Parent Guide
Grade Eight Mathematics Curriculum
Diocese of Cleveland

Below is a list of skills your child will be taught in Grade Eight Mathematics.
As parents, you are encouraged to support the work of your child's teacher in helping your child acquire each of these skills.

Number System	
Know that there are numbers that are not rational, and approximate them by rational 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.
	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).
Expressions and Equations	
Work with radicals and integer exponents.	
	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
	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.
	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.
	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.	
	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.
	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 pairs of simultaneous linear equations.	
	Solve linear equations in one variable.
	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).
	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
	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.
	Solve real-world and mathematical problems leading to two linear equations in two variables.

FUNCTIONS	
DEFINE, EVALUATE, AND COMPARE FUNCTIONS.	
	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.
	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
	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.
USE FUNCTIONS TO MODEL RELATIONSHIPS BETWEEN QUANTITIES.	
	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.
	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	
UNDERSTAND CONGRUENCE AND SIMILARITY USING PHYSICAL MODELS, TRANSPARENCIES, OR GEOMETRY SOFTWARE.	
	Verify experimentally 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.
	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.
	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
	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.
	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.
UNDERSTAND AND APPLY THE PYTHAGOREAN THEOREM.	
	Explain a proof of the Pythagorean Theorem and its converse.
	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
	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.	
	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics & Probability	
Investigate patterns of association in bivariate data.	
	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.
	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.
	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
	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.
DOC: Numbers, Number Sense and Operations	
Number and Number Systems	
	Recognize that natural numbers, whole numbers, integers, rational numbers, and irrational numbers are subsets of the real number system.
	Demonstrate an understanding of the properties of the rational number system; e.g., order, and reciprocals.
Meaning of Operations	
	Apply order of operations to simplify expressions and perform computations involving integer exponents and radicals.
Computation and Estimation	
	Add, subtract, multiply, divide, and compare numbers written in scientific notation.
DOC: Patterns, Functions and Algebra	
Patterns, Relations, and Functions	
	Describe and represent relations and functions with tables, graphs, words, and symbols.
	Identify functions as linear or nonlinear based on information given in a table, graph, or equation.
Algebraic Representation	
	Describe the relationship between the graph of a line and its equation, including being able to explain the meaning of slope as a constant rate of change.
	Use symbolic algebra (equations and inequalities), graphs and tables to represent situations and solve problems.
	Write, simplify, and evaluate algebraic expressions (including formulas) to generalize situations and solve problems.
	Solve linear equations and inequalities graphically, symbolically, and using technology.
	Solve systems of linear equations graphically and by simple substitution.
	Interpret the meaning of the solution for a system of equations; i.e., point, line, no solution.
Analyze Change	
	Differentiate and explain types of changes in mathematical relationships, such as linear vs. nonlinear, direct variation vs. inverse variation.
	Describe and compare how changes in an equation affect the related graphs; e.g., for a linear equation changing the coefficient of x affects the slope and changing the constant affects the intercepts.
	Use calculators or computers to analyze change; e.g., interest compounded over time as a nonlinear growth pattern.

DOC: Geometry and Spatial Sense	
Characteristics and Properties	
	Make and test conjectures about characteristics and properties (e.g., sides, angles, symmetry) of two-dimensional figures and three-dimensional objects.
	Explore inductive and deductive arguments concerning geometric ideas and relationships.
	Use SSS, SAS, ASA, to prove congruency of triangles.
	Recognize the angles formed and the relationship between the angles when two lines intersect and when parallel lines are cut by a transversal.
	Use proportions in several forms to solve problems involving similar figures (part-to-part, part-to-whole, corresponding sides between figures).
	Use relationships found in right triangles to solve problems.
Visual and Geometric Models	
	Recognize and apply geometric ideas and relationships outside the mathematics classroom in areas such as art, science, and everyday life.
DOC: Measurement	
Measurement Techniques and Tools	
	Determine the surface area and volume of prisms, pyramids, cylinders, spheres, and cones.
	Use conventional formulas to find the surface area and volume of prisms, pyramids, and cylinders and the volume of spheres and cones to a specified level of precision.

Date Taught	
OH: CCSS: Literacy: Reading: Science & Technical Subjects	
Key Ideas and Details	
	Cite specific textual evidence to support analysis of science and technical texts.
Craft and Structure	
	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.
OH: CCSS: Literacy: Writing	
Text Types and Purposes	
	Use precise language and domain-specific vocabulary to inform about or explain the topic.
Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.	
	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

(Source: [1] National Governors Association Center for Best Practices, Council of Chief State School Officers. 2010. *Common Core State Standards for Mathematics*. Washington, D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers.[2] Office of Catholic Education. 2007. *Mathematics Curriculum*. Cleveland, Ohio: Office of Catholic Education.)

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