GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Know That There Are Numbers That Are Not Rational, And Approximate Them By Rational Numbers.*			
DOMAIN	*The Number System*			
8.NS.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.		• Define irrational numbers	•	• Show that the decimal expansion of rational numbers repeats eventually • Convert a decimal expansion which repeats eventually into a rational number • Show informally that every number has a decimal expansion
8.NS.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.			• Compare the size of irrational numbers using rational approximations	• Estimate the value of expressions involving irrational numbers using rational approximations • Approximate irrational numbers as rational numbers • Approximately locate irrational numbers on a number line

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Work With Radicals And Integer Exponents.*			
DOMAIN	*Expressions And Equations*			
8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 × 3–5 = 3–3 = 1/33 = 1/27.		• Explain the properties of integer exponents to generate equivalent numerical expressions	• Apply the properties of integer exponents to produce equivalent numerical expressions	•
8.EE.2: Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.		• Know that the square root of 2 is irrational	• Evaluate square roots of small perfect squares • Evaluate cube roots of small perfect cubes	• Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number
8.EE.3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.		• Express numbers as a single digit times an integer power of 10	• Compare quantities to express how much larger one is compared to the other	• Use scientific notation to estimate very large and/or very small quantities
8.EE.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.			• Interpret scientific notation that has been generated by • technology	• Choose appropriate units of measure when using scientific notation • Use scientific notation to express very large and very small quantities • Perform operations using numbers expressed in scientific notations
8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.			• Compare two different proportional relationships represented in different ways • Interpret the unit rate of proportional relationships as the slope of the graph	• Graph proportional relationships

GRADE EIGHT			
MATHEMATICS	KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS	*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Understand The Connections Between Proportional Relationships, Lines, And Linear Equations.*		
DOMAIN	*Expressions And Equations*		
8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.	• Identify characteristics of similar triangles	• Analyze patterns for points on a line that passes through the origin • Analyze patterns for points on a line that do not pass through or include the origin	• Derive an equation of the form y = mx for a line through the origin • Derive an equation of the form y=mx + b for a line intercepting the vertical axis at b (the y-intercept) • Determine the y-intercept of a line • Find the slope of a line • Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane
8.EE.7: Solve linear equations in one variable.	• Identify examples of linear equations in one variable with one solution • Identify examples of linear equations in one variable with infinitely many solutions • Identify examples of linear equations in one variable with no solution	•	• Solve linear equations with rational number coefficients • Solve equations whose solutions require expanding expressions using the distributive property and/or collecting like terms • Show how to transform given equations into simpler forms, until the result is an equivalent equation of the form x=a, a=a, or a=b
8.EE.8: Analyze and solve pairs of simultaneous linear equations.	• Identify the solution(s) to a system of two linear equations in two variables as the point(s) of intersection of their graphs • Identify cases in which a system of two equations with two unknowns has no solution • Identify cases in which a system of two equations with two unknowns has an infinite number of solutions • Describe the point(s) of intersection between two lines as point(s) that satisfy both equations simultaneously	• Estimate the point(s) of intersection for a system of two equations with two unknowns by graphing the equations	• Solve a system of two equations (linear) with two unknowns algebraically • Solve simple cases of systems of two linear equations with two variables by inspection • Estimate the point(s) of intersection for a system of two equations with two unknowns by graphing the equations • Solve a system of two equations (linear) with two unknowns algebraically • Solve simple cases of systems of two linear equations with two variables by inspection • Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. • Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. • Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Define, Evaluate, And Compare Functions.*			
DOMAIN	*Functions*			
8.F.1: Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.1		• Identify cases in which a system of two equations with two unknowns has no solution • Identify cases in which a system of two equations with two	• Estimate the point(s) of intersection for a system of two equations with two unknowns by graphing the equations unknowns has an infinite number of solutions	• Solve a system of two equations (linear) with two unknowns algebraically • Solve simple cases of systems of two linear equations with two variables by inspection
8.F.2: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.		• Identify functions algebraically including slope and y-intercept • Identify functions using graphs, tables, and verbal descriptions	• Compare and contrast 2 functions with different representations • Draw conclusions based on different representations of functions	•
8.F.3: Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.		• Recognize that a linear function is graphed as a straight line • Recognize the equation y = mx + b is the equation of a function whose graph is a straight line where m is the slope and b is the y-intercept	• Compare the characteristics of linear and nonlinear functions • using various representations	• Provide examples of nonlinear functions using multiple representations

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Use Functions To Model Relationships Between Quantities.*			
DOMAIN	*Functions*			
8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.		• Recognize that slope is determined by the constant rate of change • Recognize that the y-intercept is the initial value where x=0 • Determine the rate of change from two (x, y) values, a verbal description, values in a table, or graph • Determine the initial value from two (x, y) values, a verbal description, values in a table, or graph		• Construct a function to model a linear relationship between two quantities • Relate the rate of change and initial value to real-world quantities in a linear function in terms of the situation modeled and in terms of its graph or a table of values
8.F.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.		• Analyze a graph and describe the functional relationship between two quantities using the qualities of the graph	• Interpret the relationship between x and y values by analyzing a graph	• Sketch a graph, given a verbal description of its qualitative features

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Understand Congruence And Similarity Using Physical Models, Trans- Parencies, Or Geometry Software.*			
DOMAIN	*Geometry*			
8.G.1: Verify experimentally the properties of rotations, reflections, and translations:		Define and identify rotations, reflections, and translations Identify corresponding sides and corresponding angles Identify center of rotation Identify direction and degree of rotation Identify line of reflection Understand prime notation to describe an image after a translation, reflection, or rotation		• Use physical models, transparencies, or geometry software to verify the properties of rotations, reflections, and translations • Lines are taken to lines, and line segments to line segments of the same length. • Angles are taken to angles of the same measure. • Parallel lines are taken to parallel lines.
8.G.2: Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.		Define congruency Identify symbols for congruency Describe the sequence of rotations, reflections, translations that exhibits the congruence between 2-D figures using words	• Apply the concept of congruency to write congruent statements • Reason that a 2-D figure is congruent to another if the second can be obtained by a sequence of rotations, reflections, translations	
8.G.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.		•	• Define dilations as a reduction or enlargement of a figure • Identify scale factor of the dilation • Describe the effects of dilations, translations, rotations, and reflections on 2-D figures using coordinates	•

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Understand Congruence And Similarity Using Physical Models, Trans- Parencies, Or Geometry Software.*			
DOMAIN	*Geometry*			
8.G.4: Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two- dimensional figures, describe a sequence that exhibits the similarity between them		• Define similar figures as corresponding angles are congruent and corresponding sides are proportional • Recognize symbol for similar • Describe the sequence of rotations, reflections, translations, or dilations that exhibits the similarity between 2-D figures using words and/or symbols	• Apply the concept of similarity to write similarity statements • Reason that a 2-D figure is similar to another if the second can • be obtained by a sequence of rotations, reflections, translations, or dilation	
8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.		• Define similar triangles • Define and identify transversals • Identify angles created when a parallel line is cut by a transversal (alternate interior, alternate exterior, corresponding, vertical, adjacent, etc.)	• Justify that the sum of interior angles equals 180 • Justify that the exterior angle of a triangle is equal to the sum of the two remote interior angles	• Use Angle-Angle Criterion to prove similarity among triangles (Give an argument in terms of transversals, why this is so)

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Understand And Apply The Pythagorean Theorem.*			
DOMAIN	*Geometry*			
8.G.6: Explain a proof of the Pythagorean Theorem and its converse.		• Define key vocabulary: square root, Pythagorean Theorem, right triangle, legs a & b, hypotenuse, sides, right angle, converse, base, height, proof • Identify the legs and hypotenuse of a right triangle • Explain a proof of the Pythagorean Theorem		
8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.		• Recall the Pythagorean Theorem and its converse	• Apply Pythagorean Theorem in solving real-world problems dealing with two- and three-dimensional shapes	• Solve basic mathematical Pythagorean Theorem problems and its converse to find missing lengths of sides of triangles in two and three dimensions
8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.		• Recall the Pythagorean Theorem and its converse	• Determine how to create a right triangle from two points on a coordinate graph	• Use the Pythagorean Theorem to solve for the distance between the two points
8.G.9: Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.		• Identify and define vocabulary: cone, cylinder, sphere, radius, diameter, circumference, area, volume, pi, base, height • Know formulas for volume of cones, cylinders, and spheres	• Compare the volumes of cones, cylinders, and spheres • Determine and apply appropriate volume formulas in order to solve mathematical and real-world problems for the given shape	• Given the volume of a cone, cylinder, or sphere, find the radii,height, or approximate using Π

GRADE EIGHT				
MATHEMATICS		KNOW	UNDERSTAND	DO
COMMON CORE STANDARDS		*(Factual)*	*(Conceptual)*	*(Procedural, Application, Extended Thinking)*
CLUSTER	*Investigate Patterns Of Association In Bivariate Data.*			
DOMAIN	*Statistics And Probability*			
6.SP.1: Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.		• Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association	• Interpret scatter plots for bivariate (two different variables such as distance and time) measurement data to investigate patterns of association between two quantities	• Construct scatter plots for bivariate measurement data
6.SP.2: Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.		• Know straight lines are used to model relationships between two quantitative variables	• Informally assess the model fit by judging the closeness of the data points to the line	• Formulate a straight line within scatter plot data
6.SP.3: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.		•	• Interpret the meaning of slope and intercept of a linear equation in terms of the situation	• Solve problems using the equation of a linear model • Find the slope and intercept of a linear equation
6.SP.4: Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?		• Recognize patterns shown in comparison of two sets of data • Know how to construct a two-way table	• Interpret the data in the two-way table to recognize patterns	• Use relative frequencies of the data to describe relationships (positive, negative, or no correlation)