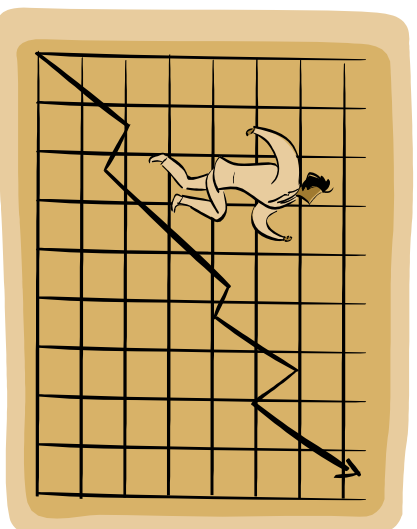


Mathematics

Curriculum Grade Seven



Overview:

This curriculum is aligned to the Common Core State Standards for Mathematics.

Standards are coded (see below). For each standard, or cluster of standards, activities are listed that are specific to those standards. Extensions, technology and other support materials (including those found in the teachers' manuals) are listed to help with differentiation of math instruction.

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

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

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

Vocabulary:

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

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

Key to Coding:

Standards define what students should understand and be able to do.

Clusters are groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.

Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.

Example:

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

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

Domains	Ratios & Proportional Relationships	The Number System	Expressions and Equations	Geometry	Statistics and Probability
Clusters	<ul style="list-style-type: none"> Analyze proportional relationships and use them to solve real-world and mathematical problems 	<ul style="list-style-type: none"> Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers 	<ul style="list-style-type: none"> Use properties of operations to generate equivalent expressions Solve real-life and mathematical problems using numerical and algebraic expressions and equations 	<ul style="list-style-type: none"> Draw, construct and describe geometrical figures and describe the relationships between them Solve real-life and mathematical problems involving angle measure, area, surface and volume 	<ul style="list-style-type: none"> Use random sampling to draw inferences about a population Draw informal comparative inferences about two populations Investigate chance processes and develop, use and evaluate probability models
Mathematical Practices	<ol style="list-style-type: none"> Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. 	<ol style="list-style-type: none"> Construct viable arguments and critique the reasoning of others. Model with mathematics. 	<ol style="list-style-type: none"> Use appropriate tools strategically. Attend to precision. 	<ol style="list-style-type: none"> Look for and make use of structure. Look for and express regularity in repeated reasoning. 	

In Grade 7, instructional time should focus on four critical areas:

1. Developing understanding of and applying proportional relationships

Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. Developing understanding of operations with rational numbers and working with expressions and linear equations

Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. Solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume

Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they 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, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. Drawing inferences about populations based on samples

Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

UNIT OF STUDY 1: Two and Three Dimensional Geometry

Pacing: 20 days (plus 2 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

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

Domain and Standards Overview

Geometry

- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
Draw, construct, and describe geometrical figures and describe the relationships between them

Priority and Supporting CCSS	Explanations and Examples*
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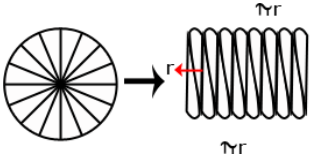
7.G.4. KNOW the formulas for the area and circumference of a circle and USE them to solve problems; GIVE an informal derivation of the relationship between the circumference and area of a circle.

7.G.4. Examples:

- The seventh grade class is building a mini golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size?

- Students measure the circumference and diameter of several circular objects in the room (clock, trash can, door knob, wheel, etc.). Students organize their information and discover the relationship between circumference and diameter by noticing the pattern in the ratio of the measures. Students write an expression that could be used to find the circumference of a circle with any diameter and check their expression on other circles.

- Students will use a circle as a model to make several equal parts as you would in a pie model. The greater number the cuts, the better. The pie pieces are laid out to form a shape similar to a parallelogram. Students will then write an expression for the area of the parallelogram related to the radius (note: the length of the base of the parallelogram is half the circumference, or πr , and the height is r , resulting in an area of πr^2). Extension: If students are given the circumference of a circle, could they write a formula to determine the circle's area or given the area of a circle, could they write the formula for the circumference?



Priority and Supporting CCSS

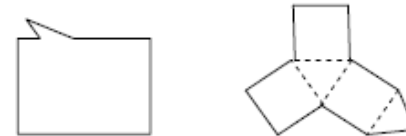
Explanations and Examples*

7.G.6. SOLVE real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

7.G.6. Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations.

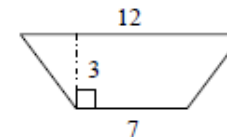
Examples:

- Choose one of the figures shown below and write a step by step procedure for determining the area. Find another person that chose the same figure as you did. How are your procedures the same and different? Do they yield the same result?



- A cereal box is a rectangular prism. What is the volume of the cereal box? What is the surface area of the cereal box? (Hint: Create a net of the cereal box and use the net to calculate the surface area.) Make a poster explaining your work to share with the class.

- Find the area of a triangle with a base length of three units and a height of four units.
- Find the area of the trapezoid shown below using the formulas for rectangles and triangles.



Priority and Supporting CCSS	Explanations and Examples*
<p>7.G.2. DRAW (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle or no triangle.</p> <p>7.G.3. DESCRIBE the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.</p>	<p>7.G.2. Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity.</p> <p>Examples:</p> <p>Is it possible to draw a triangle with a 90° angle and one leg that is 4 inches long and one leg that is 3 inches long? If so, draw one. Is there more than one such triangle?</p> <ul style="list-style-type: none"> • Draw a triangle with angles that are 60 degrees. Is this a unique triangle? Why or why not? • Draw an isosceles triangle with only one 80 degree angle. Is this the only possibility or can you draw another triangle that will also meet these conditions? <div data-bbox="1465 678 1562 753" data-label="Image"> </div> <ul style="list-style-type: none"> • Can you draw a triangle with sides that are 13 cm, 5 cm and 6cm? • Draw a quadrilateral with one set of parallel sides and no right angles. <p>7.G.3. Example:</p> <ul style="list-style-type: none"> • Using a clay model of a rectangular prism, describe the shapes that are created when planar cuts are made diagonally, perpendicularly, and parallel to the base. <div data-bbox="1291 1156 1465 1383" data-label="Image"> </div>

Priority and Supporting CCSS

Explanations and Examples*

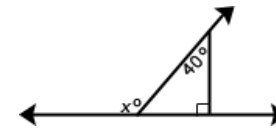
7.G.5. USE facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to WRITE and SOLVE simple equations for an unknown angle in a figure.

7.G.5. Angle relationships that can be explored include but are not limited to:

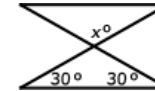
- Same-side (consecutive) interior and same-side (consecutive) exterior angles are supplementary.

Examples:

- Write and solve an equation to find the measure of angle x



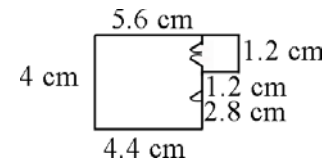
- Write and solve an equation to find the measure of angle x .



7.G.1. SOLVE problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.1. Example:

- Julie showed you the scale drawing of her room. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie's room? Reproduce the drawing at 3 times its current size.



Essential Questions

How does geometry help to describe objects better?

Corresponding Big Ideas

Geometric attributes (such as shapes, lines, angles, figures, and planes) provide descriptive information about an object's properties and position in space and support visualization and problem solving.

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Formulas <ul style="list-style-type: none"> ○ Area of circle ○ Circumference of circle • Relationship between circumference and area of a circle • Geometric conditions (points, line segments, angles, parallelism, congruence, and perpendicularity.) • Plane sections of three-dimensional figures • Angle relationships <ul style="list-style-type: none"> ○ Supplementary ○ Complementary ○ Vertical ○ Adjacent • Area <ul style="list-style-type: none"> ○ Triangles ○ Quadrilaterals ○ Polygons • Volume <ul style="list-style-type: none"> ○ Cubes ○ Right prisms • Surface Area <ul style="list-style-type: none"> ○ Cubes ○ Right prisms 	<ul style="list-style-type: none"> • KNOW/DEVELOP (formulas) • SOLVE (problems using formulas) • GIVE/DERIVE (informally the relationship between circumference and area of a circle) • SOLVE (with and without context) • DRAW/CONSTRUCT (geometric shapes with given conditions) • USE (ruler, protractor, technology) • DESCRIBE (two-dimensional figures that result from plane sections of three-dimensional figures) • WRITE/SOLVE (problems using equations to find an unknown angle in a figure) • SOLVE (problems with scale drawings) <ul style="list-style-type: none"> ○ REPRODUCE a scale drawing using a different scale 	<p>2,3</p> <p>3</p> <p>4</p> <p>4,5</p> <p>3</p> <p>3</p> <p>2</p> <p>4/5</p> <p>4</p> <p>6</p>

Teacher note: students come with previous knowledge of

- area, surface area, volume
- area of irregular figures, volume of rectangular prisms (with fractional measurements)
- nets for 3D shapes
- coordinates in four quadrants.

Learning Activities

OBJECTIVE	RESOURCES/PAGE	NOTES
Angle classification: Students will <ul style="list-style-type: none"> Classify angles and identify vertical and adjacent angles Use parallel lines to investigate the sum of measures of the angles in a triangle and similar triangles. 	MC7 (10.1) MC8 (6.1)	Need to add Geometers' Sketchpad lessons
Identify angles and finding missing angles: Students will <ul style="list-style-type: none"> Identify complementary and supplementary angles Find missing angles 	MC7 (10.2) Crosswalk Coach (Les 24) Pizzazz(D-30-D31,) Pizzazz(Bridge to Alg) p. 137	
Finding missing measures in a shape: Students will <ul style="list-style-type: none"> Identify and classify triangles Investigate the properties of special quadrilaterals 	MC7 (10.4-10.6) Pizzazz(D34, D35, D36) Pizzazz(Bridge to Alg) p.138, 143 Pizzazz(D-30-D31, D34, D35, D36) Pizzazz(PUNCHLINE) p. 48-53 Pizzazz(D-30-D31, D34, D35, D36) Pizzazz(pre-alg) p. 120-121	
Construct geometric shapes with given conditions: Students will <ul style="list-style-type: none"> Using rulers, protractors and computer drawing technology, draw triangles using given angles or given side lengths 	Geometry Sketchpad lesson _____ Crosswalk Coach Les 21 CCSS Les 11 Mathscape 7 (GS Les 2)	
Scale drawing: Students will <ul style="list-style-type: none"> Reproduce a scale drawing using a different scale 		NEED resources see G.1 example
2D figure resulting from slicing a 3D figure: Students <ul style="list-style-type: none"> identify and draw the shape resulting from a cross-section of a 3D figure 	CCSS Les 12 MC7(Concepts & Skills Bank p. 745-746) Coach Les 22 Mathscape 8 (Shapes in Space Les 2) www.learner.org (Geometry Session 9) www.learner.org/courses/learningmath/geometry/session9/part_c/index.html	

OBJECTIVE	RESOURCES/PAGE	NOTES
Area of parallelograms: Students will <ul style="list-style-type: none"> • find the area of parallelograms 	MC7 (11.1)	
Areas of triangles and trapezoids: Students will <ul style="list-style-type: none"> • find the areas of triangles and trapezoids 	MC7 (11.2) Pizzazz (D54-D58) Pizzazz(PreAlg) p. 149-150 Pizzazz(Punchline Bridge p.152-153)	
Circumference of circles: Students will <ul style="list-style-type: none"> • find circumference of circles 	MC7 (11.3) Pizzazz (D49,D59) Pizzazz(Punchline Bridge to Alg) p.154 Pizzazz(Punchline Prob Solv) p. 82	
Area of circles: Students will <ul style="list-style-type: none"> • investigate areas of circles using a paper plate • find areas of circles using a formula 	MC7 (11.4) MC8 (7.1) Crosswalk Coach Les 23 Pizzazz (D59,D62) Pizzazz(Punchline Bridge to Alg)p.155-156 Pizzazz(Punchline Prob Solv) p. 83-85 Pizzazz(PreAlg) p. 151-152	Complete minilab 11-4
Area of composite figures: Students will <ul style="list-style-type: none"> • find the areas of composite figures • estimate areas of irregular figures 	MC7 (11.6) MC8 (7.3) Crosswalk Coach Les 25 Pizzazz (D-52) Pizzazz(PreAlg)p.147-148 Pizzazz(Punchline Bridge to Alg) p. Pizzazz(Punchline Probl Solv) p. 75-78	
Relationship of area and circumference : Students will <ul style="list-style-type: none"> • measure circles, analyze data for circle relationships and apply circle relationships • estimate the area of a circle and use a formula to evaluate estimates 	Mathscape 7 (Getting in Shape Lessons 9 & 11)	

OBJECTIVE	RESOURCES/PAGE	NOTES
Volume of rectangular and triangular prisms: Students will <ul style="list-style-type: none"> investigate finding the volume of a cylinder using a vegetable can use formulas to find the volume of cylinders investigate finding the volume of rectangular prism use a formula to find volume of rectangular and triangular prisms 	Crosswalk Coach Lesson-27 MC7 (11.10) MC8 (7.5) Pizzazz (67, D68) Pizzazz(PreAlg)p.153-155 Pizzazz(Punchline Bridge)	NO cylinders
Surface area: Students will <ul style="list-style-type: none"> find surface areas using models and nets 	MC 7 (12-4) Crosswalk coach Lesson 26 Punchline Bridge to Algebra p. 158 Punchline Problem solving p. 87 Pizzazz D 67, D68 Mathscape 8 (Shapes & Spaces)	Check Geometry Sketchpad lessons
Application	Pizzazz (D63)	

UNIT 1 VOCABULARY:

adjacent angle, altitude, angles, area, base, complementary angle, congruent angles, composite figure, circumference, cross-section, cube, diameter, dimension, height, length, parallel, perpendicular, pi, polygon, quadrilateral, radius, rectangular prism, right prism, sides, straight angle, supplementary angle, surface area, triangle, triangular prism, vertical angle, vertex, volume, width

Assessment

Ledyard Assessment Unit 1
 Performance Task for Unit 1 **TBD**

**Standardized Assessment Correlations
 (State, College and Career)**

Expectations for Learning (in development)

This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

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

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

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

Technology and Electronic Resources:

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

UNIT OF STUDY 2: Operating with Rational Numbers (Addition and Subtraction)

Pacing: 20 days (plus 5 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

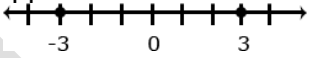
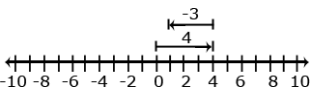
1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.**
- 3. Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics.
5. Use appropriate tools strategically.
- 6. Attend to precision.**
- 7. Look for and make use of structure.**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

Domain and Standards Overview

Number System

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

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.NS. 1. APPLY and EXTEND previous understandings of addition and subtraction to ADD and SUBTRACT rational numbers; REPRESENT addition and subtraction on a horizontal or vertical number line diagram.</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>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>7.NS.3 SOLVE real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)</p>	<p>7.NS. 1. Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with the operations. Examples:</p> <ul style="list-style-type: none"> Use a number line to illustrate: <ul style="list-style-type: none"> $p - q$ $p + (-q)$ Is this equation true $p - q = p + (-q)$ -3 and 3 are shown to be opposites on the number line because they are equal distance from zero and therefore have the same absolute value and the sum of the number and its opposite is zero.  <p>You have \$4 and you need to pay a friend \$3. What will you have after paying your friend?</p> <p>$4 + (-3) = 1$ or $(-3) + 4 = 1$</p>  <p>7.NS.3. Examples:</p> <ul style="list-style-type: none"> Your cell phone bill is automatically deducting \$32 from your bank account every month. How much will the deductions total for the year? <p>$-32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 = 12 (-32)$</p> <ul style="list-style-type: none"> It took a submarine 20 seconds to drop to 100 feet below sea level from the surface. What was the rate of the descent? <p>$\frac{-100 \text{ feet}}{20 \text{ seconds}} = \frac{-5 \text{ feet}}{1 \text{ second}} = -5 \text{ ft/sec}$</p>

*Adapted from the Arizona Academic Content Standards.

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Addition and Subtraction of positive and negative numbers (begin with integers and extend to rational number) <ul style="list-style-type: none"> ○ Number Line • Equivalent Forms • Opposite Quantities <ul style="list-style-type: none"> ○ Additive Inverses ○ Number Line • Absolute Value <ul style="list-style-type: none"> ○ Number Line • Properties of Operations • Mental Computation Strategies • Estimation Strategies 	<ul style="list-style-type: none"> • ADD and SUBTRACT (rational numbers) • REPRESENT (on number lines) • DESCRIBE (opposites quantities) • UNDERSTAND (positive or negative direction) • SHOW (additive inverses) • INTERPRET (sums in context) • UNDERSTAND (subtraction as additive inverses) • SHOW (absolute value) • APPLY (absolute value principle in context) • APPLY (properties of operations as strategies) • SOLVE (with and without context) 	<ul style="list-style-type: none"> 3 3 1 2 1 2 2 2 3 3 3,4

Teacher notes: students come with previous knowledge of

- Describing situations using positive and negative numbers
- Locating positive and negative integers on a number line
- Ordering positive and negative integers with explanations
- Graphing on a coordinate plane in 4 quadrants
- Knowledge of absolute value

Essential Questions

In what ways can rational numbers be useful?

Corresponding Big Ideas

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

Grade 7 Mathematics

Learning Activities		
OBJECTIVE	RESOURCES/PAGE	NOTES
Add and Subtract fractions: Students will <ul style="list-style-type: none"> review adding and subtracting fractions. 	Pizzazz Book E E58- E61 MC7 (5.2-5.3) Pizzazz Book C C36-C50	Review rules for \pm fractions/mixed numbers
Add integers: Students will <ul style="list-style-type: none"> use counters to model the addition of integers. use number lines to model addition of integers. develop rules for adding integers practice adding integers (procedural) apply skills to solve real-world math problems apply skills to solve real-world math problems, using estimation strategies and mental computation strategies 	MC7 2.4 PERFORMANCE TASKS TBD	
Subtract integers: Students will <ul style="list-style-type: none"> use counters to model the subtraction of integers. find the distance between two rational numbers on a number line practice subtracting integers (procedural) apply skills to solve real-world math problems, using estimation strategies and mental computation strategies 	MC7 2.5 & Crosswalk Coach Lesson 7 CCSS Les 3 PERFORMANCE TASKS TBD	

Grade 7 Mathematics

OBJECTIVE	RESOURCES/PAGE	NOTES
<p>Add and subtract rational fractions: Students will</p> <ul style="list-style-type: none"> add and subtract fractions with like and unlike denominators <p>Review Properties of Operations: Students will</p> <ul style="list-style-type: none"> Apply properties of operations to add and subtract rational numbers: <ul style="list-style-type: none"> associative property of addition $(a+b)+c=a+(b+c)$ commutative property of addition $a+b=b+a$ additive identity property of zero $a+0=0+a=a$ additive inverses $a+(-a)=(-a)+a=0$ 	<p>MC8 (2.5-2.6); Crosswalk Coach Lesson 4 Pizzazz(PreAlg) p. 28-35; Pizzazz(Bridge to Alg) p71,73,75 Use Pizzazz (Pre-Alg page 33 creating number lines to solve) PERFORMANCE TASKS TBD</p> <p>MC7 (1.8)</p>	<p>Need to develop or find more number lines, especially with rational numbers; (decimals and fractions)</p> <p>Need complex problems with more than 2 addends.</p>
<p>Add and subtract rational decimal numbers: Students will</p> <ul style="list-style-type: none"> Add and subtract rational decimal numbers 		<p>Need to add some examples of negative decimal numbers</p>

<p>UNIT 2 VOCABULARY:</p>
<p>absolute value, additive identity property of zero, additive inverse, associative property of addition, commutative property of addition, complex fraction, integer, like fraction, mixed number, negative, number line, opposites, positive, properties of operations, rational number, unlike fraction</p>

Grade 7 Mathematics

Assessment:

Ledyard Assessment Unit 2
Performance Task for Unit 2 **TBD**

Standardized Assessment Correlations (State, College and Career)

Expectations for Learning (in development)

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

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

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

Technology and Electronic Resources:

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

UNIT OF STUDY 3: Operating with Rational Numbers (Multiplication and Division)

Pacing: 15 days (plus 2 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

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

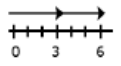
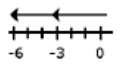
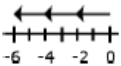
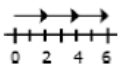
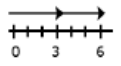
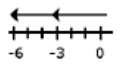
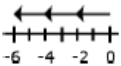
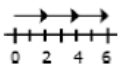
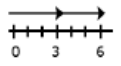
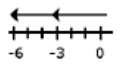
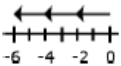
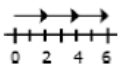
Domain and Standards Overview

Number System

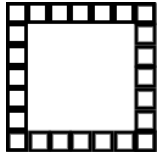
- Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Priority and Supporting CCSS	Explanations and Examples*															
<p>7.NS.2. 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>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>7.NS.3 SOLVE real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)</p>	<p>7.NS.2. Multiplication and division of integers is an extension of multiplication and division of whole numbers. Examples:</p> <ul style="list-style-type: none"> Examine the family of equations. What patterns do you see? Create a model and context for each of the products. Write and model the family of equations related to $3 \times 4 = 12$. <table border="1" data-bbox="1297 483 1675 846"> <thead> <tr> <th>Equation</th> <th>Number Line Model</th> <th>Context</th> </tr> </thead> <tbody> <tr> <td>$2 \times 3 = 6$</td> <td></td> <td>Selling two packages of apples at \$3.00 per pack</td> </tr> <tr> <td>$2 \times -3 = -6$</td> <td></td> <td>Spending 3 dollars each on 2 packages of apples</td> </tr> <tr> <td>$-2 \times 3 = -6$</td> <td></td> <td>Owing 2 dollars to each of your three friends</td> </tr> <tr> <td>$-2 \times -3 = 6$</td> <td></td> <td>Forgiving 3 debts of \$2.00 each</td> </tr> </tbody> </table> <p>7.NS.3. Examples:</p> <ul style="list-style-type: none"> Your cell phone bill is automatically deducting \$32 from your bank account every month. How much will the deductions total for the year? $-32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 = 12 (-32)$ It took a submarine 20 seconds to drop to 100 feet below sea level from the surface. What was the rate of the descent? $\frac{-100 \text{ feet}}{20 \text{ seconds}} = \frac{-5 \text{ feet}}{1 \text{ second}} = -5 \text{ ft/sec}$ 	Equation	Number Line Model	Context	$2 \times 3 = 6$		Selling two packages of apples at \$3.00 per pack	$2 \times -3 = -6$		Spending 3 dollars each on 2 packages of apples	$-2 \times 3 = -6$		Owing 2 dollars to each of your three friends	$-2 \times -3 = 6$		Forgiving 3 debts of \$2.00 each
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Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.EE.2. UNDERSTAND that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that “increase by 5 percent” is the same as “multiply by 1.05.”</i></p>	<p>7.EE.2. Examples:</p> <ul style="list-style-type: none"> • Jamie and Ted both get paid an equal hourly wage of \$9 per hour. This week, Ted made an additional \$27 dollars in overtime. Write an expression that represents the weekly wages of both if J = the number of hours that Jamie worked this week and T = the number of hours Ted worked this week? Can you write the expression in another way? <p>Students may create several different expressions depending upon how they group the quantities in the problem.</p> <p>One student might say: To find the total wage, I would first multiply the number of hours Jamie worked by 9. Then I would multiply the number of hours Ted worked by 9. I would add these two values with the \$27 overtime to find the total wages for the week. The student would write the expression. $9J + 9T + 27$.</p> <p>Another student might say: To find the total wages, I would add the number of hours that Ted and Jamie worked. I would multiply the total number of hours worked by 9. I would then add the overtime to that value to get the total wages for the week. The student would write the expression $9(J + T) + 27$.</p> <p>A third student might say: To find the total wages, I would need to figure out how much Jamie made and add that to how much Ted made for the week. To figure out Jamie’s wages, I would multiply the number of hours she worked by 9. To figure out Ted’s wages, I would multiply the number of hours he worked by 9 and then add the \$27 he earned in overtime. My final step would be to add Jamie and Ted wages for the week to find their combined total wages. The student would write the expression $(9J) + (9T + 27)$.</p> <ul style="list-style-type: none"> • Given a square pool as shown in the picture, write four different expressions to find the total number of tiles in the border. Explain how each of the expressions relates to the diagram and demonstrate that the expressions are equivalent. Which expression do you think is most useful? Explain your thinking. 

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Multiplication of positive and negative numbers (begin with integers and extend to rational numbers) • Division of positive and negative numbers (begin with integers and extend to rational numbers) • Equivalent forms of rational numbers • Equivalent forms of expressions • Properties of Operations <ul style="list-style-type: none"> ○ Distributive Property • Terminating and Repeating Decimals • Mental Computation Strategies • Estimation Strategies 	<ul style="list-style-type: none"> • MULTIPLY and DIVIDE (rational numbers) • UNDERSTAND/DEVELOP (rules for multiplying signed numbers) • UNDERSTAND (every quotient of integers (with non-zero divisor) is a rational number) • INTERPRET (products & quotients in context) • APPLY (properties of operations as strategies) • CONVERT (rational to decimal) • KNOW (decimal form terminates or repeats) • SOLVE (multi-step problems in context) <ul style="list-style-type: none"> ○ APPLY (properties of operations to calculate) ○ CONVERT (between equivalent forms of rational numbers) ○ ASSESS (reasonableness of answers) <ul style="list-style-type: none"> ▪ USE (mental computation and estimation strategies) 	<p>3</p> <p>2</p> <p>2</p> <p>6</p> <p>3</p> <p>6</p> <p>2</p> <p>2</p> <p>4</p> <p>3</p> <p>5</p>

Teacher note: students come with previous knowledge of

- Multiplication of fractions
- Division of fractions (unit÷whole, whole÷unit, fraction÷fraction)
- Fluent in finding factors and multiples
- Introduction to rational number system

Essential Questions

In what ways can rational numbers be useful?

Corresponding Big Ideas

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

Grade 7 Mathematics

Learning Activities		
OBJECTIVE	RESOURCES/PAGE	NOTES
<p>Multiply and divide rational decimal numbers: Students will</p> <ul style="list-style-type: none"> • Multiply and divide decimals • Use distributive property as a strategy to multiply decimal numbers • Apply skills to solve real-world math problems, using estimation strategies and mental computation strategies 	<p>Crosswalk Coach Lesson 5 Pizzazz(PreAlg)p.48-50; 52-55 Pizzazz(PreAlg) p. 42-43 MC7 (1.8 – distributive)</p>	<p>PERFORMANCE TASKS TBD</p>
<p>Convert rational number to decimal using long division: Students will</p> <ul style="list-style-type: none"> • Write fractions as terminating or repeating decimals • Write decimals as fractions • Apply skills to solve real-world math problems, using estimation strategies and mental computation strategies 	<p>MC7 (4.5) Step by Step Fractions & Step by Step Decimals MC8 (2.1) Crosswalk Coach Les 1 & 3 Pizzazz (C-71&C-72) Pizzazz(Punchline Problem Solv) p. 70-72 Pizzazz(Bridge to Alg) p. 83 Pizzazz (PreAlg) p. 44</p>	<p>PERFORMANCE TASKS TBD</p>
<p>Review Properties of Operations: Students will</p> <ul style="list-style-type: none"> • Apply properties of operations to multiply and divide rational numbers: <ul style="list-style-type: none"> associative property of multiplication $(axb)xc=ax(bxc)$ commutative property of multiplication $axb=bx a$ multiplicative identity property of one $ax1=1xa=a$ multiplicative inverse $for\ a\neq 0,\ ax\frac{1}{a}=\frac{1}{a}xa=1$ distributive property of multiplication over addition $ax(b+c)=axb+axc$ 	<p>Revisit MC7 (1.8)</p>	

Grade 7 Mathematics

UNIT 3 VOCABULARY:

associative property of multiplication, bar notation, commutative property of multiplication, decimal, distributive property, multiplicative identity property of one, multiplicative inverse, rational number, repeating decimal, terminating decimal

Assessment

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

Standardized Assessment Correlations (State, College and Career)

Expectations for Learning (in development)

This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

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

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

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

Technology and Electronic Resources:

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

UNIT OF STUDY 4: Proportional Reasoning

Pacing: 40 days (plus 5 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

- 1. Make sense of problems and persevere in solving them.**
- 2. Reason abstractly and quantitatively.**
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics.**
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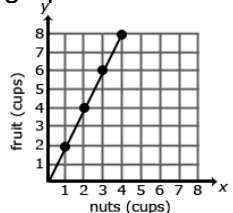
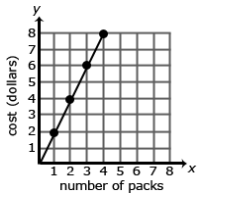
Domain and Standards Overview

Ratios and Proportional Relationships

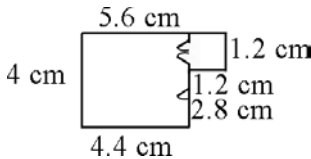
- Analyze proportional relationships and use them to solve real-world and mathematical problems.

Geometry

Draw, construct, and describe geometrical figures and describe the relationships between them.

Priority and Supporting CCSS	Explanations and Examples*																											
<p>7.RP.2. 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 or graphing on a coordinate plane and OBSERV(E)ing 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>7.RP.2. Students may use a content web site and/or interactive white board to create tables and graphs of proportional or non-proportional relationships. Graphing proportional relationships represented in a table helps students recognize that the graph is a line through the origin $(0,0)$ with a constant of proportionality equal to the slope of the line.</p> <p>Examples:</p> <ul style="list-style-type: none"> • A student is making trail mix. Create a graph to determine if the quantities of nuts and fruit are proportional for each serving size listed in the table. If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how you determined the constant of proportionality and how it relates to both the table and graph. <table border="1" data-bbox="1029 714 1480 812"> <thead> <tr> <th>Serving Size</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Cups of Nuts (x)</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Cups of Fruit (y)</td> <td>2</td> <td>4</td> <td>6</td> <td>8</td> </tr> </tbody> </table>  <p>The relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1). The constant of proportionality is shown in the first column of the table and by the slope of the line on the graph.</p> <ul style="list-style-type: none"> • The graph below represents the cost of gum packs as a unit rate of \$2 dollars for every pack of gum. The unit rate is represented as \$2/pack. Represent the relationship using a table and an equation. <p>Table:</p> <table border="1" data-bbox="987 1177 1491 1315"> <thead> <tr> <th>Number of Packs of Gum (g)</th> <th>Cost in Dollars (d)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>2</td> </tr> <tr> <td>2</td> <td>4</td> </tr> <tr> <td>3</td> <td>6</td> </tr> <tr> <td>4</td> <td>8</td> </tr> </tbody> </table>  <p>continued on next page</p>	Serving Size	1	2	3	4	Cups of Nuts (x)	1	2	3	4	Cups of Fruit (y)	2	4	6	8	Number of Packs of Gum (g)	Cost in Dollars (d)	0	0	1	2	2	4	3	6	4	8
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Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.RP.1. COMPUTE unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction $\frac{1}{2}$ to $\frac{1}{4}$ miles per hour, equivalently 2 miles per hour.</i></p> <p>7.RP.3 USE proportional relationships to SOLVE multi-step ratio and percent problems.</p> <p>7.G.1. SOLVE problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</p> <p>7.EE.3. SOLVE multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. APPLY properties of operations to calculate with numbers in any form; CONVERT between forms as appropriate; and ASSESS the reasonableness of answers US(E)ing mental computation and estimation strategies. <i>For example: If a woman making \$25 an hour gets a 10percent raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i></p>	<p>Equation: $d = 2g$, where d is the cost in dollars and g is the packs of gum A common error is to reverse the position of the variables when writing equations. Students may find it useful to use variables specifically related to the quantities rather than using x and y. Constructing verbal models can also be helpful. A student might describe the situation as “the number of packs of gum times the cost for each pack is the total cost in dollars”. They can use this verbal model to construct the equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost</p> <p>7.RP.3 Examples include simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</p> <p>7.G.1. Example: • Julie showed you the scale drawing of her room. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie’s room? Reproduce the drawing at 3 times its current size.</p> 

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Proportional relationships • Equivalent ratios <ul style="list-style-type: none"> ○ In a table ○ Straight line through the origin when graphing on a coordinate plane ○ Equation • Constant of proportionality (unit rate) <ul style="list-style-type: none"> ○ Tables ○ Graphs ○ Equations ○ Diagrams ○ Verbal descriptions • Point (x,y) in terms of situation <ul style="list-style-type: none"> ○ (0, 0) ○ (1, r) where r is the unit rate • Multi-step problems <ul style="list-style-type: none"> ○ Ratio ○ Percent • Scale drawings <ul style="list-style-type: none"> ○ Scale ○ Actual lengths and areas 	<ul style="list-style-type: none"> • RECOGNIZE (proportional relationships) • REPRESENT (proportional relationships in a variety of ways, including equations) • DECIDE (proportional relationship) <ul style="list-style-type: none"> ○ TEST (equivalent ratios) ○ OBSERVE (graph) • IDENTIFY (constant of proportionality) • REPRESENT (proportional relationships by equations) • EXPLAIN [point (x,y)] • COMPUTE (unit rates) • USE (proportional relationships) • SOLVE (multi-step ratio and percent problems) • SOLVE (problems with scale drawings) <ul style="list-style-type: none"> ○ COMPUTE (actual lengths/areas from scale drawings) 	<ul style="list-style-type: none"> 1 2 5 5 1 1 2 2 4 4 3 4 4 4 4

Teacher notes: students come with previous knowledge of

- per cent as a rate, and the understanding that 30% means 30 out of 100.
- computer skills needed for this unit – spreadsheets

Essential Questions

How can ratios and proportional relationships be used to determine unknown quantities?

Corresponding Big Ideas

Ratios and proportional relationships are used to express how quantities are related and how quantities change in relation to each other

Grade 7 Mathematics

Learning Activities		
OBJECTIVE	RESOURCES/PAGE	NOTES
Review ratios and compute unit rates associated with fractions: Students will <ul style="list-style-type: none"> • determine unit rates • write ratios • express ratios as fraction in simplest form and determine unit rates • simplify complex fractions and find unit rates • compare unit prices and determine the better buy 	Pizzazz(Bridge to Alg) p.84 *NF Pizzazz(PreAlg)p.83 Pizzazz(ProI Solv)p.103-105 *NF Pizzazz(E-8) *NF MC7 (6.2) *NF MC8 (4.1) *NF Crosswalk Coach Les 6 & 9 CCSS Les 1 Mathscape 7(Buyer Beware les 1)*NF	*NF – NO FRACTIONS
Rate of change: Students will <ul style="list-style-type: none"> • identify rate of change and slope using tables and graphs • graph data to demonstrate proportional (or non-proportional) relationships • find rates of change • find a constant rate of change 	MC7 (6.3) slope CCSS Les 2 MC8 (4.3-4.4) Pizzazz(Bridge to Alg) p.87 Crosswalk Coach Les 12 MC 7 (3.7)	
Proportional relationships: Students will <ul style="list-style-type: none"> • understand how proportions are related to ratios • understand when to use a proportion to solve a problem • use proportions to solve problems 	Mathscape 7 (Buyer Beware Les 8) MC8 (4.2) MC 7 (6.6) Mathscape 7 (Buyer Beware Les 7) Pizzazz(Bridge to Alg) p.88-91 Pizzazz(ProblSolv) p.106- 106; 109-110 Pizzazz(PreAlg) p. 84, 86 Crosswalk Coach Les 10 & 11 Pizzazz (E9-E11)	
Scale drawings: Students <ul style="list-style-type: none"> • solve problems involving scale drawings 	MC 7 (6.8) MC 8 (4.10) Pizzazz(PreAlg) p. 85,133 Pizzazz (E12) Crosswalk Coach Les 20	Complete extension and enrichment worksheet

Grade 7 Mathematics

OBJECTIVE	RESOURCES/PAGE	NOTES
Similar drawings: Students will <ul style="list-style-type: none"> • Determine whether figures are similar • Find a missing length in a pair of similar figures 	MC 7 (10.7) Pizzazz (D-42) Pizzazz(ProblSolv) p.107-108 Pizzazz(PreAlg) p.133 Pizzazz E 12, 13 Pizzazz (Bridge to Alg) p. 144-145 Crosswalk Coach Les 19	
Fractions as terminating or repeating decimal: Students will <ul style="list-style-type: none"> • Write fractions as terminating or repeating decimals • Write decimals as fractions 	MC7 (4.5)	
Fractions and ratios as percents: Students will <ul style="list-style-type: none"> • Write fractions as percents • Write percents as fractions • Write ratios as percents • Write percents as ratios 	MC7 (4.6) MC 8 (5.1) E 16, 17,18,19 Pizzazz(PreAlg) p.88,89,90,92,93	
Percents and decimals: Students will <ul style="list-style-type: none"> • Write percents as decimals and fractions • Write decimals as percents 	MC7 (4.7) MC 8 (5.2) Pizzazz (book E) p.15, 20 Pizzazz(PreAlg) p. 94 Crosswalk Coach (Les 1)	
Percent of a number: Students will <ul style="list-style-type: none"> • Use a model to find the percent of a number • Find percent of a number 	MC 7 (7.1) Pizzazz(Bridge to Alg) p. 94 Pizzazz(PreAlg) p, 95,96	
Percent proportion: Students will <ul style="list-style-type: none"> • Understand the percent proportion • Use the percent proportion to solve problems 	MC 7 (7.2) MC 8 (5.3) Pizzazz (book E) 26 & 27, 31, 36,37 Pizzazz(PreAlg) p, 100,101, 103,105,106 Pizzazz(Bridge to Alg) p. 95, 96,97, 98	
Estimation with percents: Students will <ul style="list-style-type: none"> • Estimate percents by using fractions and decimals • Compute mentally with percents 	MC 7 (7.3) MC 8 (5.4) Pizzazz (book E) p. 28, 32, 35 Pizzazz(PreAlg) p, 91	
Percent equation: Students will <ul style="list-style-type: none"> • Use the percent equation to solve problems 	MC 7 (7.4) MC 8 (5.7)	

Grade 7 Mathematics

OBJECTIVE	RESOURCES/PAGE	NOTES
Percent application: Students <ul style="list-style-type: none"> Use proportional relationships to solve multi-step ratio and percent problems including simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. 	MC 7 (7.6-7.8) MC 8 (5.8-5.9) MC7 (Concepts & Skills p.750 relative error) Mathscape 7 (Buyer Beware Les10-12) Pizzazz (book E) p. 29,30 Pizzazz(Briege to Alg) p. 99,100,101, 102 Pizzazz(PreAlg) p. 97,98,99,102,104,107,108 Crosswalk Coach (Les 2)	7-8 spreadsheet lab for simple interest Concept and Skills can be found at the end of the text 8.9 Spreadsheet lab for compound interest Use calculators to calculate percents

UNIT 4 VOCABULARY:

commission, compound interest, constant rate of change constant of proportionality, corresponding (sides/angles), discount, equivalent ratios, origin, percent, proportion, proportional relationship, rate, rate of change, ratio, scale, scale drawing, similar figure, simple interest, slope, tax, unit rate

Assessment:

Ledyard Assessment Unit 4
 Performance Task for Unit 4 TBD

Standardized Assessment Correlations (State, College and Career)

Expectations for Learning (in development)

This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Grade 7 Mathematics

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

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

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

Technology and Electronic Resources:

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

DRAFT

UNIT OF STUDY 5: Algebraic Reasoning

Pacing: 20 days (plus 5 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

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

Domain and Standards Overview

Expressions and Equations

- Solve real-life and mathematical problems using numerical and algebraic expressions and equations. Use properties of operations to generate equivalent expressions.

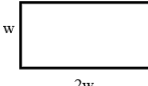
Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.EE.4 (emphasis on) USE variables to represent quantities in a real-world or mathematical problem, and CONSTRUCT simple equations and inequalities to SOLVE problems by REASONing about the quantities.</p> <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></p> <p>b. SOLVE word problems leading to equations of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. GRAPH the solution set of the inequality and interpret it in the context of the problem. <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>7.EE.4 Examples:</p> <ul style="list-style-type: none"> • Amie had \$26 dollars to spend on school supplies. After buying 10 pens, she had \$14.30 left. How much did each pen cost? • The sum of three consecutive even numbers is 48. What is the smallest of these numbers? • Solve: $\frac{3}{4}n + 5 = 20$ • Florencia has at most \$60 to spend on clothes. She wants to buy a pair of jeans for \$22 dollars and spend the rest on t-shirts. Each t-shirt costs \$8. Write an inequality for the number of t-shirts she can purchase. • Steven has \$25 dollars. He spent \$10.81, including tax, to buy a new DVD. He needs to set aside \$10.00 to pay for his lunch next week. If peanuts cost \$0.38 per package including tax, what is the maximum number of packages that Steven can buy? <p>Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number system that you used to find a solution.</p> <ul style="list-style-type: none"> • Solve $\frac{3}{4}x + 3 > 2$ and graph your solution on a number line.

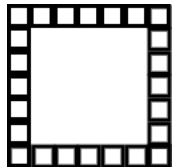
Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*						
<p>7.EE.3. SOLVE multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. APPLY properties of operations to calculate with numbers in any form; CONVERT between forms as appropriate; and ASSESS the reasonableness of answers US(E)ing mental computation and estimation strategies.</p> <p><i>For example: If a woman making \$25 an hour gets a 10percent raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i></p>	<p>7.EE.3. Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to:</p> <ul style="list-style-type: none"> • front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts), • clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), • rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), • using friendly or compatible numbers such as factors (students seek to fit numbers together - i.e., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and • using benchmark numbers that are easy to compute (students select close whole numbers for fractions or decimals to determine an estimate). <p>Example:</p> <ul style="list-style-type: none"> • The youth group is going on a trip to the state fair. The trip costs \$52. Included in that price is \$11 for a concert ticket and the cost of 2 passes, one for the rides and one for the game booths. Each of the passes cost the same price. Write an equation representing the cost of the trip and determine the price of one pass. <div style="display: flex; align-items: center; justify-content: center;"> <table border="1" style="margin-right: 20px;"> <tr> <td style="text-align: center; width: 40px;">x</td> <td style="text-align: center; width: 40px;">x</td> <td style="text-align: center; width: 40px;">11</td> </tr> <tr> <td colspan="3" style="text-align: center; border-top: none;">52</td> </tr> </table> <div style="margin-left: 20px;"> $2x + 11 = 52$ $2x = 41$ $x = \\$20.5$ </div> </div>	x	x	11	52		
x	x	11					
52							

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.EE.1. APPLY properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p>	<p>7.EE.1. Examples:</p> <ul style="list-style-type: none"> • Write an equivalent expression for $3(x + 5) - 2$ • Suzanne thinks the two expressions $2(3a - 2)$ and $10a - 2$ are equivalent? Is she correct? Explain why or why not? • Write equivalent expressions for $3a + 12$. Possible solutions might include factoring as in $3(a + 4)$, or other expressions such as $a + 2a + 7 + 5$. • A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w$. Write the expression in two other ways. Solution: $6w$ OR $2(w) + 2(2w)$ <div style="text-align: center;">  </div> <ul style="list-style-type: none"> • An equilateral triangle has a perimeter of $6x + 15$. What is the length of each of the sides of the triangle? Solution: $2(2x + 5)$, therefore each side is $2x + 5$ units long.

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.EE.2. UNDERSTAND that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that “increase by 5 percent” is the same as “multiply by 1.05.”</i></p>	<p>7.EE.2. Examples:</p> <ul style="list-style-type: none"> • Jamie and Ted both get paid an equal hourly wage of \$9 per hour. This week, Ted made an additional \$27 dollars in overtime. Write an expression that represents the weekly wages of both if J = the number of hours that Jamie worked this week and T = the number of hours Ted worked this week? Can you write the expression in another way? Students may create several different expressions depending upon how they group the quantities in the problem. <p>One student might say: To find the total wage, I would first multiply the number of hours Jamie worked by 9. Then I would multiply the number of hours Ted worked by 9. I would add these two values with the \$27 overtime to find the total wages for the week. The student would write the expression $9J + 9T + 27$.</p> <p>Another student might say: To find the total wages, I would add the number of hours that Ted and Jamie worked. I would multiply the total number of hours worked by 9. I would then add the overtime to that value to get the total wages for the week. The student would write the expression $9(J + T) + 27$.</p> <p>A third student might say: To find the total wages, I would need to figure out how much Jamie made and add that to how much Ted made for the week. To figure out Jamie’s wages, I would multiply the number of hours she worked by 9. To figure out Ted’s wages, I would multiply the number of hours he worked by 9 and then add the \$27 he earned in overtime. My final step would be to add Jamie and Ted wages for the week to find their combined total wages. The student would write the expression $(9J) + (9T + 27)$.</p> <ul style="list-style-type: none"> • Given a square pool as shown in the picture, write four different expressions to find the total number of tiles in the border. Explain how each of the expressions relates to the diagram and demonstrate that the expressions are equivalent. Which expression do you think is most useful? Explain your thinking. 

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Variables • Simple equations <ul style="list-style-type: none"> ○ form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers • Simple Inequalities <ul style="list-style-type: none"> ○ form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. • Algebraic solution • Arithmetic solution • Solution set of an inequality • Properties of operations • Linear expressions • Rational coefficients • Expressions in different forms • Quantities in a problem are related 	<ul style="list-style-type: none"> • USE (variables) • CONSTRUCT (simple equations and inequalities) • SOLVE (problems in context) <ul style="list-style-type: none"> ○ Simple equations ○ Simple inequalities ○ Rational coefficients • REASON (about quantities) • COMPARE (solutions – algebraic to arithmetic) • GRAPH (inequality) • APPLY (properties of operations) <ul style="list-style-type: none"> ○ ADD (Linear expressions with rational coefficients) ○ SUBTRACT (Linear expressions with rational coefficients) ○ FACTOR (Linear expressions with rational coefficients) ○ EXPAND (Linear expressions with rational coefficients) • WRITE (an expression in different forms) • UNDERSTAND (how rewriting an expression in different forms can show how the quantities in a problem are related) 	<p>3</p> <p>3</p> <p>4,5</p> <p>4</p> <p>2</p> <p>3</p> <p>2</p> <p>2</p> <p>2</p> <p>3</p> <p>3</p> <p>3</p> <p>2</p>

Grade 7 Mathematics

Essential Questions

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

Corresponding Big Ideas

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

Learning Activities

Objective	Resource/page	Notes
Expressions and Equations: Students will <ul style="list-style-type: none"> • Write verbal phrases and sentences as simple algebraic expressions and equations • Solve equations using models • Solve multiplication equations • Solve equations involving rational numbers • Use the Distributive Property to simplify algebraic expressions • Write two-step equations that represent real-life situations 	MC7 (3.1, 3.2, 3.3) MC8 (1.7, 2.7, 8.1, 8.3) Pizzazz(Punchline Probl Solv) p. 93-94 Pizzazz(PreAlg) p. 180-189,214 CCSS Lesson 5, 6, 7 Crosswalk Coach Les 13-17 Mathscape7(Language of Alg) Les 1, 3 Pizzazz(PreAlg) p. 198-211, 215-221 MC 7(pg. 742)	
Evaluate expressions and solve equations: Students will <ul style="list-style-type: none"> • Evaluate simple algebraic expressions • Solve equations with rational number solutions 	MC 7(1.6) Pizzazz(Bridge to Alg p.32-36) MC7 (5.6) Pizzazz(E-70 – E 75)	
Two-step equations: Students will <ul style="list-style-type: none"> • Write and solve two-step equations in $p(x+q)=r$ form using bar diagrams and algebra tiles 	MC 7(3.5) MC 8(8.2) CCSS Lesson 8, 9 Pizzazz(E 76)	

Grade 7 Mathematics

Objective	Resource/page	Notes
Application: Students <ul style="list-style-type: none"> • Solve perimeter and area problems using formulas • Graph data to demonstrate relationships 	MC 7(3.6, 3.7) Pizzazz(Bridge to Alg) p.43-53	
Inequalities: Students <ul style="list-style-type: none"> • Write and interpret inequalities • Graph inequalities • Solve word problems involving inequalities 	Mathscape7(Language of Alg) Les 2 &4 MC8 (8.6-8.8) MC7 (pg. 740-741) Pizzazz(PreAlg) p. 197, 222-225 Crosswalk Coach Les 18	

UNIT 5 VOCABULARY:

define a variable, equality, equation, equivalent expression, evaluate, expression, formula, inequality, like terms, variable, simplify, solution

Assessment:

Ledyard Assessment Unit 5
 Performance Task for Unit 5 TBD

Standardized Assessment Correlations (State, College and Career)

Expectations for Learning (in development)

This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Grade 7 Mathematics

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

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

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

Technology and Electronic Resources:

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

DRAFT

UNIT OF STUDY 6: Probability

Pacing: 20 days (plus 5 days for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

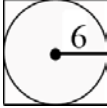
- 1. Make sense of problems and persevere in solving them.**
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.**
5. Use appropriate tools strategically.
6. Attend to precision.
- 7. Look for and make use of structure.**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

Domain and Standards Overview

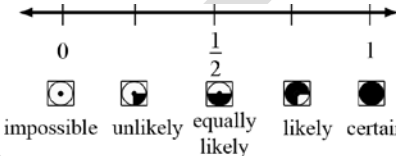

Statistics and Probability

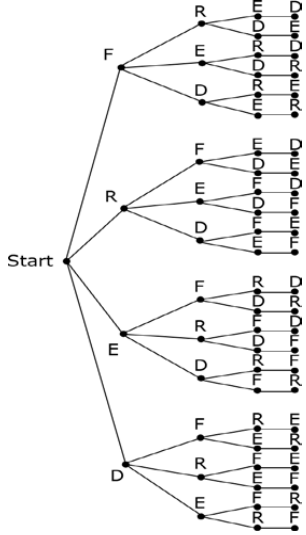
Investigate chance processes and develop, use, and evaluate probability models..

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.SP.7. DEVELOP a probability model and USE it to FIND probabilities of events. COMPARE probabilities from a model to observed frequencies; if the agreement is not good, EXPLAIN possible sources of the discrepancy.</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. <i>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?</i></p>	<p>7.SP.7 Students need multiple opportunities to perform probability experiments and compare these results to theoretical probabilities. Critical components of the experiment process are making predictions about the outcomes by applying the principles of theoretical probability, comparing the predictions to the outcomes of the experiments, and replicating the experiment to compare results. Experiments can be replicated by the same group or by compiling class data. Experiments can be conducted using various random generation devices including, but not limited to, bag pulls, spinners, number cubes, coin toss, and colored chips. Students can collect data using physical objects or graphing calculator or web-based simulations. Students can also develop models for geometric probability (i.e. a target).</p> <p>Example:</p> <ul style="list-style-type: none"> If you choose a point in the square, what is the probability that it is not in the circle? 

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
<p>7.SP.5. UNDERSTAND that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.</p> <p>7.SP.6. APPROXIMATE the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and PREDICT the approximate relative frequency given the probability. <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>7.SP.5. Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line. Students can use simulations such as Marble Mania on AAAS or the Random Drawing Tool on NCTM's Illuminations to generate data and examine patterns. Marble Mania http://www.sciencenetlinks.com/interactives/marble/marblemania.html Random Drawing Tool - http://illuminations.nctm.org/activitydetail.aspx?id=67</p> <div style="text-align: center;">  </div> <p>Example:</p> <ul style="list-style-type: none"> The container below contains 2 gray, 1 white, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a marble? A gray marble? A black marble? Justify each of your predictions. <div style="text-align: center;">  </div> <p>7.SP.6. Students can collect data using physical objects or graphing calculator or web-based simulations. Students can perform experiments multiple times, pool data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies. Example: Each group receives a bag that contains 4 green marbles, 6 red marbles, and 10 blue marbles. Each group performs 50 pulls, recording the color of marble drawn and replacing the marble into the bag before the next draw. Students compile their data as a group and then as a class. They summarize their data as experimental probabilities and make conjectures about theoretical probabilities (How many green draws would you expect if you were to conduct 1000 pulls? 10,000 pulls?). Students create another scenario with a different ratio of marbles in the bag and make a conjecture about the outcome of 50 marble pulls with replacement. (An example would be 3 green marbles, 6 blue marbles, 3 blue marbles.) Students try the experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.</p>

Priority and Supporting CCSS	Explanations and Examples*
<p>7.SP.8 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 double sixes”), identify the outcomes in the sample space which compose the events.</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 percent of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood</i></p>	<p>7.SP.8 Examples:</p> <ul style="list-style-type: none"> • Students conduct a bag pull experiment. A bag contains 5 marbles. There is one red marble, two blue marbles and two purple marbles. Students will draw one marble without replacement and then draw another. What is the sample space for this situation? Explain how you determined the sample space and how you will use it to find the probability of drawing one blue marble followed by another blue marble. • Show all possible arrangements of the letters in the word FRED using a tree diagram. If each of the letters is on a tile and drawn at random, what is the probability that you will draw the letters F-R-E-D in that order? What is the probability that your “word” will have an F as the first 

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Probability model <ul style="list-style-type: none"> ○ uniform ○ not uniform • probabilities • events <ul style="list-style-type: none"> ○ compound • frequencies • outcomes • data • chance <ul style="list-style-type: none"> ○ process ○ event • Probability of a chance event • Relative frequency • Organized list • Tables • Tree diagram • Simulation • Sample space 	<ul style="list-style-type: none"> • DEVELOP/USE <ul style="list-style-type: none"> ○ (a uniform probability model) ○ (a probability model which may not be uniform) 	3
	<ul style="list-style-type: none"> • FIND <ul style="list-style-type: none"> ○ (probabilities of simple events) ○ (probability of compound events using organized lists, tables, tree diagrams and simulation) ○ (frequencies for compound events) 	3
	<ul style="list-style-type: none"> • COMPARE (probabilities from a model to observed frequencies) 	2
	<ul style="list-style-type: none"> • EXPLAIN (possible sources of the discrepancy) 	2
	<ul style="list-style-type: none"> • OBSERVE/PREDICT (frequencies in data) 	2
	<ul style="list-style-type: none"> • UNDERSTAND <ul style="list-style-type: none"> ○ (probability of a chance event is a number between 0 and 1) ○ (probability of a compound event is the fraction of outcomes in the sample space) 	2
	<ul style="list-style-type: none"> • REPRESENT (sample spaces for compound events using various methods, e.g., organized lists, tables, tree diagrams) 	3
	<ul style="list-style-type: none"> • APPROXIMATE (probability of a chance event) 	2
	<ul style="list-style-type: none"> • PREDICT (approximate relative frequency) 	2
	<ul style="list-style-type: none"> • DESIGN/USE (simulation) 	6, 3

Teacher note: Students come with no previous knowledge of probability.

Grade 7 Mathematics

Essential Questions

How is probability used to make informed decisions about uncertain events?

Corresponding Big Ideas

The rules of probability can lead to more valid and reliable predictions about the likelihood of an even occurring.

Learning Activities

Objective	Resource/page	Notes
Simple events: Students will <ul style="list-style-type: none"> • Understand probability as a ratio of part to whole • Compute the number of items in a set using a given probability • Find the probability of a simple event 	MC 7(9.1) Crosswalk Coach Les 28 Groundworks (Reasoning with Data and Probability) p. 72-88 Pizzazz (Punchline ProbiSolv) p.135-137	
Sample Spaces: Students will <ul style="list-style-type: none"> • Find sample spaces and probabilities 	MC 7(9.2)	
Fundamental Counting Principle: Students will <ul style="list-style-type: none"> • Construct and interpret tree diagrams to count outcomes • Use multiplication to count outcomes and find probabilities • Find and compare experimental and theoretical probabilities • Apply the Fundamental Counting Principle 	MC 7(9.3 & 9.6) MC 8 (12.1) Pizzazz(Punchline ProbiSolv) p. 138 Pizzazz(Bridge to Alg) p.109 Groundworks(Probability) p. 56-71 Mathscape 8 (Looking Behind the Numbers , Lesson 10)	
Permutations: Students will <ul style="list-style-type: none"> • Find the number of permutations of a set of objects and find probabilities 	MC 7(9.4) Mathscape 8 (Looking Behind the Numbers , Lesson 11)	

Grade 7 Mathematics

Objective	Resource/page	Notes
Combinations: Students will <ul style="list-style-type: none"> • Find the number of combinations of a set of objects and find probabilities 	MC 7(9.5)	
Theoretical and Experimental Probability: Students will <ul style="list-style-type: none"> • Find and compare experimental and theoretical probabilities • Use experimental and theoretical probabilities to decide whether a game is fair 	MC 7 (9.7) MC 8 (12.3) Mathscape 8 (Looking Behind the Numbers , Lesson 9)	
Compound Events: Students will <ul style="list-style-type: none"> • Find the probability of independent and dependent events • Use a simulation to generate frequencies for a compound event 	MC 7 (9.8) MC 8(12.2) CCSS Lesson 16 Crosswalk Coach Les 29 Pizzazz(Punchline ProblSolv) p. 139	

UNIT 6 VOCABULARY:
combination, compound events, experimental probability, favorable outcomes, frequency, fundamental counting principle, likely, outcomes, permutation, random, sample space, simple event, simulation, theoretical probability, tree diagram, uniform probability model, unlikely

Grade 7 Mathematics

Assessment:

Ledyard Assessment Unit 6
Performance Task for Unit 6 **TBD**

Standardized Assessment Correlations (State, College and Career)

Expectations for Learning (in development)

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

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

Technology and Electronic Resources:

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

UNIT OF STUDY 7: Inferences About Populations

Pacing: 20 days (plus 1 day for reteaching/enrichment)

Mathematical Practices

Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning.

Practices in bold are to be emphasized in the unit.

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

Domain and Standards Overview

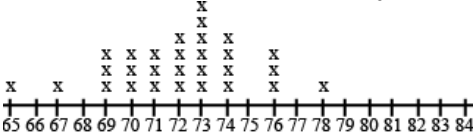
Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*															
<p>7.SP.1. UNDERSTAND that statistics can be USED to gain information about a population by EXAMIN(E)ing a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. UNDERSTAND that random sampling tends to produce representative samples and support valid inferences.</p> <p>7.SP.2. USE data from a random sample to DRAW inferences about a population with an unknown characteristic of interest. GENERATE multiple samples (or simulated samples) of the same size to GUAGE the variation in estimates or predictions. <i>For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</i></p> <p>7.SP.4. USE measures of center and measures of variability for numerical data from random samples to DRAW informal comparative inferences about two populations. <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>7.SP.1.</p> <ul style="list-style-type: none"> The school food service wants to increase the number of students who eat hot lunch in the cafeteria. The student council has been asked to conduct a survey of the student body to determine the students' preferences for hot lunch. They have determined two ways to do the survey. The two methods are listed below. Identify the type of sampling used in each survey option. Which survey option should the student council use and why? <ol style="list-style-type: none"> Write all of the students' names on cards and pull them out in a draw to determine who will complete the survey. Survey the first 20 students that enter the lunch room. <p>7.SP.2. Example: Below is the data collected from two random samples of 100 students regarding student's school lunch preference. Make at least two inferences based on the results.</p> <div style="text-align: center;"> <p>Lunch Preferences</p> <table border="1"> <thead> <tr> <th>student sample</th> <th>hamburgers</th> <th>tacos</th> <th>pizza</th> <th>total</th> </tr> </thead> <tbody> <tr> <td>#1</td> <td>12</td> <td>14</td> <td>74</td> <td>100</td> </tr> <tr> <td>#2</td> <td>12</td> <td>11</td> <td>77</td> <td>100</td> </tr> </tbody> </table> </div> <p>7.SP.4. Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range. Example:</p> <ul style="list-style-type: none"> The two data sets below depict random samples of the housing prices sold in the King River and Toby Ranch areas of Arizona. Based on the prices below which measure of center will provide the most accurate estimation of housing prices in Arizona? Explain your reasoning. <ul style="list-style-type: none"> King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000} Toby Ranch homes {5million, 154000, 250000, 250000, 200000, 160000, 190000} 	student sample	hamburgers	tacos	pizza	total	#1	12	14	74	100	#2	12	11	77	100
student sample	hamburgers	tacos	pizza	total												
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#2	12	11	77	100												

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Priority and Supporting CCSS	Explanations and Examples*
<p>7.SP.3. Informally ASSESS the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability.</p> <p><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>7.SP.3. Students can readily find data as described in the example on sports team or college websites. Other sources for data include American Fact Finder (Census Bureau), Fed Stats, Ecology Explorers, USGS, or CIA World Factbook. Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations.</p> <p>Example: Jason wanted to compare the mean height of the players on his favorite basketball and soccer teams. He thinks the mean height of the players on the basketball team will be greater but doesn't know how much greater. He also wonders if the variability of heights of the athletes is related to the sport they play. He thinks that there will be a greater variability in the heights of soccer players as compared to basketball players. He used the rosters and player statistics from the team websites to generate the following lists.</p> <p>Basketball Team – Height of Players in inches for 2010-2011 Season 75, 73, 76, 78, 79, 78, 79, 81, 80, 82, 81, 84, 82, 84, 80, 84</p> <p>Soccer Team – Height of Players in inches for 2010 73, 73, 73, 72, 69, 76, 72, 73, 74, 70, 65, 71, 74, 76, 70, 72, 71, 74, 71, 74, 73, 67, 70, 72, 69, 78, 73, 76, 69</p> <p>To compare the data sets, Jason creates a two dot plots on the same scale. The shortest player is 65 inches and the tallest players are 84 inches.</p>  <p>Continued on next page</p>

*Adapted from the Arizona Academic Content Standards.

Grade 7 Mathematics

Priority and Supporting CCSS	Explanations and Examples*
	<div data-bbox="1234 315 1743 409" data-label="Figure"> </div> <div data-bbox="1276 428 1730 461" data-label="Caption"> <p>Height of Basketball Players (in)</p> </div> <div data-bbox="978 496 1986 659" data-label="Text"> <p>In looking at the distribution of the data, Jason observes that there is some overlap between the two data sets. Some players on both teams have players between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets. Jason sets up a table for each data set to help him with the calculations.</p> </div> <div data-bbox="978 695 1986 792" data-label="Text"> <p>The mean height of the basketball players is 79.75 inches as compared to the mean height of the soccer players at 72.07 inches, a difference of 7.68 inches.</p> </div> <div data-bbox="978 828 1986 1088" data-label="Text"> <p>The mean absolute deviation (MAD) is calculated by taking the mean of the absolute deviations for each data point. The difference between each data point and the mean is recorded in the second column of the table. Jason used rounded values (80 inches for the mean height of basketball players and 72 inches for the mean height of soccer players) to find the differences. The absolute deviation, absolute value of the deviation, is recorded in the third column. The absolute deviations are summed and divided by the number of data points in the set.</p> </div> <div data-bbox="978 1097 1986 1260" data-label="Text"> <p>The mean absolute deviation is 2.14 inches for the basketball players and 2.53 for the soccer players. These values indicate moderate variation in both data sets. There is slightly more variability in the height of the soccer players. The difference between the heights of the teams is approximately 3 times the variability of the data sets ($7.68 \div 2.53 = 3.04$).</p> </div> <div data-bbox="978 1299 1293 1331" data-label="Text"> <p>Continued on next page</p> </div>

Grade 7 Mathematics

Concepts What Students Need to Know	Skills What Students Need To Be Able To Do	Bloom's Taxonomy Levels
<ul style="list-style-type: none"> • Statistics • Population <ul style="list-style-type: none"> ○ representative • Sample <ul style="list-style-type: none"> ○ representative/valid ○ random • Measures of center • Measures of variability • Inferences <ul style="list-style-type: none"> ○ informal comparative • Data • Variation • Data distribution <ul style="list-style-type: none"> ○ variability ○ center ○ mean absolute deviation 	<ul style="list-style-type: none"> • UNDERSTAND/USE (statistics) • EXAMINE (a sample of a population) • GENERALIZE (information about a population) <ul style="list-style-type: none"> ○ UNDERSTAND/DETERMINE (if a sample is representative/valid) • USE (data from a random sample) <ul style="list-style-type: none"> ○ DRAW (inferences about a population) • GENERATE (multiple samples of the same size) <ul style="list-style-type: none"> ○ GAUGE (the variation in estimates or predictions) • USE (measures of center and measures of variability for numerical data from random samples) <ul style="list-style-type: none"> ○ DRAW (informal comparative inferences) • ASSESS (informally, the difference between the centers of two numerical data distributions as a multiple of a measure of variability – mean absolute deviation) 	<p>2, 3</p> <p>4</p> <p>4</p> <p>3,4</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>3</p> <p>5</p>

Teacher note: students come with previous knowledge of

- An understanding of statistical variability
- Displaying data on line plots, histograms, and box plots
- Measures of central tendency, and giving measures of center (median, mean) and variability (interquartile range, mean absolute deviation)
- Describing patterns in data

Grade 7 Mathematics

Essential Questions

How is probability used to make informed decisions about uncertain events?

Corresponding Big Ideas

The rules of probability can lead to more valid and reliable predictions about the likelihood of an event occurring.

Learning Activities

Objective	Resource/page	Notes
<p>Measures of central tendency and range: Students will</p> <ul style="list-style-type: none"> • Review describing and finding a set of data using mean, median, mode and range • Find measures of variation of a set of data • Display and interpret data in a box plot • Compare two populations using the measures of center and variation • Determine the mean absolute deviation (MAD) • Make predictions using data • Use a spreadsheet to make a multiple-line and multiple-bar graph 	<p>MC7 (8.2) MC8 (11.4, 11.5, 11.6) Crosswalk Coach Les 31& 32 Common Core Clinic: Statistics and Probability Lessons 4, 5, 6, 7, 8 Pizzazz(Bridge to Alg) p.107 Crosswalk Coach Les 33, 35 CCSS Lesson 15 Pizzazz(Bridge to Alg) p.103 MC7 (8.6, 8.7) Crosswalk Coach Less 34</p>	

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Objective	Resource/page	Notes
Using Sampling to predict: Students will <ul style="list-style-type: none"> Predict the actions of a larger group by using a sample 	MC7 (8.8) Crosswalk Coach Les 30 MC8 (12.5)	
Misleading Statistic: Students will <ul style="list-style-type: none"> Recognize when statistics and graphs are misleading 	MC7 (8.9)	
Application: Students will <ul style="list-style-type: none"> Analyze the visual overlap of two numerical data distributions 	CCSS Les 14	

UNIT 7 VOCABULARY:

biased sample, box plot (box and whisker), mean, mean absolute deviation, inference, dot plot, interquartile range, median, measures of center, measures of variability, mode, population, random sample, representative sample, sample, unbiased sample

Assessment:

Ledyard Assessment Unit 7
Performance Task for Unit 7 **TBD**

**Standardized Assessment Correlations
(State, College and Career)**

Expectations for Learning (in development)

This information will be included as it is developed at the national level. CT is a governing member of the Smarter Balanced Assessment Consortium (SBAC) and has input into the development of the assessment.

Grade 7 Mathematics

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

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

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

Technology and Electronic Resources:

www.stattek.com tutorials on statistics

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