

Functions

MGSE8.F.1 – Relations & Functions

MGSE8.F.2 – Comparing Functions in Various Contexts

MGSE8.F.3 – $y = mx + b$; Linear & Nonlinear

MGSE8.F.4 – Constructing Functions from Various Contexts; Interpreting Rate of Change & Initial Value in Various Contexts

MGSE8.F.5 – Describing Relationships between Two Quantities

Vocabulary:

1. Function – a relation where every input has exactly one output
2. Rate of Change – (**slope**) compares the change in y-values over the change in x-values (rise/run)
3. Initial Value – (**y-intercept**) the point where a graph touches the y-axis; the beginning value of a situation
4. Linear Function – A function that forms a straight line when graphed; has a constant slope

Is it a Function or Not? Review Tips:

- I. When testing to see if a *graph* is a function, use the “Vertical Line Test”. If a vertical line would touch more than one point at least one time on a graph, it is NOT a function.
- II. When looking at a table or coordinates, check for repeating inputs only. If repeating inputs have different outputs, it is NOT a function.

Practice Problems:

❶ Describe the relationship shown in the table of values.

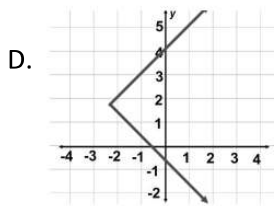
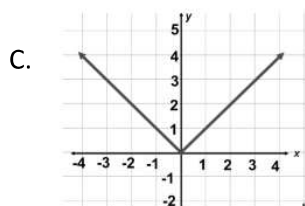
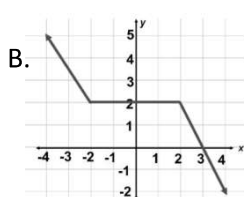
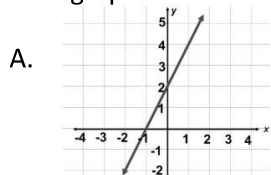
- A. Relation only
- B. Function only
- C. Relation and function
- D. Neither relation nor function

x	5	4	0
y	8	9	13

❷ Which of the following sets of ordered pairs represents a function?

- A. (2, 3), (6, 9), (10, 12), (2, -3)
- B. (-9, 4), (-2, 10), (-2, 12), (0, 6)
- C. (1, 2), (4, 9), (10, 22), (15, 7)
- D. (0, 1), (0, 2), (0, 3), (0, 4)

❸ Which graph DOES NOT represent a function?



❹ Which of the following relations does NOT represent a function?

- A. $\{(5, 8), (10, 2), (12, -2), (15, -5)\}$
- B. $y = \frac{1}{2}x + 8$

C. Multiplying each input by 10 to produce an output

D.

Age	13	14	12	13
Eye Color	Brown	Blue	Green	Hazel

❺ Choose the best description of the relation shown below:

$$\{(2, 10), (4, 15), (6, 20), (8, 25)\}$$

- A. The relation is a function because every input has exactly one output
- B. The relation is a function because every output has exactly one input
- C. The relation is not a function because every input is different.
- D. It is impossible to tell if the relation is a function without knowing more coordinates.

Linear or Nonlinear? Review Tips:

I. *Graphs*: straight line = linear. Any breaks or curves make it nonlinear.

II. *Tables*: check the slope (rise/run). Constant slope = Linear.

III. *Equations*: check the variables for exponents. Variables without exponents = linear. Variables with exponents (other than 1) = nonlinear. Also, variable in the denominator = nonlinear.

Practice Problems:

❶ Which equation shown below shows a *linear* relationship?

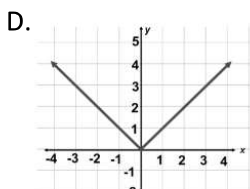
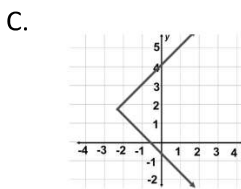
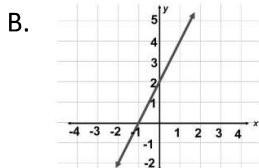
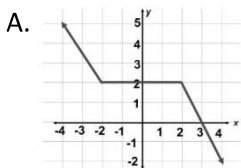
A. $y = 3x + 4$

B. $y = \frac{1}{2}x^2 - 1$

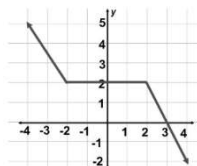
C. $2x^2 + y = 5$

D. $y = \frac{2}{x}$

❷ Which graph shows a *linear* relationship?



❸ Choose the best description of the graph shown below:



A. Linear because each section of the graph is a different straight line segment.

B. Nonlinear because each segment has a different slope.

C. Both linear and nonlinear because it is made up of straight line segments but is not a complete straight line.

D. Neither linear nor nonlinear because it is made up of straight line segments but is not a complete straight line.

❹ Which table shows *nonlinear* relationship?

A.

x	5	4	0
y	8	9	13

B.

x	-1	0	1
y	15	18	21

C.

x	5	7	9
y	15	11	5

D.

x	5	7	9
y	15	11	7

 $y = mx + b$ Review Tips:

I. m = slope (rise/run)

II. b = y-intercept (where $x = 0$)

Practice Problems:

❶ Which equation represents the table?

A. $y = 18x + 3$

B. $y = 3x + 18$

C. $y = -3x + 18$

D. $y = \frac{1}{3}x + 18$

x	-1	0	1
y	15	18	21

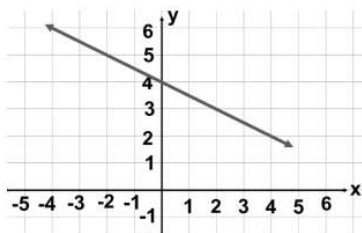
❷ Which equation represents the graph?

A. $y = 4x - 2$

B. $y = \frac{1}{2}x + 4$

C. $y = -2x + 4$

D. $y = -\frac{1}{2}x + 4$



❸ Which equation represents a line passing through the points (2, 5) and (4, 10)?

A. $y = \frac{5}{2}x$

B. $y = \frac{2}{5}x$

C. $y = 5x + 2$

D. $y = 2x + 5$

❹ David's allowance is \$5 every week, plus \$2 for each extra chore he does. Which equation shows his total allowance (A) every week, depending on the number of extra chores (c) he completes?

A. $A = 5c + 2$

B. $A = 2c + 5$

C. $A = 7c$

D. $A = 2 + 5$

Comparing Two Different Functions Review Tips:

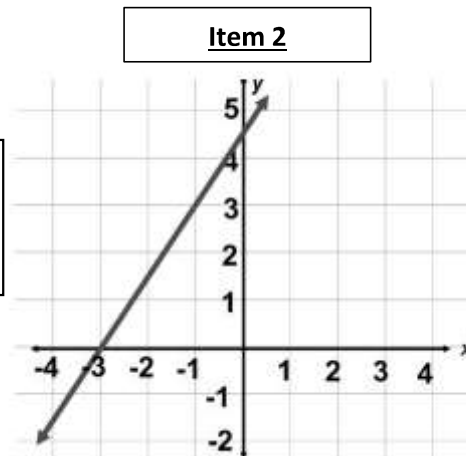
1. Only focus on one component at a time; [For example, only find the y -intercept of each situation first. Then move on to the slope.]

Practice Problems:

❶ Compare the equation in Item 1 with the graph in Item 2.

- A. Items 1 and 2 have the same rate of change, and the same y -intercepts.
 B. Items 1 and 2 have the same rate of change, but different y -intercepts.
 C. Items 1 and 2 have different rates of change, but the same y -intercepts.
 D. Items 1 and 2 have the different rates of change, and different y -intercepts.

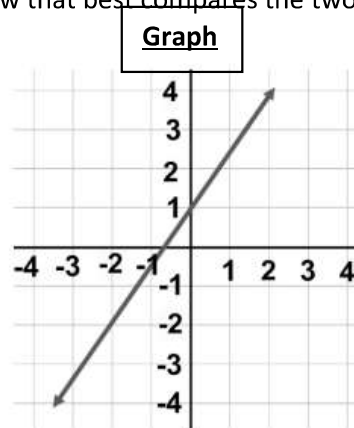
Item 1
$y = -3x + 4.5$



❷ Consider the table of values and the graph to the right. Choose the statement below that best compares the two.

- A. The table has an increasing rate of change while the graph has a decreasing rate of change; the graph and the table have the same y -intercepts.
 B. Both the table and graph have increasing rates of change; The y -intercept of the graph is greater than that of the table.
 C. Both the table and graph have decreasing rates of change; The y -intercept of the table is greater than that of the graph.
 D. The table has a decreasing rate of change while the graph has an increasing rate of change; The y -intercept of the graph is greater than that of the table.

Table	
x	y
4	2
8	5
12	8



❸ Consider the table of values and the equation to the right. Choose the statement that best compares the two.

- A. The table and equation have the same slope and the same y -intercepts.
 B. The table and the equation have the same slope, but different y -intercepts.
 C. The table and the equation have different slopes and different y -intercepts.
 D. The table and the equation have different slopes, but the same y -intercept.

Table	
x	y
4	2
8	5
12	8

Equation:
$y = -3x - 1$

❹ Compare the equation and the graph. Choose the statement below that best describes the functions:

- A. The difference between the y -intercepts is 2.
 B. The difference between the y -intercepts is 1.
 C. The y -intercepts are equal
 D. The rates of change are equal

Equation:
$2y = 4x + 6$

