## Vertical Progression:

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|---|---|
| **6th Grade** | **ELG 6.6 Reason about and solve one-variable equations and inequalities.**<br>o **6.EE.B.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.<br>o **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. |
| **7th Grade** | **ELG 7.1 Analyze proportional relationships and use them to solve real-world and mathematical problems.**<br>o **7.RP.A.2** Recognize and represent proportional relationships between quantities.<br>o **7.RP.A.2.a** Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.<br>o **7.RP.A.2.b** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.<br>o **7.RP.A.2.c** Represent proportional relationships by equations.<br>o **7.RP.A.2.d** Explain what a point (*x, y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate. |
| **8th Grade** | **ELG 8.5 Define, evaluate, and compare functions**<br>o **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 Grade 8.]<br>o **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 a linear function represented by an algebraic expression, determine which function has the greater rate of change.*<br>o **8.F.A.3** 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.* |
| **Algebra 1** | **ELG.MA.HS.F.1 Understand the concept of a function and use function notation.**<br>o **F-IF.A.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).<br>o **F-IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.<br>**ELG.MA.HS.F.3 Analyze functions using different representations.**<br>o **F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* |

## Students will demonstrate command of the ELG by:

- Identifying linear and non-linear functions from context, tables, graphs, and equations.
- Comparing properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- Knowing that an equation in the form y=mx+b is linear.
- Providing examples of functions are not linear.
- Knowing that a function is a rule that assigns exactly one output to any given input.

## Vocabulary:

- function
- input
- linear Function
- non-Linear Function
- ordered Pair
- output
- rate of Change
- slope

## Sample Instructional/Assessment Tasks:

1) **Standard(s): 8.F.A.1**

**Source:** https://www.engageny.org/sites/default/files/resource/attachments/math-g8-m5-teacher-materials.pdf

**Item Prompt:**

1. Can the table shown below represent a function? Explain.

| Input ($x$) | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| Output ($y$) | 32 | 64 | 96 | 64 | 32 |

2. Kelly can tune up four cars in three hours. If we assume he works at a constant rate, we can describe the situation using a function.
   a. Write the rule that describes the function that represents Kelly's constant rate of work.

   b. Use the function you wrote in part (a) as the formula for the function to complete the table below. Round your answers to the hundredths place.

| Time it takes to tune up cars ($x$) | 2 | 3 | 4 | 6 | 7 |
|---|---|---|---|---|---|
| Number of cars tuned up ($y$) | | | | | |

   c. Kelly works 8 hours per day. How many cars will he finish tuning up at the end of a shift?

   d. For this problem we assumed that Kelly worked at a constant rate. Do you think that is a reasonable assumption for this situation? Explain.

**Correct Answer(s)**

1. Yes, the table can represent a function since each input has exactly one output.

2a. $y = \frac{4}{3}x$

2b. 2.67, 4, 5.33, 8, 9.33

2c. Kelly will tune up 10.67 cars at the end of a shift. She will complete 10 cars.

2d. No with reason.

## 2) Standard(s): 8.F.A.3

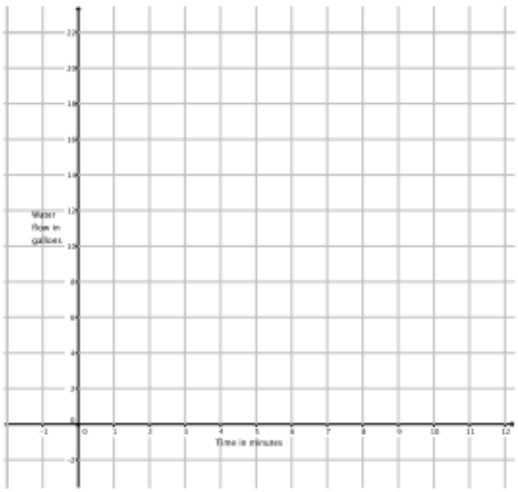
**Source:** https://www.engageny.org/sites/default/files/resource/attachments/math-g8-m5-teacher-materials.pdf

**Item Prompt:**

1. The amount of water in gallons that flows out a certain hose is a function of the amount of time the faucet is turned on. The amount of water that flows out of the hose in four minutes is eleven gallons. Assume water flows at a constant rate.
   a. Write an equation in two variables that represents the amount in gallons of water, $y$, as a function of the time, $x$, the faucet is turned on.

   b. Use the equation you wrote in part (a) to determine the amount of water that flows out of a hose in 8 minutes, 4 minutes, and 2 minutes.

   c. The input of the function, $x$, is time and the output of the function, $y$, is the amount of water that flows out of the hose in gallons. Write the input and outputs from part (b) as ordered pairs and plot them as points on a coordinate plane.



**Correct Answer(s):**

**Solution:**

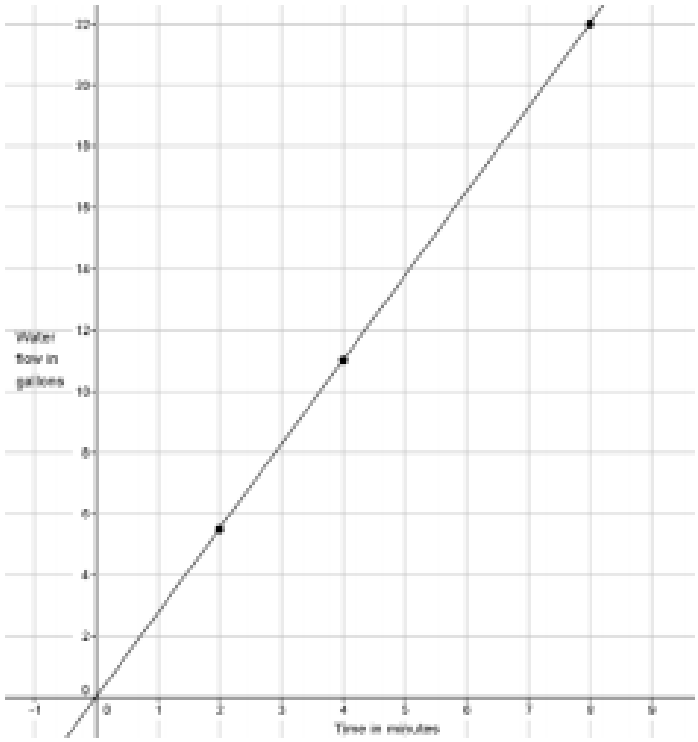
1a. $y = \frac{11}{4}x$

1b. 22 gallons in 8 minutes

11 gallons in 4 minutes

5.5 gallons in 2 minutes

1c.



**3) Standard(s): 8.F.A.2**

**Source: PARCC 8th Grade EOY Practice Test**

**Item Prompt:**

Function A and Function B are linear functions. Function A is represented by the table of values. Function B is represented by the equation.

**Function A**

| $x$ | $y$ |
|---|---|
| 1 | 2 |
| 3 | 10 |
| 4 | 14 |
| 7 | 26 |

**Function B**

$y = 3x + 4$

Which statements about the properties of Function A and Function B are true?

Select **each** correct statement.

Ⓐ The $y$-intercept of Function A is equal to the $y$-intercept of Function B.

Ⓑ The $y$-intercept of Function A is less than the $y$-intercept of Function B.

Ⓒ The $y$-intercept of Function A is greater than the $y$-intercept of Function B.

Ⓓ The rate of change of Function A is equal to the rate of change of Function B.

Ⓔ The rate of change of Function A is less than the rate of change of Function B.

Ⓕ The rate of change of Function A is greater than the rate of change of Function B.

**Solutions:**

B, F