



Grade 8 Pre-Algebra - Unit C - Functions and Volume

Unit Focus

In this unit, students are introduced to the concept of a function as a relationship between "inputs" and "outputs" in which each allowable input determines exactly one output. Students connect the terms "dependent" and "independent variable" with the inputs and outputs of a function. They use equations to express a dependent variable as a function of an independent variable. They work with tables, graphs, and equations of functions, learning the convention that the independent variable is generally shown on the horizontal axis. They work with verbal descriptions of a function arising from a real-world situation, identifying tables, equations, and graphs that represent the function, and interpreting information from these representations in terms of the real-world situation. Students use linear and piecewise linear functions to model relationships of quantities in real-world situations. Finally, students work with volume, using abilities developed in earlier work with geometry and geometric measurement to calculate the volume of a sphere, a cylinder, and a cone.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Standards - Common Core - Mathematics: 8 - 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. (CCSS.MATH.CONTENT.8.F.A.1) - 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. (CCSS.MATH.CONTENT.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. 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. (CCSS.MATH.CONTENT.8.F.A.3) - 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. (CCSS.MATH.CONTENT.8.F.B.4)	<i>Students will be able to independently use their learning to...</i> T1 Apply models to solve problems. (MP4)	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians create or use models to generalize, represent, and solve problems.	<i>Students will keep considering...</i> Q1 What model best represents this problem? Q2 How can the model created be tested and improved?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 How an input-output diagram represents a rule. K2 A function is a rule with exactly one output for each allowable input. K3 That graphs representing the same context can appear different, depending on the variables chosen.	<i>Students will be skilled at...</i> S1 Writing rules when given input-output pairs. S2 Identifying graphs that do, and do not, represent functions. S3 Using a graph of a function to find the output for a given input and to find the input(s) for a given output.

Stage 1: Desired Results - Key Understandings

- 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. *(CCSS.MATH.CONTENT.8.F.B.5)*
- 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.
(CCSS.MATH.CONTENT.8.G.C.9)
- Mathematical Practices
- Model with mathematics. *(CCSS.MATH.MP.4)*

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- Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. *(POG.1.2)*

K4 That any linear function can be represented by an equation in the form $y = mx + b$, where m is the rate of change and b is the initial value of the function.

K5 An increasing function has a positive rate of change and a decreasing function has a negative rate of change.

K6 The volume is the amount of space contained inside a three-dimensional figure.

K7 The correct formula to find the volume of a cone, a cylinder, and a sphere.

K8 A cone's volume is a third of a cylinder's volume with same dimensions.

K9 The volume of a hemisphere is half the volume of a sphere with the same dimensions.

K10 Vocabulary: function, independent variable, dependent variable, input, output, cone, cylinder, sphere, radius

K11 When a linear function is a good model for data and when it is not.

S4 Explaining the story told by a graph of a function.

S5 Drawing the graph of a function that represents a real-world situation.

S6 Interpreting multiple representations of functions, including graphs, tables, and equations, and explain how to find information in each type of representation.

S7 Creating graphs of non-linear functions with pieces of linear functions.

S8 Calculating and interpreting the different rates of change of a piecewise linear function using a graph.

S9 Finding the volume of a cylinder, cone, and a sphere in mathematical and real-world situations.

S10 Finding missing information about a cylinder and a cone if I know its volume and some other information.

S11 Using data points to model a linear function.