

Standards for Mathematical Practices – Grade 6

Standards for Mathematical Practice	Explanations and Examples
1. Make sense of problems and persevere in solving them.	In grade 6, students solve real world problems through the application of algebraic and geometric concepts. These problems involve ratio, rate, area and statistics. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”. Students can explain the relationships between equations, verbal descriptions, tables and graphs. <u>Mathematically proficient students check answers to problems using a different method.</u>
2. Reason abstractly and quantitatively.	In grade 6, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. Construct viable arguments and critique the reasoning of others.	In grade 6, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like “How did you get that?”, “Why is that true?” “Does that always work?” They explain their thinking to others and respond to others’ thinking.
4. Model with mathematics.	In grade 6, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students begin to explore covariance and represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.
5. Use appropriate tools strategically.	Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 6 may decide to represent figures on the coordinate plane to calculate area. Number lines are used to understand division and to create dot plots, histograms and box plots to visually compare the center and variability of the data. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures.
6. Attend to precision.	In grade 6, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations or inequalities.
7. Look for and make use of	Students routinely seek patterns or structures to model and solve problems. For instance, students recognize

structure.	patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 3(2 + x)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality, $c=6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving area and volume.
8. Look for and express regularity in repeated reasoning.	In grade 6, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations showing the relationships between quantities.

Grade 6 Critical Areas

The Critical Areas are designed to bring focus to the standards at each grade by describing the big ideas that educators can use to build their curriculum and to guide instruction.

The Critical Areas for sixth grade can be found beginning on page 39 in the *Common Core State Standards for Mathematics*.

1. Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems.

Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

2. Completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers.

Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Writing, interpreting, and using expressions and equations.

Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. Developing understanding of statistical thinking.

Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Expressions and Equations

• Apply and extend previous understandings of arithmetic to algebraic expressions.

Write and evaluate numerical expressions involving whole-number exponents.

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Write numerical expressions involving whole number exponents Ex. $3^4 = 3 \times 3 \times 3 \times 3$ 2. Evaluate numerical expressions involving whole number exponents Ex. $3^4 = 3 \times 3 \times 3 \times 3 = 81$ 3. Solve order of operation problems that contain exponents Ex. $3 + 2^2 - (2 + 3) = 2$ 	<p>http://nlvm.usu.edu</p>	

Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as $5 - y$.*

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Use variables to stand in for numbers in expressions. 2. Translate written phrases into algebraic expressions. 3. Translate algebraic expressions into written phrases. 	<p>Algebra tiles Cups Centimeter cubes</p>	

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.*

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient, constant, monomial) 2. Identify parts of an expression as a single entity, even if not a monomial. 	<p>Algebra tiles Cups Centimeter cubes</p>	

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.*

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Substitute specific values for variables. 2. Evaluate algebraic expressions including those that arise from real-world problems. 3. Apply order of operations when there are no parentheses for expressions that include whole number exponents. 	Algebra tiles Cups Centimeter cubes Equality mats	

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

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Generate equivalent expressions using the properties of operations. (e.g. distributive property, associative property, adding like terms with the addition property of equality, etc.) 2. Apply the properties of operations to generate equivalent expressions. 	Algebra tiles Cups Centimeter cubes Equality mats	

Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions $y + y + y$ and $3y$ are equivalent because they name the same number regardless of which number y stands for.*

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Recognize when two expressions are equivalent. 2. Prove (using various strategies) that two equations are equivalent no matter what number is substituted. 	Algebra tiles Cups Centimeter cubes Equality mats	

• Reason about and solve one-variable equations and inequalities.

Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Recognize solving an equation or inequality as a process of answering "<i>which values from a specified set, if any, make the equation or inequality true?</i>" 2. Know that the solutions of an equation or inequality are the values that make the equation or inequality true. 3. Use substitution to determine whether a given number in a specified set makes an equation or inequality true. 	Algebra tiles Cups Centimeter cubes Equality mats	

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

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Recognize that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. 2. Relate variables to a context. 3. Write expressions when solving a real-world or mathematical problem 	Algebra tiles Cups Centimeter cubes Equality mats	

Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Define inverse operation. 2. Know how inverse operations can be used in solving one-variable equations. 3. Apply rules of the form $x + p = q$ and $px = q$, for cases in which p, q and x are all nonnegative rational numbers, to solve real world and mathematical problems. (There is only one unknown quantity.) 4. Develop a rule for solving one-step equations using inverse operations with nonnegative rational coefficients. 5. Solve and write equations for real-world mathematical problems containing one unknown. 	<p>Algebra tiles Cups Centimeter cubes Equality mats</p>	

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

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> 1. Identify the constraint or condition in a real-world or mathematical problem in order to set up an inequality. 2. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions. 3. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. 4. Represent solutions to inequalities or the form $x > c$ or $x < c$, with infinitely many solutions, on number line diagrams. 	<p>Algebra tiles Cups Centimeter cubes Inequality mats Number lines</p>	

• Represent and analyze quantitative relationships between dependent and independent variables.

Student Friendly/"I Can" statements	Resources	Assessments
1. Define independent and dependent variables.	http://nlvm.usu.edu	

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time*

Student Friendly/"I Can" statements	Resources	Assessments
1. Use variables to represent two quantities in a real-world problem that change in relationship to one another. 2. Write an equation to express one quantity (dependent) in terms of the other quantity (independent). 3. Analyze the relationship between the dependent variable and independent variable using tables and graphs 4. Relate the data in a graph and table to the corresponding equation.	Graph paper	

The Number System

• Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

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

Student Friendly/"I Can" statements	Resources	Assessments
1. Compute quotients of fractions divided by fractions (including mixed numbers). 2. Interpret quotients of fractions 3. Solving word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.	http://nlvm.usu.edu fraction tiles graph paper Study Island lesson Plain paper Cuisennarie rods DOE Released items M & M Book Sports Activity Books Mathwarehouse.com	

• Compute fluently with multi-digit numbers and find common factors and multiples.

Fluently divide multi-digit numbers using the standard algorithm.

Student Friendly/"I Can" statements	Resources	Assessments
1. Fluently divide multi-digit numbers using the standard algorithm with speed and accuracy.	http://nlvm.usu.edu Cuisennarie rods	Multiplication facts timed tests Division facts timed tests

Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Student Friendly/"I Can" statements	Resources	Assessments
1. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation with speed and accuracy.	Graph paper	

Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express $36 + 8$ as $4(9 + 2)$.*

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> Identify the factors of two whole numbers less than or equal to 100 and determine the Greatest Common Factor. Identify the multiples of two whole numbers less than or equal to 12 and determine the Least Common Multiple. Apply the Distributive Property to rewrite addition problems by factoring out the Greatest Common Factor. 		

• Apply and extend previous understandings of numbers to the system of rational numbers.

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

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> Identify an integer and its opposite Use integers to represent quantities in real world situations (above/below sea level, etc) Explain where zero fits into a situation represented by integers 	Two colored counters Algebra tiles Number lines Magnetic number line with blow up integer cubes Dolphin game +, _ basic mat Integer App (iPad) Poker chips (different colors) In relation to money – purchasing, checkbook	

Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.

Student Friendly/"I Can" statements	Resources	Assessments
<ol style="list-style-type: none"> Identify a rational number as a point on the number line. Identify the location of zero on a number 	Two colored counters Algebra tiles Number lines	

<p>line in relation to positive and negative numbers</p> <ol style="list-style-type: none"> 3. Recognize opposite signs of numbers as locations on opposite sides of 0 on the number line 4. Reason that the opposite of the opposite of a number is the number itself. 		
<p>b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.</p>		
<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Recognize the signs of both numbers in an ordered pair indicate which quadrant of the coordinate plane the ordered pair will be located 2. Find and position integers and other rational numbers on a horizontal or vertical number line diagram 3. Find and position pairs of integers and other rational numbers on a coordinate plane 4. Reason that when only the x value in a set of ordered pairs are opposites, it creates a reflection over the y axis, e.g., (x,y) and (-x,y) 5. Recognize that when only the y value in a set of ordered pairs are opposites, it creates a reflection over the x axis, e.g., (x,y) and (x, -y) 6. Reason that when two ordered pairs differ only by signs, the locations of the points are related by reflections across both axes, e.g., (-x, -y) and (x,y) 	<p>Resources</p> <p>Coordinate planes</p>	<p>Assessments</p>

c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

Student Friendly/"I Can" statements

1. Find and position integers and other rational numbers on a horizontal or vertical number line diagram
2. Find and position pairs of integers and other rational numbers on a coordinate plane

Resources

Assessments

Coordinate Planes

Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, write the statement $-3 > -7$ as a statement that -3 is located to the right of -7 on a number line oriented from left to right.*

Student Friendly/"I Can" statements 1. Interpret statements of inequality as statements about relative position of two numbers on a number line diagram.	Resources Number lines	A
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b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write the fact that -3 °C is warmer than -7 °C.*

Student Friendly/"I Can" statements 1. Order rational numbers on a number line	Resources Number lines	A
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c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value of a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write $|-30|$ as the debt in dollars.*

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Identify absolute value of rational numbers 2. Interpret statements of inequality as statements about relative position of two numbers on a number line diagram. 3. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation 	<p>Resources</p>	<p>A</p>
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d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance of -40 dollars represents a debt greater than 30 dollars.*

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Write, interpret, and explain statements of order for rational numbers in real-world contexts 2. Distinguish comparisons of absolute value from statements about order and apply to real world contexts 	<p>Resources</p> <p>Number lines</p>	<p>A</p>
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Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include absolute value to find distances between points with the same first coordinate or the same second coordinate.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Calculate absolute value. 2. Graph points in all four quadrants of the coordinate plane. 3. Solve real-world problems by graphing points in all four quadrants of a coordinate plane. 4. Given only coordinates, calculate the distances between two points with the same first coordinate or the same second coordinate using absolute value. 	<p>Resources</p> <p>Coordinate planes</p>	<p>A</p>
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Statistics and Probability

• Develop understanding of statistical variability.

Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because it anticipates variability in students’ ages.

<p style="text-align: center;">Student Friendly/“I Can” statements</p> <ol style="list-style-type: none"> 1. Recognize that data can have variability. 2. Recognize a statistical question (examples versus non-examples). 	Resources	
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Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

<p style="text-align: center;">Student Friendly/“I Can” statements</p> <ol style="list-style-type: none"> 1. Know that a set of data has a distribution. 2. Describe a set of data by its center, e.g., mean and median. 3. Describe a set of data by its spread and overall shape, e.g. by identifying data clusters, peaks, gaps and symmetry 	Resources	
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Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while describes how its values vary with a single number.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Recognize there are measures of central tendency for a data set, e.g., mean, median, mode. 2. Recognize there are measures of variances for a data set, e.g., range, interquartile range, mean absolute deviation. 3. Recognize measures of central tendency for a data set summarizes the data with a single number. 4. Recognize measures of variation for a data set describes how its values vary with a single number. 	<p>Resources</p> <p>http://nlvm.usu.edu</p>	<p>A</p>
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• Summarize and describe distributions.

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Identify the components of dot plots, histograms, and box plots. 2. Analyze a set of data to determine its variance. 3. Create a dot plot to display a set of numerical data. 4. Create a histogram to display a set of numerical data. 5. Find the median, quartile and interquartile range of a set of data. 6. Create a box plot to display a set of numerical data. 	<p>Resources</p> <p>http://nlvm.usu.edu</p>	<p>A</p>
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Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Organize and display data in tables and graphs. 2. Report the number of observations in a data set or display. 	<p>Resources</p>	<p>A</p>
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b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Describe the data being collected, including how it was measured and its units of measurement. 	<p>Resources</p>	<p>A</p>
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c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation) and describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Calculate quantitative measures of center, e.g., mean, median, mode. 2. Calculate quantitative measures of variance, e.g., range, interquartile range, mean absolute deviation. 3. Identify outliers 4. Determine the effect of outliers on quantitative measures of a set of data, e.g., mean, median, mode, range, interquartile range, mean absolute deviation. 5. Choose the appropriate measure of central tendency to represent the data. 	<p>Resources</p>	<p>A</p>
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d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Analyze the shape of the data distribution and the context in which the data were gathered to choose the appropriate measures of central tendency and variability and justify why this measure is appropriate in terms of the context 	<p>Resources</p>	<p>A</p>
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Ratios and Proportional Relationships

• Understand ratio concepts and use ratio reasoning to solve problems.

Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.* “For every vote candidate C received nearly three votes.”

<p style="text-align: center;">Student Friendly/“I Can” statements</p> <ol style="list-style-type: none"> 1. Write ratio notation- __:__ to __, __/__ 2. Know order matters when writing a ratio 3. Know ratios can be simplified 4. Know ratios compare two quantities; the quantities do not have to be the same unit of measure 5. Recognize that ratios appear in a variety of different contexts; part-to-whole, part-to-part, and rates 6. Generalize that all ratios relate two quantities or measures within a given situation in a multiplicative relationship. 7. Analyze your context to determine which kind of ratio is represented. 	<p style="text-align: center;">Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>
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Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context. *example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar.” hamburgers, which is a rate of \$5 per hamburger.”*

<p style="text-align: center;">Student Friendly/“I Can” statements</p> <ol style="list-style-type: none"> 1. Identify and calculate a unit rate. 2. Use appropriate math terminology as related to rate. 3. Analyze the relationship between a ratio $a:b$ and a unit rate a/b where $b \neq 0$. 	<p style="text-align: center;">Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>
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Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, double number line diagrams, or equations.

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

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Make a table of equivalent ratios using whole numbers. 2. Find the missing values in a table of equivalent ratios. 3. Plot pairs of values that represent equivalent ratios on the coordinate plane. 4. Use tables to compare proportional quantities. 	<p>Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>	<p>A</p>
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b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow a lawn, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Solve real-world and mathematical problems involving ratio and rate, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. 2. Apply the concept of unit rate to solve real-world problems involving unit pricing. 3. Apply the concept of unit rate to solve real-world problems involving constant speed. 	<p>Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>	<p>A</p>
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c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Know that a percent is a ratio of a number to 100. 2. Find a % of a number as a rate per 100. 3. Solve real-world problems involving finding the whole, given a part and a percent. 	<p>Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>	<p>A</p>
<p>d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing units.</p>		
<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Apply ratio reasoning to convert measurement units in real-world and mathematical problems. 2. Apply ratio reasoning to convert measurement units by multiplying or dividing in real-world and mathematical problems. 	<p>Resources</p> <p>http://nlvm.usu.edu Study Island lesson Shodor.org Learner.org Mathgoodies <u>A Math Curse</u> by John Sueszka</p>	<p>A</p>

Geometry

• **Solve real-world and mathematical problems involving area, surface area, and volume.**

Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Student Friendly/"I Can" statements	Resources
<ol style="list-style-type: none">1. Recognize and know how to compose and decompose polygons into triangles and rectangles.2. Compare the area of a triangle to the area of the composed rectangle. (Decomposition addressed in previous grade.)3. Apply the techniques of composing and/or decomposing to find the area of triangles, special quadrilaterals and polygons to solve mathematical and real world problems.4. Discuss, develop and justify formulas for triangles and parallelograms (6th grade introduction)	<p>http://nlvm.usu.edu www.learner.org/interactives/geometry/index.html softchalkconnect.com Various polygons Dot paper Graph paper</p>

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply $V = b h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world problems.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Know how to calculate the volume of a right rectangular prism. 2. Apply volume formulas for right rectangular prisms to solve real-world and mathematical problems involving rectangular prisms with fractional edge lengths. 3. Model the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths. 	<p>Resources</p> <p>http://nlvm.usu.edu www.learner.org/interactives/geometry/index.html softchalkconnect.com Various right prisms –open to input centimeter cubes Centimeter cubes Dot paper Graph paper</p>	
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Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side of a polygon with parallel sides that share the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world problems.

<p>Student Friendly/"I Can" statements</p> <ol style="list-style-type: none"> 1. Draw polygons in the coordinate plane. 2. Use coordinates (with the same x-coordinate or the same y-coordinate) to find the length of a side of a polygon. 3. Apply the technique of using coordinates to find the length of a side of a polygon drawn in the coordinate plane to solve real-world and mathematical problems. 	<p>Resources</p> <p>http://nlvm.usu.edu www.learner.org/interactives/geometry/index.html softchalkconnect.com coordinate planes</p>	
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Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area. Apply these techniques in the context of solving real-world and mathematical problems.

Student Friendly/"I Can" statements	Resources	
<ol style="list-style-type: none">1. Know that 3-D figures can be represented by nets.2. Represent three-dimensional figures using nets made up of rectangles and triangles.3. Apply knowledge of calculating the area of rectangles and triangles to a net, and combine the areas for each shape into one answer representing the surface area of a 3-dimensional figure.4. Solve real-world and mathematical problems involving surface area using nets.	<p>http://nlvm.usu.edu www.learner.org/interactives/geometry/index.html softchalkconnect.com dot paper graph paper</p>	