School District of Marshfield Course Syllabus

Course Name: Grade 8 Mathematics
Length of Course: 1 Year
Credit: 1

Program Goal(s):

The School District of Marshfield Mathematics Program will prepare students for college and career in the 21st century by ensuring ***all*** students learn based on skills and knowledge needed to succeed in post-secondary education/training, career, and life. The 4K through High School Mathematics curriculum is designed to support every student in achieving success. Students will be placed in to the driver's seat. Innovative educators will tailor instruction to student need through engaging learning activities and relevant assessment.

Course Description:

Grade 8 math focuses on three critical areas: formulating and reasoning about expressions and equations, grasping the concept of a function and using functions to describe quantitative relationships, and analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence. Students will understand and apply the Pythagorean Theorem.

Standards:	
Wisconsin Standards for Mathematical Practices	
MP: 1, 2, 3, 4, 5, 6, 7, 8	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.
Wisconsin Standards for Mathematics – Grade 8	
The Number System (8.NS)	
Know that there are numbers that are not rational, and approximate them by rational numbers. 8.NS: 1, 2	1. Know that numbers are 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. Convert a decimal expansion which repeats eventually into a rational number. 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.
Expressions and Equations (8.EE)	
Work with radicals and integer exponents. 8.EE: 1, 2, 3, 4	**Expressions and Equations** 1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. 2. 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. 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 US as 3 x 10^6 and the population of the world as 7 x 10^9, and determine that the world population is more than 20 times larger. 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.
Understand the connections between proportional relationships, lines, and linear equations.	5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE: 5, 6	For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. 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.
Analyze and solve linear equations and pairs of simultaneous linear equations. 8.EE: 7a, 7b, 8a, 8b, 8c	7. Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x =a, a = a, or a = b results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. 8. Analyze and solve pairs of simultaneous linear equations. a. 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. b. 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. c. Solve real-world and mathematical problems leading to two liner equations tin 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.
Functions (8.F)	
Define, evaluate, and compare functions. 8.F: 1, 2, 3	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. 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 functions represented by a table of values and linear function represented by an algebraic expression, determine which function has the greater rate of change.

	3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of junctions that are not linear. For example, the function A = s^2 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.
Use functions to model relationships between quantities. 8.F: 4, 5	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 table of values. 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.
Geometry (8.G)	
Understand congruence and similarity using physical models, transparencies, or geometry software. 8.G: 1a, 1b, 1c, 2, 3, 4, 5	**Geometry** 1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. 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. 3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 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. 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.
Understand and apply the Pythagorean Theorem.	6. Explain a proof of the Pythagorean Theorem and its converse.

8.G: 6, 7, 8	7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. 8.G: 9	9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Statistics and Probability (8.SP)	
Investigate patterns of association in bivariate data. 8.SP: 1, 2, 3, 4	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. 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. 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. 4. Understand that patterns of associations 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?

Key Vocabulary:			
Expression	Ratio	Pythagorean theorem	Similar figures
Equation	Unit rate	Square root	Congruent figures
Like-terms	Proportion	Monomial	Slant height
Exponents	Scale	Scientific notation	Diameter
Absolute value	Dilation	Linear equation	Radius
Integer	Function	Slope	Volume
Rational number	Evaluate	Slope-intercept form	Surface area

Irrational number	Percent change	Compound interest	Transversal
Parallel lines	Perpendicular lines	Complementary	Supplementary

Topics/Content Outline- Units and Themes:

Quarter 1:

- Exponential Notation and Properties of Integer Exponents
- Magnitude and Scientific Notation
- Definitions and Properties of the Basic Rigid Motions
- Sequencing the Basic Rigid Motions
- Congruence and Angle Relationships
- The Pythagorean Theorem

Quarter 2:

- Dilation
- Similar Figures
- The Pythagorean Theorem
- Writing and Solving Linear Equations
- Linear Equations in Two Variables and Their Graphs

Quarter 3:

- Slope and Equations of Lines
- Systems of Linear Equations and their Solutions
- Pythagorean Theorem
- Functions
- Volume
- Linear Functions
- Bivariate Numerical Data

Quarter 4:

- Linear and Nonlinear Models
- Bivariate Categorical Data
- Square and Cube Roots
- Decimal Expansions of Numbers
- The Pythagorean Theorem
- Applications of Radicals and Roots

Primary Resource(s):

Eureka Math, Great Minds