

8th Grade Advanced Math

2020-2021

Term 1

Unit 1: Transformations	8.G.A.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.
	8.G.A.2 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
	8.G.A.3 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. <i>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.</i>
Unit 2: Dilations and Slope	8.G.A.2 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
	8.EE.B.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; know and 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 .
Unit 3: Linear Relationships	8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i>

8th Grade Advanced Math

2020-2021

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Unit 4: Equations and Systems of Equations

8.EE.C.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.EE.C.8 Analyze and solve systems of two 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 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.*

8th Grade Advanced Math

2020-2021

Term 2

Unit 5: Functions and Volume

8.F.A.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. (Function notation is not required in 8th grade.)

8.F.A.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 another linear function represented by an algebraic expression, determine which function has the greater rate of change.*

8.F.A.3 Know and 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 $A = s^2$ 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.*

8.F.B.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.

8.F.B.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.

8.G.C.7 Know and understand the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems.

8th Grade Advanced Math

2020-2021

Term 2

Unit 7: Exponents and Scientific Notation	8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. <i>For example, $32 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.</i>
	8.EE.A.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.
	8.EE.A.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. <i>For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.</i>
	8.EE.A.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.
Unit 8: Pythagorean Theorem and Irrational Numbers	8.G.B.4 Explain a proof of the Pythagorean Theorem and its converse.
	8.G.B.5 Know and 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.6 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

8th Grade Advanced Math

2020-2021

Term 3

IM Unit 2: Linear Equations, Inequalities, and Systems

A1.N.Q.A.2 Identify, interpret, and justify appropriate quantities for the purpose of descriptive modeling.

A1.A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations with two variables on coordinate axes with labels and scales.

A1.A.CED.A.3 Represent constraints by equations or inequalities and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

A1.A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

A1.F.LE.A.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description of a relationship, or input-output pairs.

A1.A.REI.D.5 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A1.A.REI.A.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A1.A.REI.B.2 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A1.A.REI.C.4 Write and solve a system of linear equations in context

A1.A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context. ★
a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

A1.A.REI.D.7 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

8th Grade Advanced Math

2020-2021

Term 3

IM Unit 3: Two Variable Statistics	A1.S.ID.B.4 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. b. Fit a linear function for a scatter plot that suggests a linear association.
	A1.S.ID.C.5 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
	A1.S.ID.C.6 Use technology to compute and interpret the correlation coefficient of a linear fit.
	A1.S.ID.C.7 Distinguish between correlation and causation.
Unit 6: Scatterplots	8.SP.A.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.
	8.SP.A.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.
	8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. <i>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.</i>

**8th Grade Advanced Math
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Term 4

Extension and Review	Standards Review
	PBL