URBANDALE COMMUNITY SCHOOL DISTRICT

Course Title:	**Eighth Grade Math**

Description: In eighth grade we focus on the following main learning topics:

- Understand of real numbers, both rational and irrational
- Solve of multi-step equations, to include systems of equations
- Graph and write equations in two variables
- Geometric concepts to include Pythagorean Theorem, Transformations in the Coordinate Plane, and Volume of 3-dimensional figures
- Statistical correlations between data sets

Number and Quantity

Reporting Topic	Grade Level Standards	Competency Statement
Rational and Irrational Numbers	• 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. (8.NS.A.1) • 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 $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. (8.NS.A.2)	Students will identify and estimate irrational numbers, as well as, convert decimals to rational numbers.
	• Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 x 3 - 5 = 3 - 3 = 1/33 = 1/27 (8.EE.A.1) • Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. (8.EE.A.2) • 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	Students will perform operations with radicals, integer exponents, and scientific notation.

Exponents and Roots	one is than the other. (8.EE.A.3) • 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. (8.EE.A.4)	

Operations and Algebra

Reporting Topic	Grade Level Standards	Competency Statement
Solving Equations	• Solve linear equations in one variable. (8.EE.C.7)	Students will solve equations with rational coefficients with one, many, infinite, or no solutions.
Slope	• Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. (8.EE.B.5) • 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. (8.EE.B.6)	Students will understand the connections between proportional relationships, lines, and linear equations.
Systems of Equations	• Analyze and solve pairs of simultaneous linear equations. (8.EE.C.8)	Students will solve systems of equations by graphing and substitution.

Functions

Reporting Topic	Grade Level Standards	Competency Statement
	• 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	Students will define, evaluate, and compare functions.

Functions	corresponding output. (8.F.A.1) • Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (8.F.A.2) • 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. (8.F.A.3)	
Interpret Functions	• 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. (8.F.B.4) • 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. (8.F.B.6)	Students will use functions to model relationships between quantities
	Geometry	
Reporting Topic	**Grade Level Standards**	
Volume	• Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (8.G.C.9)	Students will apply the volume formula to solve problems.
Angles	• 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. (8.G.A.5)	Students will investigate and identify relationships between angles and lines of triangles.
Pythagorean Theorem	• Explain a proof of the Pythagorean Theorem and its converse. (8.G.B.6) • Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real–world and mathematical problems in two and three dimensions. (8.G.B.7) • Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.G.B.8)	Students will understand and apply the Pythagorean Theorem
	• 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	Students will understand congruence and similarity using models and graphs.

Transformations	between them. (8.G.A.2) • 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. (8.G.A.4) • Verify experimentally the properties of rotations, reflections, and translations. (8.G.A.1) • Describe the effect of dilations, translations, rotations, and reflections on two–dimensional figures using coordinates. (8.G.A.3)	

Measurement, Data, Statistics, and Probability

Reporting Topics	Grade Level Standards	Competency Statement
Multivariable Data Distributions	• 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. (8.SP.A.1) • 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. (8.SP.A.2) • Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. (8.SP.A.3) • 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. (8.SP.A.4)	Students will investigate patterns of association in bivariate data.