and express regularity in repeated reasoning.</p> <p><u>Grade Level Standards</u></p> <p>Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p> <p>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.</p> <p>a. Describe situations in which opposite quantities combine to make 0. <i>For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.</i></p>	<p>MP1</p> <p>MP2</p> <p>MP3</p> <p>MP4</p> <p>MP5</p> <p>MP6</p> <p>MP7</p> <p>MP8</p> <p>7.NS.A</p> <p>7.NS.A.1</p> <p>7.NS.A.1a</p>

		<p>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.</p> <p>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.</p> <p>d. Apply properties of operations as strategies to add and subtract rational numbers.</p> <p>Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.</p> <p>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.</p> <p>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.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers.</p>	<p>7.NS.A.1 b</p> <p>7.NS.A.1c</p> <p>7.NS.A.1 d</p> <p>7.NS.A.2</p> <p>7.NS.A.2a</p> <p>7.NS.A.2 b</p> <p>7.NS.A.2c</p>
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		<p>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.</p> <p>Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p>Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.</p> <p>Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</p>	<p>7.NS.A.2 d</p> <p>7.NS.A.3</p> <p>8.NS.A.1</p> <p>8.NS.A.2</p>
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EVIDENCE of LEARNING			
Understanding	Standards	Unit Performance Assessment:	R/R Quadrant
g # 1, #2, #5	MP1 MP6 7.NS.A.1 7.NS.A.1b 7.NS.A.1c 7.NS.A.1d 7.NS.A.2 7.NS.A.3	<p>Description of Assessment Performance Task(s):</p> <p>Unit Performance Assessment: The Number System (See Appendix 1.A)</p> <p>All problems in this performance task are related to operations with rational numbers including integers. The performance task applies work with integers to maintaining a school store account balance.</p> <p>Teacher will assess:</p> <p>The five selected responses and the performance task will assess the student’s knowledge of operations with integers both as a skill and in a real-life situation. The performance task will assess the student’s ability to use acquired knowledge to solve a problem.</p>	B

		<p><u>Performance:</u></p> <p>Mastery: <i>Students will show that they really understand when they...</i> complete the formative with a score of 75% or better.</p> <p>Scoring Guide: See Appendix 1.A and 1.B</p>	
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SAMPLE LEARNING PLAN

Pre-assessment: District Benchmark assessment

<u>Understanding</u>	<u>Standards</u>	<u>Major Learning Activities:</u>	<u>Instructional Strategy:</u>	<u>R/R Quadrant:</u>
#1	MP6 MP8 7.NS.A.1 7.NS.A.2 ISTE-S.3 ISTE-S.4	<p>1. Activity: Arithmetic Four!</p> <ul style="list-style-type: none"> Objective: Students will play an online game that mimics the game Connect Four. Students apply operations on rational numbers in order to earn game chips. http://www.shodor.org/interactivate/activities/ArithmeticFour/ Appendix Document: Appendix 1.C – Arithmetic Four! 	<ul style="list-style-type: none"> Homework and Practice Technology Integration with an online game 	A
#2	MP2 MP3 MP6 7.NS.A.3	<p>2. Activity: Pizzeria Profits!</p> <ul style="list-style-type: none"> Objective: Students will be able to solve a real-world problem by comparing rational numbers, using a number line, calculating net loss/net gain, and constructing an argument to advise the purchase of the pizzeria. Appendix Document: Appendix 1.D – Pizzeria Profits! 	<ul style="list-style-type: none"> Identifying Similarities and Differences 	D
#5	MP1 MP3 7.NS.A.2	<p>3. Activity: Choosing False Statements and Providing a Reason or Example</p> <ul style="list-style-type: none"> Objective: Students will construct a viable argument or create an expression that proves a statement to be false. This is a released SBAC extended response activity. Appendix Document: 	<ul style="list-style-type: none"> Identifying Similarities and Differences 	C

		Appendix 1.E – Choosing False Statements and Providing a Reason or Example		
#4, #6	MP5 MP7 8.NS.A.1 8.NS.A.2	<p>4. Activity: Estimating with Irrational Numbers and Placement on the Number Line This can be completed individually or with a partner*</p> <ul style="list-style-type: none"> ● Objective: <u>Part 1</u> The first part of this learning activity can be used to either build or assess initial understandings related to rational approximations or irrational numbers. Students are comparing the size of irrational numbers. <p><u>Part 2</u> The second part of this activity the students will plot irrational numbers on a number line. They will need to understand the idea of where they fit into a number system that includes the more familiar integer and rational numbers.</p> ● Appendix Document: Appendix 1.F – Estimating with Irrational Numbers and Placement on the Number Line 	<ul style="list-style-type: none"> ● Cooperative Learning* ● Similarities and Differences 	B
#4	MP6 8.NS.A.2	<p>5. Activity: Real Number Race</p> <ul style="list-style-type: none"> ● Objective: This is a cooperative learning activity in which the student outcomes are as follows: <ul style="list-style-type: none"> ● Write a decimal approximation for an irrational number to a given decimal place ● Convert either repeating or terminal decimals into a fraction ● Explain the difference between a rational and an irrational number <p>Materials:</p> <ul style="list-style-type: none"> ● One copy of the real number hexagon per team ● Spinner or cube ● Two different colors of pencils for each student <p>Directions:</p> <ol style="list-style-type: none"> 1. S/he chooses one of their colors for rational and one for irrational 	<ul style="list-style-type: none"> ● Cooperative Learning ● Similarities and Differences 	B

		<ol style="list-style-type: none">2. On each player's first turn, s/he will spin the spinner and get a real number, irrational number, rational number or lose a turn.3. S/he colors a number on the hexagon that fits the category that they spun. If S/he spins a real number they can color either rational or irrational.4. Students take turns with the spinner and marking their numbers.5. The winner is the first player to get four in a diagonal row of one color. If a player colors an incorrect circle, the opponents should challenge her/him; a wrong move has the penalty of losing a spin and the color should be erased. <ul style="list-style-type: none">● Appendix Document: Appendix 1.G – Real Number Race		
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UNIT RESOURCES

Teacher Resources:

- Learnzillion: <http://learnzillion.com/>
- Brain-pop: <http://brainpop.com>
- Teachers Pay Teachers: www.teacherspayteachers.com (free lessons)
- Study Island: www.studyisland.com
- Michigan Council of Teachers of Mathematics: <http://www.mictm.org>
- National Council of Supervisors of Mathematics: <http://www.mathedleadership.org/>
- CCSS Curriculum Analysis Tool:
- Illustrative Mathematics <http://illustrativemathematics.org/>
- MAISA Model Mathematics Lesson Plans (in progress, some in draft form)
<http://oaklandk12-public.rubiconatlas.org/c/pi/v.php/Atlas/Browse/View/Default>
- Assessment and Lesson Samples aligned to Common Core <http://map.mathshell.org.uk/materials/>
- Engage NY - Tools for Implementation of Common Core and School Reform <http://engageny.org/common-core/>
- A professional resource for mathematics educators <http://www.insidemathematics.org>
- The Teaching Channel – Mathematics http://www.teachingchannel.org/videos?categories=subjects_math
- Implementing the Mathematical Practice Standards – lessons and student dialogue: <http://www.mathpractices.edc.org/>
- Problem Based learning (PBL) - www.emergentmath.com
- 2013 NAEP Released Items: <http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx>
- 3-Acts PBL lessons by Dan Meyer: www.blog.danmeyer.com
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Problem Solving Resources 5-8: <http://www.mathwire.com/problemsolving/probs58.html>
- Holt course textbook online: <http://my.hrw.com>
- Holt 7th grade math textbook and resources
- Math Scholastic magazines
- <http://www.nctm.org/resources>

Student Resources:

- Thinking Blocks: <http://www.mathplayground.com/thinkingblocks.html>
- Learnzillion: <http://learnzillion.com>

- Holt course textbook online: <http://my.hrw.com>
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Funny homework help: <http://www.shmoop.com/>
- Greg Tang Math website: <http://www.gregtang.com/p/blog-page.html> GAMES!
- Brainpop: <http://brainpop.com>
- Study Island: www.studyisland.com
- Holt Pre-Algebra math textbook
- Math Scholastic magazines

Vocabulary:

- Absolute Value - The distance of a number from zero on a number line; shown by | |
- Additive Inverse - The opposite of a number
- Algebraic Expression - An expression that contains at least one variable
- Associative Property - The property that states that for all real numbers, the sum or product is always the same, regardless of their grouping
- Coefficient - The number is multiplied by the variable in an algebraic expression
- Commutative Property - The property that states that two or more numbers can be added or multiplied in any order without changing the sum or product.
- Constant - A value that doesn't change
- Distributive Property - The property that states if you multiply a sum of a number, you will get the same result if you multiply each term or number separately
- Divisor - The number by which is being divided
- Exponent – A number or variable in an expression that represents how many times another numbers is used in repeated multiplication
- Expression - A mathematical phrase that contains numbers, symbols, and/or operation
- Identity Property of One - The property that states that the product of 1 and any number is that number.
- Identity Property of Zero - The property that states the sum of zero and any number is that number
- Integer - The set of whole numbers and their opposites
- Irrational Numbers - A real number that cannot be expressed as a ratio of two numbers.
- Loss-A decrease in amount; as when the money earned is less than the money spent
- Multiplicative Inverse - A number times its reciprocal (multiplicative inverse) is equal to 1
- Opposite - Two numbers that are equal distance from zero on a number line
- Order of Operations - A rule for evaluating
- Perfect Square – The product of an integer and itself. Perfect squares are non-negative and can be written as x^2 when x is an integer
- Principal Square Root - The nonnegative square root on a number
- Profit - A gain; as in the positive amount represented by the difference between the money earned and spent

- Radical Sign – A symbol used in expressions when a root is to be taken. $\sqrt{36}$ means the square root of 36.
- Rational Number - Any number that can be expressed as a ratio of 2 integers
- Real Numbers - The set of all rational and irrational numbers.
- Reciprocal - One of two numbers whose product is 1
- Repeating Decimal - A decimal in which one or more digits repeats infinitely
- Square Root – The square root of x is the number that, when multiplied by itself, gives the number, x .
- Terminating Decimal - A decimal number that ends or terminates
- Term - The parts (variables, numbers, or coefficient and variables together) of an expression that are added or subtracted
- Variable - A symbol used to represent a quantity that can change

Content Area: Math	Course: Pre-Algebra 7	UNIT 2: Expressions and Equations
<p>Unit Description: Students will be able to use properties of operations to generate equivalent expressions, including scientific notation, as well as solve real-life and mathematical problems using numerical and algebraic expressions and equations. In this unit, students will solve multi-step equations and inequalities, use distributive property, and combine like terms.</p>		<p>Unit Timeline: 7 weeks</p>

DESIRED RESULTS
<p><u>Transfer Goal</u> - <i>Students will be able to independently use their learning to...</i></p> <ul style="list-style-type: none"> ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – *Students will understand that... (Big Ideas)*

1. Mathematical properties can be used to find equivalent expressions, including the use of scientific notation, and equations.
2. Expressions, equations and inequalities can be used to represent and solve real-life situation problems.
3. Variables are used to represent an unknown quantity in expressions, equations, and inequalities.

4. Mental computation strategies and estimation are used to assess the reasonableness of an answer.

Essential Questions: *Students will keep considering...*

- How are expressions and equations used and applied in real-life and mathematical situations?
- How can the use of properties be used to manipulate expressions and equations into different forms?
- How can you find the value of an unknown quantity?
- What are the possible solutions for a linear equation with one variable?
- How can you write an equation to represent a real world problem?

Students Will Know...	Standard	Students Will Be Able to ...	Standard
<p><i>See Vocabulary at the end of this unit.</i></p>		<p><u>Mathematical Practices</u></p> <p>Make sense of problems and persevere in solving them.</p> <p>Reason abstractly and quantitatively.</p> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Model with mathematics.</p> <p>Use appropriate tools strategically.</p> <p>Attend to precision.</p> <p>Look for and make use of structure.</p> <p>Look for and express regularity in repeated reasoning.</p> <p><u>Grade Level Standards</u></p> <p>Use properties of operations to generate equivalent expressions.</p> <p>Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Understand that rewriting an expression in different forms in a problem context can shed light on a problem and how the quantities in it are related.</p> <p>Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</p>	<p>MP1</p> <p>MP2</p> <p>MP3</p> <p>MP4</p> <p>MP5</p> <p>MP6</p> <p>MP7</p> <p>MP8</p> <p>7.EE.A</p> <p>7.EE.A.1</p> <p>7.EE.A.2</p> <p>7.EE.B</p>

		<p>Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. Scientific notation to express how many times as much one is than the other.</p>	7.EE.B.3
		<p>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. <i>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. 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.</i></p>	8.EE.3
		<p>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.</p>	7.EE.B.4
		<p>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. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i> Perform operations with scientific notation and choose units of appropriate size for measurements of very large or very small quantities.</p>	7.EE.B.4a
			7.EE.B.4b

		<p>b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. <i>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.</i></p> <p>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.</p> <p>Solve linear equations in one variable.</p> <p>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 equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).</p> <p>Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</p>	<p>8.EE.A.4</p> <p>8.EE.C.7</p> <p>8.EE.C.7 a</p> <p>8.EE.C.7 b</p>
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EVIDENCE of LEARNING			
<u>Understanding</u> #2, #3	<u>Standards</u> MP1 MP3 MP4 MP6 MP7 7.EE.A.2 7.EE.B.3 7.EE.B.4 7.EE.B.4.a 8.EE.C.7	<u>Unit Performance Assessment:</u> Description of Assessment Performance Task(s): <i>Unit Performance Assessment: Expressions and Equations</i> (See Appendix 2.A) All problems in this performance task are related to writing and solving expressions and equations. The performance task applies the use of the distributive property to writing and solving an equation to find the total cost, including tax, of a purchase made at a bookstore and decide which method will earn the most money to purchase equipment for the school. Teacher will assess: Student ability to show correct work, understand equivalent expressions, recognize the amount of solutions to an equation, and the student’s ability to use acquired knowledge to solve a real-world problem. Performance: Mastery: <i>Students will show that they really understand when they...</i> complete the formative with a score of 75% or better. Scoring Guide: See Appendix 2.B	<u>R/R Quadrant</u> D

SAMPLE LEARNING PLAN

Pre-assessment: District Benchmark assessment

<u>Understanding</u>	<u>Standards</u>	<u>Major Learning Activities:</u>	<u>Instructional Strategy:</u>	<u>R/R Quadrant:</u>
#3	MP4 MP5 MP7 7.EE.B.4b	<p>1. Activity: Inequality Puzzle Game</p> <ul style="list-style-type: none"> Objective: Students will be able to solve a puzzle by matching the graph the solution set of an inequality with its inequality. Teachers make copies of the puzzle and cut the puzzle into 16 smaller squares. They will then mix up the pieces, give each student a puzzle, and tell them to put the pieces together to form a 4×4 square. When pieces are joined, the problem on one side must be attached to the answer on the other. This can be completed individually or with a partner* Appendix Document: Appendix 2.C – Inequality Puzzle Game 	<ul style="list-style-type: none"> Homework and Practice Nonlinguistic Representations Cooperative Learning* 	B
#1	MP1 MP6 MP7 7.EE.A.1	<p>2. Activity: Distributive Property Gallery Walk</p> <ul style="list-style-type: none"> Objective: Students will be paired in twos in order to apply the distributive property to match equivalent expressions. Expression clues will be placed around the room and students will find the equivalent expression on their worksheet. Students will use the Rally Coach structure in which students alternate the responsibilities of finding the equivalent expression as the other student coaches and gives feedback. Appendix Document: Appendix 2.D – Distributive Property Gallery Walk 	<ul style="list-style-type: none"> Cooperative Learning – Rally Coach 	B
#2, #3, #4	MP1 MP2 MP6 7.EE.A.2 7.EE.B.3	<p>3. Activity: Credit Card Statement</p> <ul style="list-style-type: none"> Objective: Students will be able to solve real-world, multi-step problems and asses the reasonableness of their answer by working with credit card statements. They are asked 	<ul style="list-style-type: none"> Similarities and Differences Technology Integration: Blog 	D

	ISTE-S.2	<p>to justify their answer to a question using an online blog such as found on Schoology or Glogster. (Please get advice from your building Library Media Specialist.)</p> <ul style="list-style-type: none"> Appendix Document: Appendix 2.E – Credit Card Statement 		
#1, #3	MP6 MP7 7.EE.A.1 7.EE.B.3 ISTE-S.3 ISTE-S.4	<p>4. Activity: Equation Millionaire</p> <ul style="list-style-type: none"> Objective: Students will play an online game that mimics the game Millionaire. Students will practice writing and solving a variety of equations. http://www.math-play.com/Algebraic-Expressions-Millionaire/algebraic-expressions-millionaire.html Appendix Document: Appendix 2.F – Equation Millionaire 	<ul style="list-style-type: none"> Homework and Practice Technology Integration with an online game 	B
#1, #2, #5	MP1 MP3 MP5 7.EE.A.1 7.EE.A.2 7.NS.A.2	<p>5. Activity: Cost for Renting a Vacation Home</p> <ul style="list-style-type: none"> Objective: Students will solve a real-world problem for sharing the rent for a vacation house. They will compute and justify each individual's costs. Appendix Document: Appendix 2.G – Cost for Renting a Vacation Home 	<ul style="list-style-type: none"> Homework and Practice 	C
#1	MP1 MP2 MP3 MP4 MP5 8.EE.A.3 8.EE.A.4 ISTE-S.4	<p>6. Activity: Planets Activity</p> <p>This activity uses information about the planets for comparisons using scientific notation and planet diameters. It includes an argument piece where students can cast their vote as to whether Pluto should still be considered a planet. http://heasarc.nasa.gov/docs/cosmic/planets.html</p> <ul style="list-style-type: none"> Objective: <ul style="list-style-type: none"> Students will be able to perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Students will be able to 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). 	<ul style="list-style-type: none"> Cooperative Learning Technology research tools Similarities and Differences 	D

		<ul style="list-style-type: none"> Students will be able to interpret scientific notation that has been generated by technology. Appendix Documents: Appendix 2.H – Planets Activity Appendix 2.I – Planets Activity Scoring Guide 		
#1	MP1 MP2 MP3 MP4 8.EE.A.3 8.EE.A.4	<p>7. Activity: Fish Tank “Fun Facts”</p> <p>This activity combines using precision with scientific notation and conversion within units. Students are using the capacity of fish tanks and the volume of the oceans in the world. Students are also asked to create a “fun fact” about their own task that they have designed. This can be completed individually or with a partner*</p> <ul style="list-style-type: none"> Objective: <ul style="list-style-type: none"> Students will be able to perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Students will be able to 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). Appendix Documents: Appendix 2.J – Fish Tank Fun Fact Appendix 2.K – Fish Tank Fun Fact Scoring Guide 	<ul style="list-style-type: none"> Cooperative Learning* Similarities and Differences 	C

UNIT RESOURCES

Teacher Resources:

- Learnzillion: <http://learnzillion.com/>
- Michigan Council of Teachers of Mathematics: <http://www.mictm.org>
- National Council of Supervisors of Mathematics: <http://www.mathedleadership.org/>
- CCSS Curriculum Analysis Tool: Illustrative Mathematics <http://illustrativemathematics.org/>
- MAISA Model Mathematics Lesson Plans (in progress, some in draft form)
<http://oaklandk12-public.rubiconatlas.org/c/pi/v.php/Atlas/Browse/View/Default>
- Assessment and Lesson Samples aligned to Common Core <http://map.mathshell.org.uk/materials/>
- Engage NY - Tools for Implementation of Common Core and School Reform <http://engageny.org/common-core/>
- A professional resource for mathematics educators <http://www.insidemathematics.org>
- The Teaching Channel – Mathematics http://www.teachingchannel.org/videos?categories=subjects_math
- Implementing the Mathematical Practice Standards – lessons and student dialogue: <http://www.mathpractices.edc.org/>
- Problem Based learning (PBL) - www.emergentmath.com
- 2013 NAEP Released Items: <http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx>
- 3-Acts PBL lessons by Dan Meyer: www.blog.danmeyer.com
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Problem Solving Resources 5-8: <http://www.mathwire.com/problemsolving/probs58.html>
- Holt course textbook online: <http://my.hrw.com>
- Holt 7th grade math textbook and resources
- Math Scholastic magazines

Extra Practice:

- <http://kutasoftware.com/FreeWorksheets/Alg1Worksheets/Systems%20of%20Equations%20Graphing.pdf>
- <http://middlemathccss.files.wordpress.com/2011/04/systems-of-equation-no-solution.pdf>

Videos:

- http://goanimate4schools.com/public_movie/0bKHL40jy8bc

Student Resources:

- Thinking Blocks: <http://www.mathplayground.com/thinkingblocks.html>
- Learnzillion: <http://learnzillion.com>
- Holt course textbook online: <http://my.hrw.com>
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Funny homework help: <http://www.shmoop.com/>
- Greg Tang Math website: <http://www.gregtang.com/p/blog-page.html> GAMES!
- Brainpop: <http://brainpop.com>
- Holt 7th grade math textbook
- Math Scholastic magazines

Vocabulary:

- Break-Even Point – The point at which there is neither a profit nor a loss
- Coefficient – The number that is multiplied by the variable in an algebraic expression
- Direct Variation – A relationship between two variables in which the data increase or decrease together at a constant rate
- Distributive Property – Property indicating a special way in which multiplication is applied to addition of two or more numbers in which each term inside a set of parenthesis can be multiplied by a factor outside the parenthesis, such as $a(b + c) = ab + ac$
- Domain – The set of all possible input values of a function
- Equivalent Expressions – Expressions that have the same value for all values of the variables
- Function Notation – The notation used to describe a function
- Functions – An input – output relationship that has exactly one output for each input
- Inverse operations – The operation that reverses the effect of another operation
- Like Terms – Two or more terms that have the same variable raised to the same power
- Linear Equation – An equation whose solutions form a straight line on a coordinate plane
- Linear Inequality – A mathematical sequence using $<$, $>$, \leq , or \geq whose graph is a region with a straight line boundary
- Point-Slope Form – The equation of a line in the form of $y - y_1 = m(x - x_1)$ where m is the slope and (x_1, y_1) is the specific point on the line
- Properties of Equality – The property that states you must perform the same operation on both sides of the equal sign on an equation, in order to keep it balanced
- Range (of a function) – The set of all possible output values of a function
- Rate of Change – Another term for slope that describes how one quantity (variable) changes another quantity (variable)

- Rise – The vertical change when the slope of a line is expressed as the ratio $\frac{\text{rise}}{\text{run}}$, or “rise over run”
- Run – The horizontal change when the slope of a line is expressed as the ratio $\frac{\text{rise}}{\text{run}}$, or “rise over run”
- Scientific Notation – A form of writing numbers as the product of a power of 10 and a decimal number greater than or equal to one
- Simplify – To write a fraction or expression in simplest form
- Slope – A measure of the steepness of a line on a graph; the rise divided by the run. It is the constant rate of change
- Slope-Intercept Form – A linear equation written in the form $y = mx + b$ where m represents slope and b represents the y -intercepts
- Solution – Means of solving a problem; an answer
- Solution of a System of Equations – A set of values that make all equations in a system true
- System of Equations – A set of two or more equations that contain two or more variables
- Term – The parts (variables, numbers, or coefficient and variables together) of an expression that are added or subtracted
- Variable – A symbol for an unknown value
- X-Intercept – The x -coordinate of the point where the graph of a line crosses the x -axis
- Y-Intercept – The y -coordinate of the point where the graph of a line crosses the y -axis

Content Area: Math	Course: Pre-Algebra 7	UNIT 3: Ratios and Proportions
<p>Unit Description: Students extend their understanding of ratios and develop proportional relationships to solve real-world and mathematical single- and multi-step problems. Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.</p>		<p>Unit Timeline: 12 weeks</p>

DESIRED RESULTS
<p><u>Transfer Goal</u> - <i>Students will be able to independently use their learning to...</i></p> <ul style="list-style-type: none"> ● Make sense of problems and persevere in solving them ● Reason abstractly and quantitatively ● Construct viable arguments and critique the reasoning of others ● Model with mathematics ● Use appropriate tools strategically ● Attend to precision ● Look for and make use of structure ● Look for and express regularity in repeated reasoning

Understandings – *Students will understand that...* (Big Ideas)

1. Rates, ratios, percentages and proportional relationships express how quantities change in relationship to each other and can be applied to solve multi-step problems such as interest, tax, discount, etc.
2. How to recognize linearity in a table or graph by a constant rate of change
3. Non-linear data can be modeled with linear graph models to make predictions
4. Rates and ratios are related numerically, graphically, and algorithmically (by equations).
5. Functions describe relationships and will be able to compare and construct a function
6. The equation $y = mx + b$ will be interpreted as a straight line, where m and b are constants.
7. Patterns are sequences and sequences are functions with a domain consisting of whole numbers.
8. They can use similar triangles to identify the slope of a line.

Essential Questions: *Students will keep considering...*

- How do rates, ratios, percentages and proportional relationships apply to our world?
- What is the difference between a unit rate and a ratio?
- How are equivalent ratios, values in a table, ordered pairs, and the slope of a graph connected?
- What defines a function and how can it be represented?
- What makes a function linear?
- How can linear relationships be modeled and used in real-life situations?
- How do you solve a linear equation algebraically with one solution or no solution?
- How do you use functions to model relationships between quantities?
- How do you define, evaluate, and compare functions?

Students Will Know...	Standard	Students Will Be Able to ...	Standard
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<p><i>See Vocabulary at the end of this unit.</i></p>		<p><u>Mathematical Practices</u></p> <p>Make sense of problems and persevere in solving them.</p> <p>Reason abstractly and quantitatively.</p> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Model with mathematics.</p> <p>Use appropriate tools strategically.</p> <p>Attend to precision.</p> <p>Look for and make use of structure.</p> <p>Look for and express regularity in repeated reasoning.</p> <p><u>Grade Level Standards</u></p> <p>Analyze proportional relationships and use them to solve real-world and mathematical problems.</p> <p>Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.</i></p> <p>Recognize and represent proportional relationships between quantities.</p> <p>a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table</p>	<p>MP1</p> <p>MP2</p> <p>MP3</p> <p>MP4</p> <p>MP5</p> <p>MP6</p> <p>MP7</p> <p>MP8</p> <p>7.RP.A</p> <p>7.RP.A.1</p> <p>7.RP.A.2</p> <p>7.RP.A.2a</p>
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		<p>or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.</p> <p>b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</p> <p>c. Represent proportional relationships by equations. <i>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 $t = pn$.</i></p> <p>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.</p> <p>Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i></p> <p>Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is a set of ordered pairs consisting of an input and the corresponding output.</p> <p>Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions)</p>	<p>7.RP.A.2b</p> <p>7.RP.A.2c</p> <p>7.RP.A.2d</p> <p>7.RP.A.3</p> <p>8.F.A.1</p> <p>8.F.A.2</p> <p>8.F.A.3</p>
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		<p>Interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear</p> <p>Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table, or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>Describe qualitatively the functional relationship between two quantities by analyzing a graph. Sketch a graph that exhibits the qualitative features of a function that has been described verbally</p>	<p>8.F.B.4</p> <p>8.F.B.5</p>
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EVIDENCE of LEARNING			
<u>Understanding</u> g # 1, #4	<u>Standards</u> MP1 MP3 MP4 7.RP.A.2 7.RP.A.2c 7.RP.A.3	<u>Unit Performance Assessment:</u> Description of Assessment Performance Task(s): <i>Unit Performance Assessment: Ratios and Proportions</i> (See Appendix 3.A) All problems in this performance task are related to ratios and proportional relationships. For the performance task, the students will have to determine if the distribution of cash flow is proportional to the amount of cash invested.	<u>R/R Quadrant</u> B

		<p>Teacher will assess: The four selected responses and the performance task will assess the students' knowledge of applying unit rates and proportional reasoning in a real-world situation.</p> <p><u>Performance:</u> Mastery: <i>Students will show that they really understand when they...</i> complete the formative with a score of 75% or better.</p> <p>Scoring Guide: See Appendix 3.B</p>	
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SAMPLE LEARNING PLAN

Pre-assessment: District Benchmark assessment

<u>Understanding</u>	<u>Standards</u>	<u>Major Learning Activities:</u>	<u>Instructional Strategy:</u>	<u>R/R Quadrant:</u>
# 1, #2, #3	MP1 MP2 MP3 MP4 MP6 7.RP.A 7.RP.A.1	<p>1. Activity: Track Practice</p> <ul style="list-style-type: none"> Objective: Students will be able to compute unit rates to determine speed and distances using the following: http://www.illustrativemathematics.org/illustrations/82 This can be completed individually or with a partner in a cooperative learning activity.* Appendix Document: Appendix 3.C – Track Practice 	<ul style="list-style-type: none"> Nonlinguistic Representations Cooperative Learning* 	C
#1, #2, #3, #5	MP1 MP3 MP4 MP5 MP6 MP7 7.RP.A.1 7.RP.A.2a 7.RP.A.2b 7.RP.A.2c 7.RP.A.2d 7.RP.A.3 7.NS.A.3 ISTE-S.3	<p>2. Activity: Car or Motorcycle?</p> <ul style="list-style-type: none"> Objective: Students will be able to compute unit rates, create tables, graphs, and equations to determine proportionality. This activity can be found in the Holt grade 7 textbook, Chapter 5 Problem Solving Connections. *For technology extensions, have the students create the tables, graphs, and equations of the car and motorcycle using a TI-73 graphing calculator. Calculator directions: http://www.austintown.k12.oh.us/~aust_tr/TI-73%20Graphing%20Basics%20%20july%20099.PDF Appendix Document: Appendix 3.D – Car or Motorcycle? Student Copy Appendix 3.E – Car or Motorcycle? Teacher Guide Appendix 3.F – TI-73 Graphing Calculator Directions 	<ul style="list-style-type: none"> Homework and Practice Cooperative Learning Nonlinguistic Representations Technology Integration* 	C

#1, #2, #3, #4, #5	MP1 MP3 MP4 MP5 MP6 MP8 7.RP.A.3 7.NS.A.2 7.NS.A.3	<p>3. Activity: Percent Change</p> <ul style="list-style-type: none"> Objective: Students will be able to work with others in a cooperative learning activity to show their knowledge and understanding of percent increase and decrease using the following: http://map.mathshell.org/materials/lessons.php?taskid=210&subpage=concept This lesson is intended to assess how well students are able to interpret percent increase and decrease, and in particular, to identify and help students who have the following difficulties: <ul style="list-style-type: none"> Translating between percents, decimals, and fractions. Representing percent increase and decrease as multiplication. Recognizing the relationship between increases and decreases. Appendix Document: Appendix 3.G – Percent Change 	<ul style="list-style-type: none"> Cooperative Learning Similarities and Differences Nonlinguistic Representations 	D
#1, #2, #3, #4, #5	MP1 MP4 MP5 MP6 MP8 7.RP.A.2c 7.RP.A.3 7.NS.A.3 7.EE.A.2 7.EE.B.3 7.EE.B.4a ISTE-S.3	<p>4. Activity: Discount Savings Using a Graphing Calculator</p> <ul style="list-style-type: none"> Objective: In this activity, students will find discounts and sale prices for items selling at 20% off and 40% off by using tables. They will then find the general rules, using a variable, for finding those discounts and prices using a TI-73 Explorer TM or a TI-Navigator TM. http://education.ti.com/en/us/activity/detail?id=0352AFFB172B44FBA60BF68AD66E206B&ref=/en/us/activity/search/subject?d=E6BF78EF098644A8A458D8D1B4AA1A44&sa=B843CE852FC5447C8DD88F6D1020EC61&sa=3702C4C225D647AD888ECE38B4EB90A2&t=55CE576452D64763BE248EEE632924D8 Appendix Document: Appendix 3.H – Discount Savings Using a Graphing Calculator Student Copy Appendix 3.I – Discount Savings Using a Graphing Calculator Teacher Guide 	<ul style="list-style-type: none"> Nonlinguistic Representations Similarities and Differences Technology Integration 	B
	MP1	<p>5. Activity: Cell Phone Plans</p> <ul style="list-style-type: none"> Objective 		B

#2, #4, #5, #6	MP2 MP3 MP4 8.EE.B.5 8.F.A.2 8.F.A.3 8.F.B.4 8.F.B.5	<p>In this lesson, students 1) complete a table, graph, and function for two cell phone companies, 2) compare the two companies, determine which company is a better buy and 3) form an opinion and communicate reasoning about which company they should choose.</p> <ul style="list-style-type: none"> Appendix Document: Appendix 3.J – Logging On (Cell Phone Activity) 	<ul style="list-style-type: none"> Similarities and Differences Nonlinguistic Representations 	
#1	MP6 7.RP	<p>6. Activity: Vocabulary Activity</p> <ul style="list-style-type: none"> Objective: In this activity, students will learn the key vocabulary of the unit (proportional relationship, ratio, slope and unit rate) using a word categorization chart. Students use the chart to analyze important attributes and characteristics of a definition, draw an image and create examples. The vocabulary sheets can be used at the beginning of a unit to go over several major concepts or can be used throughout the unit in individual lessons as concepts are being taught. Appendix Documents: Appendix 3.K – Blank Vocabulary Sheets Side 1 Appendix 3.L – Blank Vocabulary Sheets Side 2 	<ul style="list-style-type: none"> Nonlinguistic Representations 	B
#1, #2	MP2 MP4 MP5 7.RP.A.2 ISTE-S.6	<p>7. Activity: Graphing a Proportional Relationship and SBAC Technology Enhanced Question Practice</p> <ul style="list-style-type: none"> Objective: Students will graph a proportional relationship. This is a released SBAC technology enhanced activity. Students will access the Smarter Balanced website and enter the Math GR6-8 Training Test. They will follow directions in the appendix document to access the coordinate grid (Question 1 of the Training Test). Students will use the graphing tool to create the proportional relationship on the SBAC released item or a proportional relationship chosen by the teacher. Students will check their graph with the teacher for accuracy and 1) get feedback if incorrect or 2) complete the remaining 7 	<ul style="list-style-type: none"> Nonlinguistic Representations Homework and Practice Setting Objectives and Providing Feedback 	C

		<p>questions on the practice test. These remaining questions include several technology enhanced items.</p> <p>https://login4.cloud1.tds.airast.org/student/V30/Pages/LoginShell.aspx?c=SBAC_PT</p> <ul style="list-style-type: none"> Appendix Documents: <ul style="list-style-type: none"> Appendix 3.M – Graphing a Proportional Relationship Appendix 3.N – Accessing the Math GR6-8 Training Test and Coordinate Grid 		
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UNIT RESOURCES

Teacher Resources:

- Learnzillion: <http://learnzillion.com/>
- Michigan Council of Teachers of Mathematics: <http://www.mictm.org>
- National Council of Supervisors of Mathematics: <http://www.mathedleadership.org/>
- CCSS Curriculum Analysis Tool: Illustrative Mathematics <http://illustrativemathematics.org/>
- MAISA Model Mathematics Lesson Plans (in progress, some in draft form)
<http://oaklandk12-public.rubiconatlas.org/c/pi/v.php/Atlas/Browse/View/Default>
- Assessment and Lesson Samples aligned to Common Core <http://map.mathshell.org.uk/materials/>
- Engage NY - Tools for Implementation of Common Core and School Reform <http://engageny.org/common-core/>
- A professional resource for mathematics educators <http://www.insidemathematics.org>
- The Teaching Channel – Mathematics http://www.teachingchannel.org/videos?categories=subjects_math
- Implementing the Mathematical Practice Standards – lessons and student dialogue: <http://www.mathpractices.edc.org/>
- Problem Based learning (PBL) - www.emergentmath.com
- 2013 NAEP Released Items: <http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx>
- 3-Acts PBL lessons by Dan Meyer: www.blog.danmeyer.com
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Problem Solving Resources 5-8: <http://www.mathwire.com/problemsolving/probs58.html>
- Holt course textbook online: <http://my.hrw.com>
- http://www.austintown.k12.oh.us/~aust_tr/TI-73%20Graphing%20Basics%20%20july%2099.PDF
- Holt 7th grade math textbook and resource books
- Math Scholastic magazines
- <https://grade7commoncoremath.wikispaces.hcps.org/Unit+2+Ratios+and+Proportional+Relationships>
- <http://education.ti.com/en/us/activity/detail?id=0352AFFB172B44FBA60BF68AD66E206B&ref=/en/us/activity/search/subject?d=E6BF78EF098644A8A458D8D1B4AA1A44&s=B843CE852FC5447C8DD88F6D1020EC61&sa=3702C4C225D647AD888ECE38B4EB90A2&t=55CE576452D64763BE248EEE632924D8>
- www.studyisland.com

- <http://www.amathsdictionaryforkids.com/>
- www.teacherspayteachers.com (there are free resources)
- When Are We Ever Gonna Have To Use This? By Hale Saunders
- Illustrative Mathematics: <http://www.illustrativemathematics.org/>
- Google Drawings: Must have Google account and access GoogleDrive

Student Resources:

- Thinking Blocks: <http://www.mathplayground.com/thinkingblocks.html>
- Learnzillion: <http://learnzillion.com>
- Holt course textbook online: <http://my.hrw.com>
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Funny homework help: <http://www.shmoop.com/>
- Greg Tang Math website: <http://www.gregtang.com/p/blog-page.html> GAMES!
- Brainpop: <http://brainpop.com>
- Holt 7th grade math textbook
- Math Scholastic magazines
- www.studyisland.com
- <http://www.amathsdictionaryforkids.com/>
- Google Drawings: Must have Google account and access GoogleDrive

Vocabulary:

- Commission – A fee paid to a person making a sale.
- Commission rate – The fee paid to a person who makes a sale expressed as a percent of the selling price.
- Complex fraction – A fraction that contains one or more fractions in the numerator, the denominator, or both.
- Constant of proportionality – The constant ratio between two quantities in a proportional relationship.
- Coordinate Grid- A plane that is divided into four regions by a horizontal line called the x-axis and a vertical line called the y-axis.
- Dependent Variable- The output of a function.
- Equivalent ratios – Ratios that name the same comparison.
- Independent Variable- The input of a function
- Interest – The amount of money charged or earned for borrowing or investing money
- Linear – A relationship where a constant rate of change exists between two variables.
- Origin – The point of intersection of the x and y axis on a coordinate or Cartesian plane. The coordinates of the origin are (0,0).
- Percent of change – The amount stated as a percent that a number increases or decreases.
- Percent of decrease – A percent change describing a decrease in a quantity.
- Percent of increase – A percent change describing an increase in a quantity.
- Principal – The initial amount of money borrowed or saved.

- Proportion – A special name for an equation that states that two ratios are equivalent.
- Proportional relationship – A relationship between two quantities in which the ratio of one quantity to the other quantity is constant. Two quantities are in a proportional relationship when they can be observed in a table or equivalent ratios or fall on the line of equivalent ratios in a coordinate plane.
- Rate of change – A ratio that compares the amount of change in a dependent variable to the amount of change in an independent variable.
- Ratio – A comparison of two quantities by division.
- Simple interest – A fixed percent of the principal. It is traditionally found using the formula $I = Prt$, where P represents the principal, r the rate of interest, and t the time.
- Slope – A measure of the steepness of a line on a graph; the rise divided by the run (rate of change).
- Slope-Intercept Form – $y = mx + b$ when m is the slope and b is the y-intercept
- Unit price – A unit rate used to compare prices and the unit is associated with the item purchased.
- Unit rate – A rate in which the second quantity in the comparison is one unit.
- X-intercept- the first number in an ordered pair, which indicates the horizontal distance of a point from the origin on the coordinate plane.
- Y-intercept- The second number in an ordered pair, which indicates the vertical distance of a point from the origin on the coordinate plane.

Content Area: Pre-Algebra	Course: Pre-Algebra 7	UNIT 4: Geometry
Unit Description: Students begin to reason about relationships among two-dimensional figures using scale and informal geometric constructions, and gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.		Unit Timeline: 8 weeks

DESIRED RESULTS

Transfer Goal - Students will be able to independently use their learning to...

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – Students will understand that... (Big Ideas)

1. Real world and geometric structures are composed of shapes and spaces with specific properties.
2. Shapes have a purpose in the designing of structures.
3. Three-dimensional figures have relationships to specific two-dimensional figures.

4. Planes that cut polyhedra create related two-dimensional figures.
5. Reflections, translations, and rotations are actions that produce congruent geometric objects.
6. A dilation is a transformation that changes the size of a figure but not the shape; if the scale factor of a dilation is greater than 1, the image resulting from the dilation is an enlargement, and if the scale factor is less than 1, the image is a reduction. If the scale factor of a dilation is equal to 1, the image resulting from the dilation is congruent to the original figure.
7. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
8. Two shapes are similar if the lengths of all the corresponding sides are proportional and all the corresponding angles are congruent.
9. Two similar figures are related by a scale factor, which is the ratio of the lengths of corresponding sides.
10. When parallel lines are cut by a transversal, corresponding angles, alternate interior angles, alternate exterior angles, and vertical angles are congruent.
11. The Pythagorean Theorem can be used to find the missing side lengths in a coordinate plane and real-world situations.

Essential Questions: *Students will keep considering...*

- How are forms and objects created or represented?
- How are two-dimensional and three-dimensional space related?
- How are specific characteristics and a classification system useful in analyzing and designing structures?
- How does our understanding of geometry help us to describe real-world objects?
- What are transformations and what effect do they have on an object?
- What does the scale factor of a dilation convey?
- How can transformations be used to determine congruency or similarity?
- What angle relationships are formed by a transversal?

Students Will Know...	Standard	Students Will Be Able to ...	Standard
<p><i>See Vocabulary at the end of this unit.</i></p>		<p><u>Mathematical Practices</u></p> <p>Make sense of problems and persevere in solving them.</p> <p>Reason abstractly and quantitatively.</p> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Model with mathematics.</p> <p>Use appropriate tools strategically.</p> <p>Attend to precision.</p> <p>Look for and make use of structure.</p> <p>Look for and express regularity in repeated reasoning.</p> <p>Solve problems involving surface area of figures composed of triangles and rectangles.</p> <p>Solve problems involving volume of right rectangular prisms.</p> <p>Represent three-dimensional figures using nets.</p> <p>Find area of quadrilaterals and triangles, and of other polygons through decomposition strategies.</p> <p><u>Grade Level Standards</u></p> <p>Draw, construct, and describe geometrical figures and describe the relationships between them.</p>	<p>MP1</p> <p>MP2</p> <p>MP3</p> <p>MP4</p> <p>MP5</p> <p>MP6</p> <p>MP7</p> <p>MP8</p> <p>7.G.A</p>

		<p>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.</p>	7.G.A.1
		<p>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.</p>	7.G.A.2
		<p>Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.</p>	7.G.A.3
		<p>Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</p>	7.G.B
		<p>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.</p>	7.G.B.4
		<p>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.</p>	7.G.B.5
		<p>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.</p>	7.G.B.6
		<p>Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates</p>	8.G.A.3
			8.G.A.4

		<p>Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of transformations. Describe similarity</p> <p>Apply the Pythagorean Theorem to determine unknown side lengths for right triangles</p> <p>Apply the Pythagorean Theorem to determine distance between two points in coordinate system</p> <p>Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems</p>	<p>8.G.B.7</p> <p>8.G.B.8</p> <p>8.G.C.9</p>
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EVIDENCE of LEARNING			
<u>Understanding</u> g #1, #2, #11	<u>Standards</u> MP1 MP2 MP4 MP6 7.G.B.4 7.G.B.6 8.G.B.7	<p>Unit Performance Assessment: Description of Assessment Performance Task(s):</p> <p>Unit Performance Assessment: Geometry (See Appendix 4.A) All problems in these performance tasks are related to the formulas for area, surface area, volume and the use of the Pythagorean Theorem. For the first performance task, students will apply the formulas for area to a problem dealing with the purchase and installation of a hardwood floor. The second performance task will apply the Pythagorean theorem to a problem dealing with the replacement of a support beam in a wall.</p> <p>Teacher will assess: The four selected responses and the performance tasks will assess the students' knowledge of formulas for area, surface area, volume and Pythagorean Theorem as a skill and in a real-life situation. The performance tasks will assess the students' ability to use acquired knowledge to solve a problem.</p>	<u>R/R Quadrant</u> B

		<p><u>Performance:</u></p> <p>Mastery: <i>Students will show that they really understand when they...</i> Complete the formative with a score of 75% or better.</p> <p>Scoring Guide: See Appendix 4.B</p>	
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SAMPLE LEARNING PLAN

Pre-assessment: District Benchmark assessment

<u>Understanding</u>	<u>Standards</u>	<u>Major Learning Activities:</u>	<u>Instructional Strategy:</u>	<u>R/R Quadrant:</u>
#1, #2, #4	MP1 MP3 MP6 7.G.A	<p>1. Activity: Geometry Task Cards – Attributes</p> <ul style="list-style-type: none"> ● Objective: Students will identify geometric figures by their attributes with Geometry task cards using the Cooperative Learning structure – Showdown. ● Appendix Document: Appendix 4.C – Geometry Task Cards – Attributes 	<ul style="list-style-type: none"> ● Cooperative Learning – Showdown 	A
#1, #4	MP1 MP2 MP3 MP6 7.G.B.4 7.G.B.6	<p>2. Activity: Math is Real Life – Snow Removal</p> <ul style="list-style-type: none"> ● Objective: Students will use area and volume formulas to solve real world problems. ● Appendix Documents: Appendix 4.D - Math is Real Life – Snow Removal 	<ul style="list-style-type: none"> ● Homework and Practice 	B
#1, #3, #4	MP1 MP2 MP3 MP4 MP6 MP7 MP8 7.G.A.1 7.G.B.4 7.G.B.6 7.RP.A.3 ISTE-S.6	<p>3. Activity: Bedroom Remodeling SBAC Performance Task</p> <ul style="list-style-type: none"> ● Objective: Students will use the Cooperative learning Structure called Rally Coach in order to use area, proportions and measurement data to solve a complex Performance Task. The student will use the content for the domains of geometry, ratios and proportional relationships, and measurement and data to explore methods for remodeling a bedroom and creating a scale drawing. During the activity, they will use an online website to choose furniture for the bedroom. The teacher will scaffold students through each Part and allow students to work cooperatively to solve the task. The teacher will allow the students to discuss their mathematics prior and correct misunderstandings prior to moving to the next Part of the Performance Task. http://dese.mo.gov/divimprove/assess/documents/asmt-sbac-math-gr7-sample-items.pdf 	<ul style="list-style-type: none"> ● Cooperative Learning - Rally Coach ● Setting Objectives and Providing Feedback ● Homework and Practice 	D

		<ul style="list-style-type: none"> Appendix documents: Appendix 4.E – Bedroom Remodeling SBAC Performance Task and Scoring Guide 		
#1, #2, #4	MP6 7.G.A ISTE-S.6	<p>4. Activity: Identifying 3D Shapes with QR Codes</p> <ul style="list-style-type: none"> Objective: Students will recognize and identify three dimensional shapes by their basic attributes and identify them as parts of real world objects. QR Codes are used to give students immediate feedback. Students will answer the questions about the shapes and then scan the QR code to self-check their responses. <p>By Carrie Cominciola: http://www.teacherspayteachers.com/Product/3D-Shapes-with-QR-Codes-Freebie-682336</p> <ul style="list-style-type: none"> Appendix document: Appendix 4.F – 3D Shapes with QR Codes 	<ul style="list-style-type: none"> Setting Objectives and Providing Feedback Homework and Practice 	A
#1, #2, #11	MP1 MP2 MP4 8.G.B.7	<p>5. Activity: Aspect Ratio with TV</p> <p>In this lesson, students will use the Pythagorean theorem to determine the dimensions of a TV, decide whether the TV will fit onto an existing table, and justify their reasoning with a viable argument.</p> <ul style="list-style-type: none"> Objective: <ul style="list-style-type: none"> Students will be able to determine which proof best proves the Pythagorean Theorem and communicate reasoning Appendix Document: Appendix 4.G – Aspect Ratio with TV 	<ul style="list-style-type: none"> Homework and Practice 	B
#7	MP1 MP2 MP4 MP6 8.G.C.9	<p>6. Activity: Volumes of Familiar Solids – Cones and Cylinders</p> <ul style="list-style-type: none"> Objective In this activity, students gain knowledge about the volume formulas for cones and cylinders and apply them to real-world and mathematical problems. This includes a teacher guided lesson/discussion as well as an Exit Ticket for students upon conclusion of the lesson. 	<ul style="list-style-type: none"> Nonlinguistic Representations Homework and Practice 	C

		<p>Materials:</p> <ul style="list-style-type: none"> • For the demonstrations in this lesson you will need a stack of the same-sized note cards, a stack of the same-sized round disks, a cylinder and cone of the same dimensions, and something to fill the cone with (e.g., rice, sand, water). <p>Directions:</p> <ol style="list-style-type: none"> 1. Demonstrate to students that the volume of a rectangular prism is like finding the sum of the areas of congruent rectangles, stacked one on top of the next. 2. A similar demonstration will be useful for the volume of a cylinder. 3. To demonstrate that the volume of a cone is one-third that of the volume of a cylinder with the same dimension, you will need to fill a cone with something like rice, sand, or water and show students that it takes exactly three cones to equal the volume of the cylinder. <ul style="list-style-type: none"> • Appendix Documents: Appendix 4.H – Volumes of Familiar Solids – Cones and Cylinders 	<ul style="list-style-type: none"> • Similarities and Differences 	
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UNIT RESOURCES

Teacher Resources:

- Learnzillion: <http://learnzillion.com/>
- Brain-pop: <http://brainpop.com>
- Teachers Pay Teachers: www.teacherspayteachers.com (free lessons)
- Study Island: www.studyisland.com
- Michigan Council of Teachers of Mathematics: <http://www.mictm.org>
- National Council of Supervisors of Mathematics: <http://www.mathedleadership.org/>
- CCSS Curriculum Analysis Tool: Illustrative Mathematics <http://illustrativemathematics.org/>
- MAISA Model Mathematics Lesson Plans (in progress, some in draft form)
<http://oaklandk12-public.rubiconatlas.org/c/pi/v.php/Atlas/Browse/View/Default>
- Assessment and Lesson Samples aligned to Common Core <http://map.mathshell.org.uk/materials/>
- Engage NY - Tools for Implementation of Common Core and School Reform <http://engageny.org/common-core/>
- A professional resource for mathematics educators <http://www.insidemathematics.org>
- The Teaching Channel – Mathematics http://www.teachingchannel.org/videos?categories=subjects_math
- Implementing the Mathematical Practice Standards – lessons and student dialogue: <http://www.mathpractices.edc.org/>
- Problem Based learning (PBL) - www.emergentmath.com
- 2013 NAEP Released Items: <http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx>
- 3-Acts PBL lessons by Dan Meyer: www.blog.danmeyer.com
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Problem Solving Resources 5-8: <http://www.mathwire.com/problemsolving/probs58.html>
- Holt course textbook online: <http://my.hrw.com>
- Holt 7th grade math textbook and resources
- Math Scholastic magazines
- The Geometer’s Sketchpad: <http://www.keycurriculum.com/sketchpad-resources>
- Similarity Practice: <http://www.engageny.org/resource/grade-8-mathematics-module-3>

Student Resources:

- Thinking Blocks: <http://www.mathplayground.com/thinkingblocks.html>
- Learnzillion: <http://learnzillion.com>
- Holt course textbook online: <http://my.hrw.com>
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Funny homework help: <http://www.shmoop.com/>
- Greg Tang Math website: <http://www.gregtang.com/p/blog-page.html> GAMES!
- Brainpop: <http://brainpop.com>
- Study Island: www.studyisland.com

- Holt 7th grade math textbook
- Math Scholastic magazines
- The Geometer's Sketchpad: <http://www.keycurriculum.com/sketchpad-resources>

Vocabulary:

- **Acute Angle** - An angle that measures less than 90°
- **Acute Triangle** - A triangle with all angles measuring less than 90°
- **Adjacent angles** - Angles in the same plane that have a common vertex and a common side
- **Alternate Exterior Angles** - A pair of angles on the outer sides of two lines cut by a transversal that are on opposite sides of the transversal
- **Alternate Interior Angles** - A pair of angles on the inner sides of two lines cut by a transversal that are on opposite sides of the transversal
- **Angle** - A figure formed by two rays with a common endpoint called the vertex
- **Angle of rotation** – The measure of degrees that a figure is rotated about a fixed point.
- **Center of Rotation** - The point about which the figure is rotated
- **Circle** - The set of all points in a plane that are the same distance from a given point called the center
- **Circumference** - The distance around the circle
- **Complementary Angles** - Two angles whose measures add up to 90°
- **Cone** - A three-dimensional figure with one vertex and one circular base
- **Congruent Angles** - Angles that have the same measure
- **Coordinate Plane** - A plane formed by the intersection of a horizontal number line called the x-axis and a vertical number line called the y-axis
- **Correspondence** - The relationship between two or more objects that are matched by being in the same relative position
- **Corresponding Angles** - Matching angles of two or more polygons
- **Corresponding Sides** - Matching sides of two or more polygons
- **Cylinder** - A three-dimensional figure with two parallel, congruent circular bases connected by a curved lateral surface
- **Diameter** - A line segment that passes through the center of a circle and has endpoints on the circle, or the length of that segment
- **Dilation** - A transformation that enlarges or reduces a figure
- **Equilateral Triangle** - A triangle with three congruent sides
- **Hemisphere** - A half of a sphere
- **Hypotenuse** - In a right triangle, the side opposite the right angle
- **Image** - A figure resulting from a transformation
- **Isosceles Triangle** - A triangle with at least two congruent sides
- **Line of reflection** – Another name for reflection symmetry. One half is the reflection of the other half.
- **Midpoint** - The point that divides a line segment into two congruent line segments

- **Obtuse Angle** - An angle whose measure is greater than 90° but less than 180°
- **Obtuse Triangle** - A triangle containing one obtuse angle
- **Ordered Pair** - A pair of numbers that can be used to locate a point on a coordinate plane
- **Origin** - The point where the x-axis and the y-axis intersect on the coordinate plane
- **Parallel Lines** - Lines in a plane that do not intersect
- **Perpendicular lines** - Lines that intersect to form right angles
- **Pi (π)** - The ratio of the circumference of a circle to the length of its diameter
- **Principal Square Root** - The nonnegative square root of a number
- **Prism** - A polyhedron that has two congruent, polygon-shaped bases and other faces that are all parallelograms
- **Pyramid** - A polyhedron with a polygon base and triangular sides that all meet at a common vertex
- **Pythagorean Theorem** - In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs
- **Quadrant** - The x and y axes divide the coordinate plane into four regions.
- **Radius** - A line segment with one endpoint at the center of the circle and the other endpoint on the circle, or the length of that segment
- **Reflection** - A transformation of a figure that flips the figure across the line
- **Right Angle** - An angle that measures 90°
- **Right Triangle** - A triangle containing a right angle
- **Rotation** - A transformation in which a figure is turned around a center point
- **Scale Factor** - The ratio used to enlarge or reduce similar figures
- **Scale Model** - A proportional model of a three-dimensional object
- **Scalene Triangle** - A triangle with no congruent sides
- **Scale** - The ratio between two sets of measurements
- **Similar** - Figures with the same shape but not necessarily the same size
- **Sphere** - A three-dimensional figure with all points the same distance from the center
- **Square Root** - One of the two equal factors of a number
- **Straight Angle** - An angle that measures exactly 180°
- **Supplementary Angles** - Two angles whose measures have a sum of 180°
- **Surface Area** - The sum of the areas of the faces, or surfaces, of a three-dimensional figure
- **Transformation** - A change in the size or position of the figure
- **Translation** - moving in the same distance and direction
- **Transversal** - A line that intersects two or more lines

- **Triangle Inequality Theorem** - The theorem that states that for any triangle, the sum of the lengths of any two sides must be greater than the length of the remaining side
- **Triangle Sum Theorem** - The theorem that states that the measures of the angles in a triangle add up to 180°
- **Unique Triangles** - Triangles that do not have an equivalent. This means there is not another triangle that has the exact dimensions or shape. A set of conditions for two triangles is said to determine a unique triangle if whenever the conditions are satisfied, the triangles are identical.
 - Three sides condition (Two triangles satisfy the three sides condition if there is a triangle correspondence that pairs all three sides of one triangle with sides of equal length. The three sides condition determines a unique triangle.)
 - Two angles and the included side condition (Two triangles satisfy the two angles and the included side condition if there is a triangle correspondence that pairs two angles and the included side of one triangle with angles of equal measure and a side of equal length. This condition determines a unique triangle.)
 - Two angles and the side opposite a given angle condition (Two triangles satisfy the two angles and the side opposite a given angle condition if there is a triangle correspondence that pairs two angles and a side opposite one of the angles with angles of equal measure and a side of equal length. The two angles and the side opposite a given angle condition determines a unique triangle.)
 - Two sides and the included angle condition (Two triangles satisfy the two sides and the included angle condition if there is a triangle correspondence that pairs two sides and the included angle with sides of equal length and an angle of equal measure. The two sides and the included angle condition determines a unique triangle.)
- **Vertical Angles** - A pair of opposite congruent angles formed by intersecting lines
- **Volume** - the number of cubic units needed to fill a given space
- **X-Axis** - The horizontal axis on a coordinate plane
- **X-Coordinate** - The first number in an ordered pair and tells the distance to move right or left from the origin
- **Y-Axis** - The vertical axis on a coordinate plane
- **Y-Coordinate** - The second number in an ordered pair and tells the distance to move up or down from the origin

Content Area: Pre-Algebra 7	Course: Pre-Algebra 7	UNIT 5: Statistics and Probability
Unit Description: Students develop a general understanding of the likelihood of events occurring by realizing that probabilities fall between 0 and 1. They gather data from simulations to estimate theoretical probability using the experimental probability. Students will make predictions about the relative frequency of an event by using simulations to collect, record, organize and analyze data. They will develop probability models to be used to find the probability of simple and compound events. Students will determine from each sample space the probability or fraction of each possible outcome.		Unit Timeline: 4 weeks

DESIRED RESULTS

Transfer Goal - *Students will be able to independently use their learning to...*

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Understandings – *Students will understand that... (Big Ideas)*

1. The probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.
2. The probability of a chance event is approximated by collecting data on the chance process that produces it, observing its long-run relative frequency, and predicting the approximate relative frequency given the probability.
3. A probability model (including organized lists, tables, tree diagrams, and simulations), which may or may not be uniform, is used to find probabilities of independent and dependent (compound) events.
4. Formulating questions, designing studies, and collecting data about a characteristic shared by two populations or different characteristics within one population.
5. Selecting, creating, and using appropriate graphical representations of data, including histograms and box plots.

6. Finding, using, and interpreting measure of center and spread, including mean and inter-quartile range.
7. Using observations about differences between two or more samples to make conjectures about the populations from which samples were taken.

Essential Questions: *Students will keep considering...*

- How are probability and the likelihood of an occurrence related and represented?
- How is probability approximated?
- How is a probability model used?
- How are probabilities of compound events determined?

Students Will Know...	Standard	Students Will Be Able to ...	Standard
<ul style="list-style-type: none"> ● 0 represents an event that is impossible. ● 1 represents an event is certain. ● The closer to 1, the more likely an event is to occur. ● The closer to 0, the less likely an event is to occur <p><i>See Vocabulary at the end of this unit.</i></p>		<p><u>Mathematical Practices</u></p> <p>Make sense of problems and persevere in solving them.</p> <p>Reason abstractly and quantitatively.</p> <p>Construct viable arguments and critique the reasoning of others.</p> <p>Model with mathematics.</p> <p>Use appropriate tools strategically.</p> <p>Attend to precision.</p> <p>Look for and make use of structure.</p> <p>Look for and express regularity in repeated reasoning.</p> <p><u>Grade Level Standards</u></p> <p>Use random sampling to draw inferences about a population.</p> <p>Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.</p> <p>Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. <i>For example,</i></p>	<p>MP1</p> <p>MP2</p> <p>MP3</p> <p>MP4</p> <p>MP5</p> <p>MP6</p> <p>MP7</p> <p>MP8</p> <p>7.SP.A</p> <p>7.SP.A.1</p> <p>7.SP.A.2</p>

	<p><i>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.</i></p> <p>Draw informal comparative inferences about two populations.</p> <p>Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. <i>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.</i></p> <p>Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>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.</i></p> <p>Investigate chance processes and develop, use, and evaluate probability models.</p> <p>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.</p> <p>Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run</p>	<p>7.SP.B</p> <p>7.SP.B.3</p> <p>7.SP.B.4</p> <p>7.SP.C</p> <p>7.SP.C.5</p> <p>7.SP.C.6</p>
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		<p>relative frequency, and predict the approximate relative frequency given the probability. <i>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.</i></p> <p>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.</p> <p>a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>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.</i></p> <p>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?</p> <p>Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</p> <p>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.</p> <p>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</p>	<p>7.SP.C.7</p> <p>7.SP.C.7a</p> <p>7.SP.C.7b</p> <p>7.SP.C.8</p> <p>7.SP.C.8a</p> <p>7.SP.C.8b</p>
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		<p>double sixes”), identify the outcomes in the sample space which compose the event.</p> <p>c. Design and use a simulation to generate frequencies for compound events. <i>For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?</i></p>	7.SP.C.8c
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EVIDENCE of LEARNING			
<u>Understanding</u>	<u>Standards</u>	<u>Unit Performance Assessment:</u>	<u>R/R Quadrant</u>
#1, #2, #3, #4	MP1 MP2 MP3 MP4 MP6 MP8 7.SP.A.1 7.SP.A.2 7.SP.B.3 7.SP.B.4 7.SP.C.5 7.SP.C.6 7.SP.C.8b	<p>Description of Assessment Performance Task(s):</p> <p><i>Unit Performance Assessment: Statistics and Probability</i> (See Appendix 5.A and 5.B) All problems in this performance assessment are related to the use of sampling to predict larger populations. For the performance task, students will explore and apply the use of different sampling methods as well as proportional relationships in the making of a population prediction. Students will also need to explain how a sample could be biased.</p> <p>Teacher will assess: The five selected response and the performance task will assess the students’ knowledge of predicting populations based on given samples, different sampling methods, and existing possible bias.</p> <p>Performance: Mastery: <i>Students will show that they really understand when they...</i> complete the formative with a score of 75% or better.</p> <p>Scoring Guide: See Appendix 5.A, 5.C and 5.D</p>	D

SAMPLE LEARNING PLAN

Pre-assessment: District Benchmark assessment

<u>Understanding</u>	<u>Standards</u>	<u>Major Learning Activities:</u>	<u>Instructional Strategy:</u>	<u>R/R Quadrant:</u>
#1, #2, #3,	MP1 MP2 MP3 MP4 MP6 7.SP.C.5 7.SP.C.6 7.SP.C.7a 7.SP.C.8a 7.SP.C.8c	<p>1. Activity: Fun Fundraisers!</p> <ul style="list-style-type: none"> Objective: Students will use probability to determine if the game is fair and economical and to determine which game should be used in their fundraiser. Appendix Document: Appendix 5.E – Fun Fundraisers! 	<ul style="list-style-type: none"> Cues, Questions, and Advance Organizers 	D
#1, #2, #3	MP1 MP3 7.SP.C.5 7.SP.C.7	<p>2. Activity: Spinner Game</p> <ul style="list-style-type: none"> Objective: Students can clearly and precisely construct a viable argument to support their reasoning when distinguishing correct logic from that which is flawed. Appendix Documents: Appendix 5.F – Spinner Game 	<ul style="list-style-type: none"> Cues, Questions, and Advance Organizers 	C
#5, #6, #7,	MP1 MP2 MP3 MP4 MP5 MP6 7.SP.A.1 7.SP.A.2 7.SP.B.3 7.SP.B.4	<p>3. Activity: Travel Time to Work SBAC Performance Task</p> <ul style="list-style-type: none"> Objective: Students will use the Cooperative learning Structure called Rally Coach in order to use statistics and probability concepts and proportional relationships to analyze data, relate it to other gathered information, and solve a complex Performance Task. The student uses concepts of statistics and probability and ratio and proportional relationships to analyze national census data and relate it to locally gathered information. The work is supported by calculations, graphing, and explanations of reasoning. The teacher will scaffold students through each Part and allow students to work cooperatively to solve the task. The teacher will allow the students to discuss their mathematics prior and 	<ul style="list-style-type: none"> Cooperative Learning – Rally Coach 	D

		<p>correct misunderstandings prior to moving to the next Part of the Performance Task. http://dese.mo.gov/divimprove/assess/documents/asmt-sbac-math-gr7-sample-items.pdf</p> <ul style="list-style-type: none"> Appendix documents: Appendix 5.G – Travel Time to Work SBAC Performance Task and Scoring Guide 		
#1, #2, #3,	MP1 MP3 MP4 MP6 MP8 7.SP.C.6 7.SP.C.7a 7.SP.C.7b 7.SP.C.8a 7.SP.C.8b 7.SP.C.8c	<p>4. Activity: Mickey’s Mazes</p> <ul style="list-style-type: none"> Objective: Students will compare experimental and theoretical probabilities. Then they will use experimental probability to predict possible outcomes. Finally they will design their own maze and determine the probability that Mickey would leave through each exit. Appendix Documents: Appendix 5.H – Mickey’s Mazes 	<ul style="list-style-type: none"> Generating and Testing Hypotheses 	C
#4, #5, #6, #7	MP1 MP3 MP6 7.SP.A.1 7.SP.A.2 7.SP.B.4 ISTE-S.3 ISTE-S.4	<p>5. Activity: Comparing Sampling Data & Making Inferences</p> <ul style="list-style-type: none"> Objective: Students will use an online polling tool such as polleverywhere (http://www.polleverywhere.com/) to input their own preferences and collect data on the class preferences to several questions. They will then use the data to draw inferences about their grade level based on their classmates’ data. Students will then compare the inferences drawn about their grade level with that of another grade level. Appendix Documents: Appendix 5.I – Comparing Sampling Data & Making Inferences 	<ul style="list-style-type: none"> Nonlinguistic Representations Technology Integration with an online poll 	C

UNIT RESOURCES

Teacher Resources:

- Learnzillion: <http://learnzillion.com/>
- Brain-pop: <http://brainpop.com>
- Teachers Pay Teachers: www.teacherspayteachers.com (free lessons)
- Study Island: www.studyisland.com
- Michigan Council of Teachers of Mathematics: <http://www.mictm.org>
- National Council of Supervisors of Mathematics: <http://www.mathedleadership.org/>
- CCSS Curriculum Analysis Tool: Illustrative Mathematics <http://illustrativemathematics.org/>
- MAISA Model Mathematics Lesson Plans (in progress, some in draft form)
<http://oaklandk12-public.rubiconatlas.org/c/pi/v.php/Atlas/Browse/View/Default>
- Assessment and Lesson Samples aligned to Common Core <http://map.mathshell.org.uk/materials/>
- Engage NY - Tools for Implementation of Common Core and School Reform <http://engageny.org/common-core/>
- A professional resource for mathematics educators <http://www.insidemathematics.org>
- The Teaching Channel – Mathematics http://www.teachingchannel.org/videos?categories=subjects_math
- Implementing the Mathematical Practice Standards – lessons and student dialogue: <http://www.mathpractices.edc.org/>
- Problem Based learning (PBL) - www.emergentmath.com
- 2013 NAEP Released Items: <http://nces.ed.gov/nationsreportcard/itmrlsx/landing.aspx>
- 3-Acts PBL lessons by Dan Meyer: www.blog.danmeyer.com
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Problem Solving Resources 5-8: <http://www.mathwire.com/problemsolving/probs58.html>
- Holt course textbook online: <http://my.hrw.com>
- Holt 7th grade math textbook and resources
- Math Scholastic magazines

Student Resources:

- Thinking Blocks: <http://www.mathplayground.com/thinkingblocks.html>
- Learnzillion: <http://learnzillion.com>
- Holt course textbook online: <http://my.hrw.com>
- Real world problems - Mathalicious: <http://www.mathalicious.com/>
- Funny homework help: <http://www.shmoop.com/>
- Greg Tang Math website: <http://www.gregtang.com/p/blog-page.html> GAMES!
- Brainpop: <http://brainpop.com>
- Study Island: www.studyisland.com
- Holt 7th grade math textbook
- Math Scholastic magazines

Vocabulary:

- **Compound events** - An event made up of two or more simple events
- **Correlation** - The description of the relationship between two data set.
- **Event** - An outcome or set of outcomes of an experiment or situation
- **Inference** - Using data from a sample to draw conclusions about a population
- **Line of best fit** - A straight line that comes closest to the points on a scatter plot
- **Measure of central tendency** - A measure used to describe the middle of a data set (mean, median, and mode)
- **Outcome** - A possible result of a probability experiment
- **Outliers** - A value much greater or much less than the others in a data set
- **Population** - The entire group of objects or individuals considered for a survey
- **Probability** - A number from 0 to 1 that describes how likely an event can occur
- **Random sample** - A sample in which every person, object, or event in the population has an equal chance of being selected for the sample
- **Range** - The difference between the greatest and least values in a data set
- **Sample** - The people, objects, or events chosen from a given population to represent the entire group
- **Tree diagram** - A branching diagram that shows all possible combinations or outcomes of an event
- **Variability** - The spread of values in a set of data