| Grade 6 | Grade 7 | Grade 8 |
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| ***Standard 1 – Number Sense***<br>*Students compare and order positive and negative integers*, decimals, fractions, and mixed numbers. They find multiples* and factors*.* | ***Standard 1 - Number Sense***<br>*Students understand and use scientific notation* and square roots. They convert between fractions and decimals.* | ***Standard 1 - Number Sense***<br>*Students know the properties of rational* and irrational* numbers expressed in a variety of forms. They understand and use exponents*, powers, and roots.* |
| 6.1.1 Understand and apply the basic concept of negative numbers (e.g., on a number line, in counting, in temperature, in "owing").<br>Example: The temperature this morning was -6˚ and now it is 3˚. How much has the temperature risen? Explain your answer.<br>6.1.2 Interpret the absolute value of a number are the distance from zero on a number line, and find the absolute value of real numbers.<br>Example: Use a number line to explain the absolute values of -3 and of 7.<br>6.1.3 Compare and represent on a number line positive and negative integers, fractions, decimals (to hundredths), and mixed numbers.<br>Example: Find the positions on a number line of 3.56, -2.5, $1\frac{5}{6}$, and -4.<br>6.1.4 Convert between any two representations of numbers (fractions, decimals, and percents) without the use of a calculator.<br>Example: Write $\frac{5}{8}$ as a decimal and as a percent.<br>6.1.5 Recognize decimal equivalents for commonly used fractions without the use of a calculator.<br>Example: Know that $\frac{1}{3}$ = 0.333 …, ½ = 0.5, $\frac{2}{5}$ = 0.4, etc.<br>6.1.6 Use models to represent ratios. | 7.1.1 Read, write, compare and solve problems using whole numbers in scientific notation.<br>Example: Write 300,000 in scientific notation.<br>7.1.2 Compare and order rational* and common irrational* numbers and place them on a number line.<br>Example: Place in order: -2, $\frac{5}{8}$, -2.45, 0.9, π, -1 ¾.<br>7.1.3 Identify rational and common irrational numbers from a list.<br>Example: Name all the irrational numbers in the list: =2, $\frac{5}{8}$, -2.45, 0.9, π, -1 ¾.<br>7.1.4 Understand and compute whole number power of whole numbers.<br>Example: $3^5$ = 3 X 3 X 3 X 3 X 3 = ?<br>7.1.5 Find the prime factorization* of whole numbers and write the results using exponents.<br>Example: 24 = 2 x 2 x 2 x 3 = $2^3$ X 3.<br>7.1.6 Understand and apply the concept of square root.<br>Example: Explain how you can find the length of the hypotenuse of a right triangle with legs that measure 5 cm and 12 cm.<br>7.1.7 Convert terminating decimals* into reduced fractions.<br>Example: Write 0.95 as a fraction.<br>*scientific notation: a shorthand way of writing numbers using | 8.1.1. Read, write, compare and solve problems using decimals in scientific notation*.<br>Example: Write 0.00357 in scientific notation.<br>8.1.2 Know that every rational number is either a terminating or repeating decimal and that every irrational number is a non-repeating decimal.<br>Example: Recognize that 2.375 is a terminating decimal, 5.121212… is a repeating decimal, and that π = 3.14159265… is a non-repeating decimal. Name a rational number. Explain your reasoning.<br>8.1.3 Understand that computations with an irrational number and a rational number (other than zero) produce an irrational number.<br>Example: Tell whether the product of 7 and π is rational or irrational. Explain how you know that your answer is correct.<br>8.1.4 Understand and evaluate negative Integer* exponents.<br>Example: Write $2^{-3}$ as a fraction.<br>8.1.5 Use the laws of exponents for integer exponents.<br>Example: Write $2^2$ x $2^3$ as 2 x 2 x … and then as a single power of 2. Explain what you are doing.<br>8.1.6 Use the inverse relationship between squaring and find the square root of a perfect square integer.<br>Example: Find the value $(\sqrt{144})^2$. |

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| Example: Divide 27 pencils to represent the ratio 4:5.<br><br>6.1.7 Find the least common multiple* and the greatest common factor* of whole numbers. Use them to solve problems with fractions (e.g., to find a common denominator to add two fractions or to find the reduced form for a fraction).<br><br>Example: Find the smallest number that both 12 and 18 divide into. How does this help you add the fractions $\frac{5}{12}$ and $\frac{7}{18}$?<br><br>*positive and negative integers: …, -3, -2, -1, 0, 1, 2, 3, …<br>*multiples: e.g., multiples of 7 are 7, 14, 21, 28, etc.<br>*factors: e.g., factors of 12 are 1, 2, 3, 4, 6, 12<br>*least common multiple: e.g., least common multiple of 4 and 6 is 12<br>*greatest common factor: e.g., greatest common factor of 18 and 42 is 6 | power of ten (e.g., 300,000 = 3 x $10^5$)<br>*rational number: any number that can be written as a ratio of two integers* (e.g., ½, $\frac{5}{8}$, $\frac{23}{9}$)<br>*integers: …, -3, -2, -1, 0, 1, 2, 3 …<br>*irrational number: any number that cannot be written as a ratio of two integers (e.g., π, $\sqrt{3}$, 7π)<br>*prime factors: e.g., prime factors of 12 are 2 and 3, the two prime numbers that divide 12<br>*terminating decimals: decimals that do not continue indefinitely (e.g., 0.362, 34.1857) | 8.1.7 Calculate and find approximations of square roots.<br><br>Example: For an integer that is not a perfect square, find the two integers (one larger, one smaller) that are closest to its square root and explain your reasoning.<br><br>*rational number: any number that can be written as a ratio of two integers* (e.g., ½, $\frac{5}{8}$, $\frac{23}{9}$)<br>*integers: …, -3, -2, -1, 0, 1, 2, 3 …<br>*irrational number: any number that cannot be written as a ratio of two integers (e.g., π, $\sqrt{3}$, 7π)<br>*exponent: e.g., the exponent 4 in $3^4$ tells you to write four 3s and compute 3 x 3 x 3 x 3<br>*scientific notation: a shorthand way of writing numbers using power of ten (e.g., 300,000 = 3 x $10^5$, 0.0000005 = 5 X $10^7$) |

| ***Standard 2 – Computation***<br>*Students solve problems involving addition, subtraction, multiplication, and division of integers. They solve problems involving fractions, decimals, ratios, proportions, and percentages.* | ***Standard 2 – Computation***<br>*Students solve problems involving integers*, fractions, decimals, ratios, and percentages.* | ***Standard 2 – Computation***<br>*Students compute with rational numbers* expressed in a variety of forms. They solve problems involving ratios, proportions, and percentages.* |
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| 6.2.1 Add and subtract positive and negative integers.<br>Example: 17 ÷ -4 = ?, -8 - 5 = ?<br>6.2.2 Multiply and divide positive and negative integers.<br>Example: Continue the pattern: 3 x 2 = ?, 2 x 2 = ?, 1 x 2 = ?, 0 x 2 = ?, -1 x 2 = ?, -2 x 2 = ?, etc.<br>6.2.3 Multiply and divide decimals.<br>Example: 3.265 x 0.96 = ?, 56.79 ÷ 2.4 = ?<br>6.2.4 Explain how to multiply and divide positive fractions and perform the calculations.<br>Example: Explain why $\frac{5}{8} \div \frac{15}{16} = \frac{5}{8} \times \frac{16}{15} = \frac{2}{3}$.<br>6.2.5 Solve problems involving addition, subtraction, multiplication, and division of positive fractions and explain why a particular operation was used for a given situation.<br>Example: you want to place a towel bar 9 ¾ inches long in the center of a door 27 ½ inches wide. How far from each edge should you place the bar? Explain your method.<br>6.2.6 Interpret and use ratios to show the relative sizes of two quantities. Use the notations: a/b, a to b, a:b.<br>Example: A car moving at a constant speed travels 130 miles in 2 hours. Write the ratio of distance to time and use it to find how far the car will travel in 5 hours.<br>6.2.7 Understand proportions and use them to solve | 7.2.1 Solve addition, subtraction, multiplication, and division problem that use integers, fractions, decimals, and combinations of the four operations.<br>Example: the temperature one day is 5°. It then falls by 3° each day for 4 days and, after that, rises by 2° each day for 3 days. What is the temperature on the last day? Explain your method.<br>7.2.2 Calculate the percentage increase and decrease of a quantity.<br>Example: The population of a country was 36 million in 1990 and it rose to 41.4 million during the 1990s. What was the percentage increase in the population?<br>7.2.3 Solve problems that involve discounts, markups, and commissions.<br>Example: A merchant buys CDs for $11 wholesale and marks up the price by 35%. What is the retail price?<br>7.2.4 Use estimation to decide whether answers are reasonable in problems involving fractions and decimals.<br>Example: Your friend says that $3\frac{3}{8} \times 2\frac{2}{9} = 10$. Without solving, explain why you think the answer is wrong.<br>7.2.5 Use mental arithmetic to compute with simple fractions, decimals, and powers.<br>Example: Find $3^4$ without using pencil and paper. | 8.2.1 Add, subtract, multiply, and divide rational numbers (integers*, fractions, and terminating decimals) in multi-step problems.<br>Example: -3.4 + 2.8 X 5.75 = ?, $1\frac{4}{5} + -\frac{3}{8}$ X $2\frac{2}{9}$ = ?, 81.04 ÷ 17.4 – 2.79 = ?<br>8.2.2 Solve problems by computing simple and compound interest.<br>Example: You leave $100 in each of three bank accounts paying 5% interest per year. One account pays simple interest, one pay interest compounded annually, and the third pays interest compounded quarterly. Use a spreadsheet to find the amount of money in each account after one year, two years, three years, ten years, and twenty years. Compare the results in the three accounts and explain how compounding affects the balance in each account.<br>8.2.3 Use estimation techniques to decide whether the answers to computations on a calculator are reasonable.<br>Example: Your friend says that 15% of $25 is $375. Without solving, explain why you think the answer is wrong.<br>8.2.4 Use mental arithmetic to compute with common fractions, decimals, powers, and percents.<br>Example: Find 20% of $50 without using pencil and paper.<br>*rational number: any number that can be written as a ratio of |

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| | problems.<br><br>Example: Sam made 8 out of 24 free throws. Use a proportion to show how many free throws Sam would probably make out of 60 attempts. | *integers: …, -3, -2, -1, 0, 1, 2, 3, … | two integers* (e.g., ½, $\frac{5}{8}$, $\frac{23}{9}$)<br>*integers: …, -3, -2, -1, 0, 1, 2, 3, … |
| 6.2.8 | Calculate given percentages of quantities and solve problems involving discounts at sales, interest earned, and tips.<br><br>Example: In a sale, everything is reduced by 20%. Find the sale price of a shirt whose pre-sale price was $30. | | |
| 6.2.9 | Use estimation to decide whether answers are reasonable to decimal problems.<br><br>Example: your friends says that 56.79 ÷ 2.4 = 2.36625. Without solving, explain why you thing the answer is wrong. | | |
| 6.2.10 | Use mental arithmetic to add or subtract simple fractions and decimals.<br><br>Example: Subtract $\frac{1}{6}$ from ½ without using pencil and paper. | | |

| ***Standard 3 – Algebra and Functions*** *Students write verbal expressions and sentences as algebraic expressions and equations. They evaluate algebraic expressions, solve simple linear equations, and graph and interpret their results. They investigate geometric relationships and describe them algebraically.* | ***Standard 3 – Algebra and Functions*** *Students express quantitative relationships using algebraic terminology, expressions, equations, inequalities, and graphs.* | ***Standard 3 – Algebra and Functions*** *Students solve simple linear equations and inequalities. They interpret and evaluate expressions involving integer* powers. They graph and interpret functions. They understand the concepts of slope* and rate* |
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| 6.3.1 Write and solve one-step linear equations and inequalities in one variable and check the answers.<br><br>Example: The area of a rectangle is 143 cm² and the length is 11 cm. Write an equation to find the width of the rectangle and use it to solve the problem. Describe how you will check to be sure that your answer is correct.<br><br>6.3.2 Write and use formulas with up to three variables to solve problems.<br><br>Example: You have $P$ dollars in a bank that gives r% simple interest per year. Write a formula for the amount of interest you will receive in one year. Use the formula to find the amount of interest on $80 at 6% per year.<br><br>6.3.3 Interpret and evaluate mathematical expressions that use grouping symbols such as parentheses.<br><br>Example: Find the values of 10 – (7 – 3) and of (10 – 7) – 3.<br><br>6.3.4 Use parentheses to indicate which operation to perform first when writing expressions containing more than two terms and different operations.<br><br>Example: Write in symbols: add 19 and 34 and double the result.<br><br>6.3.5 Use variables in expressions describing geometric quantities. | 7.3.1 Use variables and appropriate operations to write an expression, a formula, an equation, or an inequality that represents a verbal description.<br><br>Example: Write in symbols the inequality: 5 less than twice the number is greater than 42.<br><br>7.3.2 Write and solve two-step linear equations and inequalities in one variable and check the answers.<br><br>Example: Solve the equation $4x - 7 = 12$ and check your answer in the original equation.<br><br>7.3.3 Use correct algebraic terminology such as variable, equation, term, coefficient*, inequality, expression, and constant.<br><br>Example: Name the variable, terms, and coefficient in the equation: $7x + 4 = 67$.<br><br>7.3.4 Evaluate numerical expressions and simplify algebraic expressions by applying the correct order of operations and the properties of rational numbers* (e.g., identify, inverse, commutative*, associative*, distributive*). Justify each step in the process.<br><br>Example: Simplify 3(4x + 5x – 1) + 2(x+3) by removing the parentheses and rearranging. Explain each step you take.<br><br>7.3.5 Solve an equation or formula with two variables for a particular variable.<br><br>Example: Solve the formula $C = 2\pi r$ for $r$. | 8.3.1 Write and solve linear equations and inequalities in one variable, interpret the solution or solutions in their context, and verify the reasonableness of the results.<br><br>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, solve it, and check that your answer is reasonable.<br><br>8.3.2 Solve systems of linear equations using the substitution method and identify approximate solutions graphically.<br><br>Example: Solve the system. $2x + 3y = 6$<br>$y = 0$<br><br>8.3.3 Interpret positive integer powers as repeated multiplication and negative integer powers as repeated division or multiplication by the multiplicative inverse.<br><br>Example: Use a spreadsheet to explore the relationship between positive and negative integer powers by making a table of values of powers of 3, from $3^{-5}$ to $3^5$.<br><br>8.3.4 Use the correct order of operations to find the values of algebraic expressions involving powers.<br><br>Example: Use a scientific calculator to find the value of $3(2x + 5)^2$ when $x = -35$.<br><br>8.3.5 Identify and graph linear functions, and identify lines |

Example: Let $l$, $w$, and $P$ be the length, width, and perimeter of a rectangle. Write a formula for the perimeter in terms of the length and width.

6.3.6 Apply the correct order of operations and the properties of real numbers (e.g., identity, inverse, commutative*, associative*, and distributive* properties) to evaluate numerical expressions. Justify each step in the process.

Example: Simplify 3(4 - 1) + 2. Explain your method.

6.3.7 Identify and graph ordered pairs in the four quadrants of the coordinate plane.

Example: Plot the points (3, -1), (-6, 2) and (9, -3). What do you notice?

6.3.8 Solve the problems involving linear functions with integer* values. Write the equation and graph the resulting ordered pairs of integers on a grid.

Example: A plant is 3 cm high the first time you measure it (on Day 0). Each day after that the plant grows by 2 cm. Write and equation connecting the height and the number of the day and draw its graph.

6.3.9 Investigate how a change in one variable relates to a change in a second variable.

Example: In the last example, what do you notice about the shape of the graph?

*commutative: the order when adding or multiplying numbers makes no difference (e.g., 5 + 3 = 3 + 5), but note that this is not true for subtraction or division
*associative: the grouping when adding or multiplying numbers make s no difference (e.g., in 5 + 3 + 2, adding 5 and 3 and then adding 2 is the same as 5 added to 3 + 2), but note that this is not true fro subtraction and division
*distributive: e.g., 3(5 + 2) = 3 X 5 + 3 x 2
*integers: …, -3, -2, -1, 0, 1, 2, 3 …

7.3.6 Define slope as vertical change per unit of horizontal change and recognize that a straight line has constant slope or rate of change.

Example: Examine a table of values and make a conjecture about whether the table represents a linear function.

7.3.7 Find the slope of a lien from its graph.

Example: Draw the graph of $y = 2x = 1$. Choose two points on the graph and divide the change in $y$-value by the change in $x$-value. Repeat this for other pairs of points on the graph. What do you notice?

7.3.8 Draw the graph of a line given the slope and one point on the line, or two points on the line.

Example: Draw the graph of the equation with slope of 3 and passing through the point with coordinates (0, -2).

7.3.9 Identify functions as linear or nonlinear and examine their characteristics in tables, graphs, and equations.

Example: A plant is growing taller according to the formula $H = 2d + 3$, where $H$ is the height after $d$ days. Draw the graph of this function and explain what the point where it meets the vertical axis represents. Is this graph linear or nonlinear?

7.3.10 Identify and describe situations with constant or varying rates of change and know that a constant rate of change describes a linear function.

Example: In the last example, how will the graph be different if the plant's speed of growth changes?

*coefficient: e.g., 7 is the coefficient in $7x$
*rational number: any number that can be written as a ratio of two integers* (e.g., $\frac{1}{2}$, $\frac{5}{6}$, $\frac{23}{9}$)
*integers: …, -3, -2, -1, 0, 1, 2, 3, …
*commutative property: the order when adding or multiplying numbers make no difference (e.g., 5 + 3 = 3 + 5), but note

with positive and negative slope.

Example: Draw the graphs of $y = 2x - 1$, $y = 3x - 1$, $y = -2x - 1$, $y = -3x - 1$. Find the slope of each graph. What do you notice?

8.3.6 Find the slope of a linear function given the equation and write the equation of a line given the slope and any point on the line.

Example: Write an equation of the line with slope 2 and $y$-intercept -4.

8.3.7 Demonstrate an understanding of rate as a measure of one quantity with respect to another quantity.

Example: A car moving at a constant speed travel 90 km in 2 hours, 135 km in 3 hours, 180 km in 4 hours, etc. Draw a graph of distance as a function of time and find the slope of the graph. Explain what the slope tells you about the movement of the car.

8.3.8 Demonstrate an understanding of the relationships among tables, equations, verbal expressions, and graphs of linear functions.

Example: Write an equation that represents the verbal description: "the perimeter of a square is four times the side length." Construct a table of values for this relationship and draw its graph.

8.3.9 Represent simple quadratic functions using verbal descriptions, tables, graphs, and formulas, and translate among these representations.

Example: Draw the graph of $y = x^2$, $y = 2x^2$, and $y = 3x^2$. Describe their similarities and differences.

8.3.10 Graph functions of the form $y = nx^2$ and $y = nx^3$ and describe the similarities and differences in the graphs.

Example: Draw the graph of $y = 2x^2$ and $y = 2x^3$. Explain which graph shows faster growth.

*integers: …, -3, -2, -1, 0, 1, 2, 3, …
*slope: between any two points on a line, the slope is the

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| | that this is not true for subtraction and division<br>*associative: the grouping when adding or multiplying numbers makes no difference (e.g., in 5 + 3 +2, adding 5 and 3 and then adding 2 is the same as 5 added to 3 + 2), but note that this is not true for subtraction or division<br>*distributive: e.g., 3(5 + 2) = 3(5) + 3(2) | change in vertical distance divided by change in horizontal distance (“rise” over “run”) |

| ***Standard 4 – Geometry***<br>*Students identify, describe, and classify the properties of plane and solid geometric shapes and the relationships between them.* | ***Standard 4 – Geometry***<br>*Students deepen their understanding of plane and solid geometric shapes by constructing shapes that meet given conditions and by identifying attributes of shapes.* | ***Standard 4 – Geometry***<br>*Students deepen their understanding of plane and solid geometric shapes by constructing shapes that meet given conditions, by identifying attributes of shapes, and by applying geometric concepts to solve problems.* |
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| 6.4.1 Identify and draw vertical*, adjacent*, complementary, and supplementary* angles and describe these angle relationships.<br><br>Example: Draw two parallel lines with another line across them. Identify all pairs of supplementary angles.<br><br>6.4.2 Use the properties of complementary, supplementary, and vertical angles to solve problems involving an unknown angle. Justify solutions.<br><br>Example: Find the size of the supplement to an angle that measures 122˚. Explain how you obtain your answer.<br><br>6.4.3 Draw quadrilaterals* and triangles from given information about them.<br><br>Example: Draw a quadrilateral with equal sides but no right angles.<br><br>6.4.4 Understand that the sum of the interior angles of any triangle is 180˚ and that the sum of the interior angles of any quadrilateral is 360˚. Use this information to solve problems.<br><br>Example: find the size of the third angle of a triangle with the angles of 73˚ and 49˚.<br><br>6.4.5 Identify and draw two-dimensional shapes that are similar*.<br><br>Example: Draw a rectangle similar to a given rectangle, but twice the size. | 7.4.1 Understand coordinate graphs and use them to plot simple shapes, find lengths and areas related to the shapes and find images under translations (slides), rotations (turns), and reflections (flips).<br><br>Example: Draw the triangle with vertices (0,0), (3,0), and (0,4). Find the lengths of the sides and the area of the triangle. Translate (slide) the triangle 2 units to the right. What are the coordinates of the triangle?<br><br>7.4.2 Understand that transformations such as slides, turns, and flips preserve the length of segments, and that figures resulting from slides, turns, and flips are congruent* to the original figures.<br><br>Example: In the last example, find the lengths of the sides and the area of the new triangle.<br><br>7.4.3 Know and understand the Pythagorean Theorem and use it to find the length of the missing side of a right triangle and the lengths of other line segments. Use direct measurement to test conjectures about triangles.<br><br>Example: Use the length and width of your classroom to calculate the distance across the room diagonally. Check by measuring.<br><br>7.4.4 Construct two-dimensional patterns (nets) for three-dimensional objects, such as right prisms*, pyramids, cylinders, and cones.<br><br>Example: Draw a rectangle and two circles that will fit together to make a cylinder. | 8.4.1 Identify and describe basic properties of geometric shapes: altitudes*, diagonals, angle bisectors, perpendicular bisectors*, central angles*, radii, diameters, and chords* of circles.<br><br>Example: Describe a central angle of a circle in words and draw a diagram.<br><br>8.4.2 Perform simple constructions such as bisectors of segments and angles, copies of segments and angles, and perpendicular segments. Describe and justify the constructions.<br><br>Example: Explain the procedures used to construct the three angle bisectors of a triangle.<br><br>8.4.3 Identify properties of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more figures intersect in a plane or in space.<br><br>Example: Find two lines in your classroom that are not parallel, yet do not meet.<br><br>8.4.4 Draw the translation (slide), rotation (turn), reflection (flip), and dilation (stretches and shrinks) of shapes.<br><br>Example: Draw a rectangle and slide it 3 inches horizontally across your page. Then rotate it clockwise 90˚ about the bottom left vertex. Draw the new rectangle in a different color.<br><br>8.4.5 Use the Pythagorean Theorem and its converse to solve problems in two and three dimensions. |

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| 6.4.6 Draw the translation (slide) and reflection (flip) of shapes.<br><br>Example: Draw a square and then slide it 3 inches horizontally across your page. Draw the new square in a different color.<br><br>6.4.7 Visualize and draw two-dimensional views of three-dimensional objects made from rectangular solids.<br><br>Example: Draw a picture of an arrangement of rectangular blocks from the top, front, and right-hand side.<br><br>*vertical angle: angles 1 and 3, or 2 and 4<br><br>*adjacent angles: angles 1 and 2 or 2 and 3, etc.<br><br>*complementary angles: two angles whose sum is 90˚<br><br>*supplementary angles: two angles who sum is 180˚ (angels 1 and 2)<br><br>*quadrilateral: a two-dimensional figure with four sides<br><br>*similar: figures that have the same shape but may not have the same size | *congruent: same shape and size<br><br>*right prism: a three dimensional shape with two congruent Ends that are polygons and all other sides are rectangles | Example: Measure the dimensions of a shoe box and calculate the length of a diagonal from the top right to the bottom left of the box. Measure with a string to evaluate your answer.<br><br>*altitude: line segment from vertex of triangle to meet The line containing the opposite side in a right angle (altitude is $\overline{BD}$ in $\Delta ABC$)<br><br>*perpendicular bisector: line (or ray or line segment)<br><br>at right angles to given line segment and dividing it in half ($\overleftrightarrow{CD}$ is the perpendicular bisector of $\overline{AB}$)<br><br>*central angle: angle formed by joining two points on a circle to the center ($\angle$AOB is a central angle)ing<br>*chord: line segment joining two points on a circle ($\overline{CD}$ is a chord) |

| ***Standard 5 – Measurement***<br>*Students deepen their understanding of the measurement of plane and solid shapes and use this understanding to solve problems. They calculate with temperature and money, and choose appropriate units of measure in other areas.* | ***Standard 5 – Measurement***<br>*Students compare units of measure and use similarity* to solve problems. They compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less regular objects.* | ***Standard 5 – Measurement***<br>*Students convert between units of measure and use rates and scale factors to solve problems. They compute the perimeter, area, and volume of geometric objects. They investigate how perimeter, area, and volume are affected by changes of scale.* |
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| 6.5.1 Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.<br><br>Example: A triangular sheet of metal is about 1 foot across. Describe the units and tools you would use to measure its weight, its angles, and the length of its sides.<br><br>6.5.2 Understand and use larger units for measuring length by comparing miles to yards and kilometers to meters.<br><br>Example: How many meters are in a kilometer?<br><br>6.5.3 Understand and use larger units for measuring area by comparing acres and square miles to square yards and square kilometers to square meters.<br><br>Example: How many square meters are in a square kilometer?<br><br>6.5.4 Understand the concept of the constant $\pi$ as the ratio of the circumference to the diameter of a circle. Develop and use the formulas for the circumference and area of a circle.<br><br>Example: Measure the diameter and circumference of several circular objects. (Use string to find the circumference.) With a calculator, divide each circumference by its diameter. What do you notice about the results?<br><br>6.5.5 Know common estimates of $\pi$ (3.14, $\frac{22}{7}$) and use | 7.5.1 Compare lengths, areas, volumes, weights, capacities, times, and temperatures within measurement systems.<br><br>Example: The area of the school field is 3 acres. How many square yards is that? Explain your method.<br><br>7.5.2 Use experimentation and modeling to visualize similarity problems. Solve problems using similarity.<br><br>Example: At a certain time, the shadow of your school building is 36 feet long. At the same time, the shadow of a yardstick held vertically is 4 feet long. How high is the school building?<br><br>7.5.3 Read and create drawings made to scale, construct scale models, and solve problems related to scale.<br><br>Example: On a plan of your school, your classroom is 5 cm long and 3 cm wide. The actual classroom is 10 m long. How wide is it? Explain your answer.<br><br>7.5.4 Use formulas for finding the perimeter and area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms*, trapezoids*, triangles, circles, right prisms*, and cylinders.<br><br>Example: Find the surface area of a cylindrical can 15 cm high and with a diameter of 8 cm.<br><br>7.5.5 Estimate and compute the area of more complex | 8.5.1 Convert common measurements for length, area, volume, weight, capacity, and time to equivalent measurements within the same system.<br><br>Example: The area of a hall is 40 square yards. What is the area in square feet?<br><br>8.5.2 Solve simple problems involving rates and derived measurements for such attributes as velocity and density.<br><br>Example: A car travels at 60 mph for 20 minutes. How far does it travel? What units are appropriate for distance? Explain your answer.<br><br>8.5.3 Solve problems involving scale factors, area, and volume using ratio and proportion.<br><br>Example: Calculate the volume and surface area of cubes with side 1 cm, 2 cm, 3 cm, etc. Make a table of your results and describe any patterns in the table.<br><br>8.5.4 Use formulas for find the perimeter and area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms*, trapezoids*, triangles, circles, prisms*, cylinders, spheres, cones, and pyramids.<br><br>Example: Find the total surface area of a right triangular prism 14 feet high and with a base that measures 8 feet by 6 feet. |

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| these values to estimate and calculate the circumference and the area of circles. Compare with actual measurements.<br><br>Example: Find the area of a circle of radius 15 cm.<br><br>6.5.6 Understand the concept of significant figures and round answers to an appropriate number of significant figures.<br><br>Example: You measure the diameter of a circle as 2.47 m and use the approximation 3.14 for $\pi$ to calculate the circumference. Is it reasonable to give 7.7558 m as your answer? Why or why not?<br><br>6.5.7 Construct a cube and rectangular box from two-dimensional patterns and use these patterns to compute the surface area of these objects.<br><br>Example: Find the total surface area of a shoe box with length 30 cm, width 15 cm, and height 10 cm.<br><br>6.5.8 Use strategies to find the surface area and volume of right prisms* and cylinders using appropriate units.<br><br>Example: Find the volume of a cylindrical can 15 cm high and with a diameter of 8 cm.<br><br>6.5.9 Use a formula to convert temperatures between Celsius and Fahrenheit.<br><br>Example: What is the Celsius equivalent of 100˚F? Explain your method.<br><br>6.5.10 Add, subtract, multiply, and divide with money in decimal notation.<br><br>Example: Share $7.25 among five people.<br><br>*right prism: a three-dimensional shape with two congruent ends<br><br>that are polygons and all other faces are rectangles | irregular two-dimensional shapes by dividing them into more basic shapes.<br><br>Example: A room to be carpeted is a rectangle 5 m by 4 m. A semicircular fireplace of diameter 1.5 m takes up some of the floor space. Find the area to be carpeted.<br><br>7.5.6 Use objects and geometry modeling tools to compute the surface area of the faces and the volume of a three-dimensional object built from rectangular solids.<br><br>Example: Build a model of an apartment building with blocks. Find its volume and total surface area.<br><br>*similarity: figures that have the same shape but may not have the same size<br><br>*parallelogram: a four-sided figure with both pairs of opposite sides parallel<br><br>*trapezoid: a four-sided figure with one pair of opposite sides parallel<br><br>*right prism: a three-dimensional shape with two congruent ends that<br>are polygons and all other sides are rectangles. | 8.5.5 Estimate and compute the area and volume of irregular two- and three-dimensional shapes by breaking the shapes down into more basic geometric objects.<br><br>Example: Find the volume of a dog house that has a rectangular space that is 3 ft by 2 ft by 5 ft and has a triangular roof that is 1.5 ft higher than the walls of the house.<br><br>*parallelogram: a four-sided figure with both pairs of opposite sides parallel<br><br>*trapezoid: a four-sided figure with one pair of opposite sides parallel<br><br>*prism: solid shape with fixed cross-section (right prism is a solid shape<br>with two parallel faces that are polygons and other faces that are<br>rectangles. |

| ***Standard 6 – Data Analysis and Probability*** | ***Standard 6 – Data Analysis and Probability*** | ***Standard 6 – Data Analysis and Probability*** |
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| *Students compute and analyze statistical measures for data sets. They determine theoretical and experimental probabilities and use them to make predictions about events.* | *Students collect, organize, and represent data sets and identify relationships among variables within a data set. They determine probabilities and use them to make predictions about events.* | *Students collect, organize, represent, and interpret relationships in data sets that have one or more variables. They determine probabilities and use them to make predictions about events.* |
| 6.6.1 Organize and display single-variable data in appropriate graphs and stem-and-leaf plots*, and explain which types of graphs are appropriate for various data sets.<br><br>6.6.2 Make frequency tables for numerical data, grouping the data in different ways to investigate how different groupings describe the data. Understand and find relative and cumulative frequency for a data set. Use histograms of the data and of the relative frequency distribution, and a broken line graph for cumulative frequency, to interpret the data.<br><br>Example: A bag contains pens in three colors. Nine students each draw a pen from the bag without looking, then record the results in the frequency table shown. Complete the column showing relative frequency.<br><br>6.6.3 Compare the mean*, median*, and mode* for a set of data and explain which measure is most appropriate in a given context.<br><br>6.6.4 Show all possible outcomes for compound events in an organized way and find the theoretical probability of each outcome.<br><br>Example: A box contains four cards with the numbers 1 through 4 written on them. Show a list of all the possible outcomes if you draw two cards from the box without looking. What is the theoretical probability that you will draw the numbers one and two? Explain your answer.<br><br>6.6.5 Use data to estimate the probability of future events.<br><br>Example: Teams A and B have played each other 3 | 7.6.1 Analyze, interpret, and display data in appropriate bar, line, and circle graphs and stem-and-leaf plots*, and justify the choice of display.<br><br>Example: You survey the students in your school to find which of three designs for a magazine cover they prefer. To display the results, which would be more appropriate: a bar chart or a circle graph? Explain your answer.<br><br>7.6.2 Make predictions from statistical data.<br><br>Example: Record the temperature and weather conditions (sunny, cloudy, or rainy) at 1 p.m. each day for two weeks. In the third week, use your results to predict the temperature from the weather conditions.<br><br>7.6.3 Describe how additional data, particularly outliers, added to a data set may affect the mean*, median*, and mode*.<br><br>Example: You measure the heights of the students in your grade on a day when the basketball team is playing an away game. Later you measure the players on the team and include them in your data. What kind of effect will including the team have on the mean, median, and mode? Explain your answer.<br><br>7.6.4 Analyze data displays, including ways that they can be misleading. Analyze ways in which the wording of questions can influence survey results.<br><br>Example: On a bar graph of a company's sales, it appears that sales have more than doubled since last year. Then you notice that the vertical axis starts at $5 million and can see that sales have in fact | 8.6.1 Identify claims based on statistical data and, in simple cases, evaluate the reasonableness of the claims. Design a study to investigate the claim.<br><br>Example: A study shows that teenagers who use a certain brand of toothpaste have fewer cavities than those using other brands. Describe how you can test this claim in your school.<br><br>8.6.2 Identify different methods of selecting samples, analyzing the strengths and weaknesses of each method, and the possible bias in a sample or display.<br><br>Example: Describe possible bias in the following survey: A local television station has a daily call-in poll. Viewers of the morning and noon newscasts are asked to call one telephone number to answer "yes" and a different telephone number to answer "no." The results are reported on the six-o'clock newscast.<br><br>8.6.3 Understand the meaning of, and be able to identify or compute the minimum value, the lower quartile*, the median*, the upper quartile*, the interquartile range, and the maximum value of a data set.<br><br>Example: Arrange a set of test scores in increasing order and find the lowest and highest scores, the median, and the upper and lower quartiles.<br><br>8.6.4 Analyze, interpret, and display single- and two-variable data in appropriate bar, line and circle graphs, stem-and-leaf plots* and box-and-whisker plots*, and explain which types of display are appropriate for various data sets.<br><br>8.6.5 Represent two-variable data with a scatterplot* on the |

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| times this season and Team A has won twice. When they play again, what is the probability of Team B winning? How accurate do you think this estimate is?<br><br>6.6.6 Understand and represent probabilities as ratios, measures of relative frequency, decimals between 00 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable.<br><br>Example: the weather forecast says that the chance of rain today is 30%. Should you carry an umbrella? Explain your answer.<br><br>*stem-and-leaf plot: see diagram in the first example<br>*mean: the average obtained by adding the values and dividing by the number of values<br>*median: the value that divides a set of data (written in order of size) into two equal parts<br>*mode: the most common value in a set of data | increased from $5.5 million to $6.2 million.<br><br>7.6.5 Know that if $P$ is the probability of an event occurring, then 1 – $P$ is the probability of that event not occurring.<br><br>Example: The weather forecast says that the probability of rain today is 0.3. What is the probability that it won't rain?<br><br>7.6.6 Understand that the probability of either one or the other of two disjoint events* occurring is the sum of the two individual probabilities.<br><br>Example: Find the probability of rolling 9 with two number cubes. Also find the probability of rolling 10. What is the probability of rolling 9 or 10?<br><br>7.6.7 Find the number of possible arrangements of several objects using a tree diagram.<br><br>Example: A state's license plates contain 6 digits and one letter. How many different plates can be made if the letter must always be in the third position and the first digit cannot be zero?<br><br>*stem-and-leaf plot: e.g., this one shows 62, 63, 67, 71, 75, 75, 76, etc.<br><br>*mean: the average obtained by adding the values and dividing by the number of values<br><br>*median: the value that divides a set of data written in order of size into two equal parts<br><br>*mode: the most common value<br><br>*disjoint events: events that cannot happen at the same time | coordinate plane and describe how the data points are distributed. If the pattern appears to be linear, draw a line that appears to best fit the data, and write the equation of that line.<br><br>Example: Survey some of the students at each grade level in your school, asking them how much time they spend on homework. Plot the grade level and time of each student as a point (grade, time) on a scatter diagram. Describe and justify any relationship between grade and time spent on homework.<br><br>8.6.6 Understand and recognize equally likely events.<br><br>Example: When you roll a number cube, what is the probability that the number on the top face will be a 6? Explain your answer.<br><br>8.6.7 Find the number of possible arrangements of several objects by using the Basic Counting Principle.<br><br>Example: You are planning to place four pictures in a line on a shelf. Find the number of ways you can arrange the four pictures.<br><br>*lower quartile: the value that separates the lowest one-fourth of the values from the rest of the values<br>*median: the value that divides a set of data written in order of size into two equal parts<br>*upper quartile: the value that separates the highest one-fourth of the values from the rest of the values<br>*stem-and-leaf plot:<br><br>*box-and-whisker plot: diagram showing median, quartiles, and range (see diagram on previous page)<br>*scatterplot: a coordinate graph showing ordered pairs of data |

| *Standard 7 – Problem Solving* | *Standard 7 – Problem Solving* | *Standard 7 – Problem Solving* |
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| **Students make decisions about how to approach problems and communicate their ideas.**<br><br>6.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.<br><br>Example: Solve the problem: "Develop a method for finding all the prime numbers up to 100." Notice that any numbers that 4, 6, 8, … divide into also divide exactly by 2, and so you do not need to test 4, 6, 8, …<br><br>6.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.<br><br>Example: In the first example, decide that you need to test only the prime numbers as divisors, and explain it in the same way as for 4, 6, 8, ….<br><br>6.7.3 Decide when and how to break a problem into simpler parts.<br><br>Example: In the first example, decide to find first those numbers not divisible by 2. | **Students make decisions about how to approach problems and communicate their ideas.**<br><br>7.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.<br><br>7.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.<br><br>Example: In the first example, notice that three dots make and equilateral triangle for the number 3 and six dots make the next equilateral triangle.<br><br>7.7.3 Decide when and how to divide a problem into simpler parts.<br><br>Example: In the first example, decide to make a diagram for the fourth and fifth triangular numbers. | **Students make decisions about how to approach problems and communicate their ideas.**<br><br>8.7.1 Analyze problems by identifying relationships, telling relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.<br><br>Example: Solve the problem: "For computers, binary numbers are great because they are simple to work with and they use just two values of voltage, magnetism, or other signal. This makes hardware easier to design and more noise resistant. Binary numbers let you represent any amount you want using just two digits: 0 and 1. The number you get when you count ten objects is written 1010. In expanded notation, this is $1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$. Write the number for thirteen in the binary (base2) system. Decide to make and organized list.<br><br>8.7.2 Make and justify mathematical conjectures based on a general description of a mathematical question or problem.<br><br>Example: In the first example, if you have only two symbols, 0 and 1, the one object: 1, two objects: 10, three objects: 11, four objects: 100. Predict the symbol for five objects.<br><br>8.7.3 Decide when and how to divide a problem into simpler parts.<br><br>Example: In the first example, write expanded notation for the number five in base 2; begin with the fact that 5 = 4 + 1. |

| **Students use strategies, skills, and concepts in finding and communicating solutions to problems.** | **Students use strategies, skills, and concepts in finding and communicating solutions to problems.** | **Students use strategies, skills, and concepts in finding and communicating solutions to problems.** |
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| 6.7.4 Apply strategies and results from simpler problems to solve more complex problems.<br><br>Example: In the first example, begin by finding all the prime numbers up to 10. | 7.7.4 Apply strategies and results from simpler problems to solve more complex problems.<br><br>Example: In the first example, list the differences between any two triangular numbers. | 8.7.4 Apply strategies and results from simpler problems to solve more complex problems.<br><br>Example: In the first example, write the first five numbers in base 2 notation and look for a pattern. |
| 6.7.5 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.<br><br>Example: In the first example, use a hundreds chart to cross off all multiples of 2 (except 2), then all multiples of 3 (except 3), then all multiples of 5 (except 5), etc. Explain why you are doing this. | 7.7.5 Make and test conjectures by using inductive reasoning.<br><br>Example: In the first example, predict the difference between the fifth and sixth numbers and use this to predict the sixth triangular number. Make a diagram to test your conjecture. | 8.7.5 Make and test conjectures by using inductive reasoning.<br><br>Example: In the first example, predict the base 2 notation for six objects, then use expanded notation to test your prediction. |
| 6.7.6 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.<br><br>Example: Calculate the perimeter of a rectangular field that needs to be fenced. How accurate should you be: to the nearest kilometer, meter, centimeter, or millimeter? Explain your answer. | 7.7.6 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.<br><br>Example: In the first example, use words, numbers, and tables to summarize your work with triangular numbers. | 8.7.6 Express solutions clearly and logically by using the appropriate mathematical terms and notation. Support solutions with evidence in both verbal and symbolic work.<br><br>Example: In the first example, explain how you will find the base two notation for thirteen objects. |
| 6.7.7 Select and apply appropriate methods for estimating results of rational-number computations.<br><br>Example: Measure the length and height of the walls of a room to find the total area. Estimate an answer by imagining meter squares covering the walls. | 7.7.7 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.<br><br>Example: Calculate the amount of aluminum needed to make a can with diameter 10 cm that is 15 cm high and 1 mm thick. Take $\pi$ as 3.14 and give your answer to appropriate accuracy. | 8.7.7 Recognize the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.<br><br>Example: Measure the length and width of a basketball court. Use the Pythagorean Theorem to calculate the length of a diagonal. How accurately should you give your answer? |
| 6.7.8 Use graphing to estimate solutions and check the estimates with analytic approaches.<br><br>Example: use a graphing calculator to estimate the coordinates of the point where the straight line $y = 8x - 3$ crosses the $x$-axis. Confirm your answer by checking it in the equation. | 7.7.8 Select and apply appropriate methods for estimating results of rational-number computations.<br><br>Example: Measure the dimensions of a swimming pool to find its volume. Estimate an answer by working with an average depth. | 8.7.8 Select and apply appropriate methods for estimating results of rational-number computations.<br><br>Example: Use a calculator to find the cube of 15. Check your answer by finding the cubes of 10 and 20. |
| 6.7.9 Make precise calculations and check the validity of | 7.7.9 Use graphing to estimate solutions and check the estimates with analytic approaches. | 8.7.9 Use graphing to estimate solutions and check the estimates with analytic approaches.<br><br>Example: Use a graphing calculator to draw the straight line $x + y = 10$. Use this to estimate solutions of the inequality $x + y > 10$ by testing points on each |

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| the results in the context of the problem.<br><br>Example: In the first example, check whether some of the numbers not crossed out are in fact primes. | Example: Use a graphing calculator to find the crossing point of the straight lines $y = 2x + 3$ and $x + y = 10$. Confirm your answer by checking it in the equations.<br><br>7.7.10 Make precise calculations and check the validity of the results in the context of the problem.<br><br>Example: In the first example, check that your later results fit with your earlier ones. If they do not, repeat the calculations to make sure. | side of the line.<br><br>8.7.10 Make precise calculations and check the validity of the results in the context of the problem.<br><br>Example: In the first example, list the first thirteen numbers in base 2 notation. Use patterns or expanded notation to confirm your list. |
| **Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.**<br><br>6.7.10 Decide whether a solution is reasonable in the context of the original situation.<br><br>Example: In the first example, decide whether your method was a good one – did it find all the prime numbers efficiently?<br><br>6.7.11 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems<br><br>Example: Use a hundreds chart to find all the numbers that are multiples of both 2 and 3. | **Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.**<br><br>7.7.11 Decide whether a solution is reasonable in the context of the original situation.<br><br>Example: In the first example, calculate the $10^{th}$ triangular number and draw the triangle of dots that goes with it.<br><br>7.7.12 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.<br><br>Example: Use your method from the first example to investigate pentagonal numbers. | **Students determine when a solution is complete and reasonable and move beyond a particular problem by generalizing to other situations.**<br><br>8.7.10 Decide whether a solution is reasonable in the context of the original situation.<br><br>Example: In the basketball court example, does the accuracy of your answer depend on your initial measuring?<br><br>8.7.11 Note the method of finding the solution and show a conceptual understanding of the method by solving similar problems.<br><br>Example: In the first example, use your list of base 2 numbers to add numbers in base 2. Explain exactly how your addition process works. |