

# MATHEMATICS

## Quarter 2 - Module 4: Finding the Domain and Range of a Function, and Graphing and Illustrating Linear Functions



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## MATHEMATICS 8

### Quarter 2 - Module 4: Finding the Domain and Range of a Function, and Graphing and Illustrating Linear Functions Second Edition, 2021

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Region I

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# **MATHEMATICS**

**Quarter 2 - Module 4:  
Finding the Domain and Range of a  
Function and Graphing and  
Illustrating Linear Functions**

## **Introductory Message**

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.



## Target

Good day mathematicians!

This module is designed and written to help you find the domain and range of a function, as well as graph and illustrate linear functions. You will learn how to easily graph linear functions given its domain, range, table of values, intercepts and slope. A **linear function** is any **function** that graphs to a straight line. The linear function is popular in economics. It is attractive because it is simple, easy to handle and has many important applications.

In the lessons, you are given the opportunity to use your prior knowledge and skills in linear functions. Activities are also given to process your knowledge and skills acquired, deepen and transfer your understanding. The scope of this module enables you to use it to many different learning situations.

Before we start, let us consider first the learning competencies:

1. finds the domain and range of a function. **(M8AL-IIId-1)**
2. graphs and illustrates a linear function and its (a) domain; (b) range; (c) table of values (d) intercepts; and (e) slope. **(M8AL-IIe-2)**

After going through this module, you are expected to:

1. determine the domain and range of a given function.
2. write the domain and range of a relation using interval notation.
3. plot a linear function given its (a) domain; (b) range; (c) table of values (d) intercepts; and (e) slope.
4. illustrate a linear function given its (a) domain; (b) range; (c) table of values (d) intercepts; and (e) slope.

*Before going on, check how much you know about this topic.  
Answer the pre-test on the next page.*



## Pretest

**Direction:** Read each statement carefully. Choose the letter of the correct answer. Write your answer on the space provided for.

- \_\_\_ 1. Does the table below represent a function, then what are its domain and range?

Table.1

Input	Output
65	42
36	37
29	37
29	17

A. yes, it is a function;  
domain: {29, 29, 36}  
range: {17, 37, 42}

B.no, it is not a function;  
domain: {29, 36, 65}  
range: {37, 37, 42}

C. yes, it is a function;  
domain: {29, 29, 36}  
range: {37, 37, 42}

D.no, it is not a function;  
domain: {29, 36, 65}  
range: {17, 37, 42}

- \_\_\_ 2. The following statements are true about linear function **EXCEPT?**

- A. The domain and range in a function are the set of all the inputs and outputs a function.
- B. The domain and range are important aspects of a function.
- C. The range takes all the possible input values from the set of real numbers.
- D. The range takes all the output values of the function.

- \_\_\_ 3. A linear function written in the form  $f(x) = mx + b$  is known as \_\_\_\_?

- A. General form
- B.  $f$ -form
- C. Slope-intercept form
- D. Standard form

- \_\_\_ 4. Fred, a grade 8 student recalls on how to graph a linear function. The following below are steps **EXCEPT?**

- A. Connect the points with a straight line.
- B. Plot the 2 points.
- C. Find 2 points which satisfy the equation.
- D. Prove the graph.

- \_\_\_ 5. What table below shows the function  $\{(-3, 1), (0, 2), (3, 6)\}$ ?

A.

x	f(x)
6	0
3	-1
2	-3

B.

x	f(x)
-3	2
1	3
0	6

C.

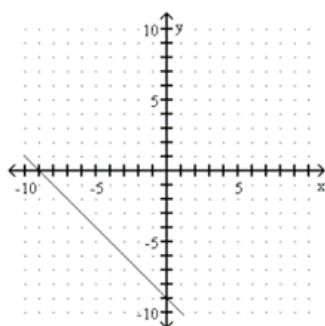
x	f(x)
1	-3
2	0
6	3

D.

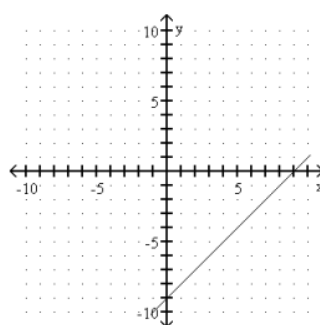
x	f(x)
-3	1
0	2
3	6

\_\_\_6. Which is the correct graph of  $f(x) = -x + 7$ ?

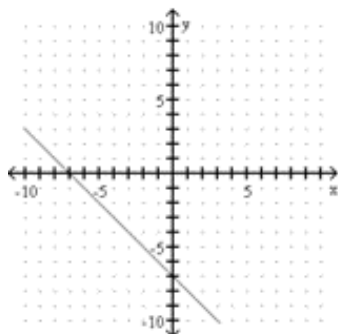
A.



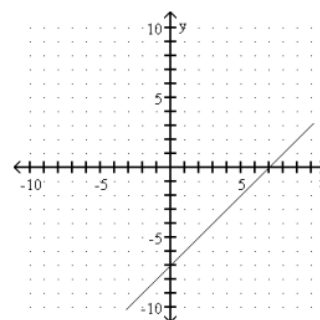
B.



C.



D.



\_\_\_7. What is the domain of the given set  $\left\{ \left(-1, \frac{1}{2}\right), \left(-\frac{1}{2}, -1\right), \left(\frac{3}{2}, 0\right), \left(2, \frac{3}{2}\right) \right\}$  ?

A.  $\left\{ -1, -\frac{1}{2}, -\frac{3}{2}, 2 \right\}$

B.  $\left\{ -1, -\frac{1}{2}, 2, \frac{3}{2} \right\}$

C.  $\left\{ -1, 0, \frac{1}{2}, \frac{3}{2} \right\}$

D.  $\left\{ -1, 0, \frac{1}{2}, \frac{3}{2} \right\}$

\_\_\_8. Determine the range of the set;  $\left\{ \left(-1, \frac{1}{2}\right), \left(-\frac{1}{2}, -1\right), \left(\frac{3}{2}, 0\right), \left(2, \frac{3}{2}\right) \right\}$  ?

A.  $\left\{ \frac{1}{2}, -1, 0, \frac{1}{2} \right\}$

B.  $\left\{ -1, 0, \frac{1}{2}, \frac{3}{2} \right\}$

C.  $\left\{ -1, -\frac{1}{2}, 2, \frac{3}{2} \right\}$

D.  $\left\{ -1, -\frac{1}{2}, 2, \frac{3}{2} \right\}$

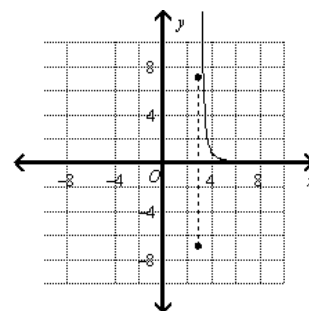
\_\_\_9. Determine the domain and range. Does the graph below illustrate a function?

A. domain: all real numbers; range: all real numbers; Yes, it is a function.

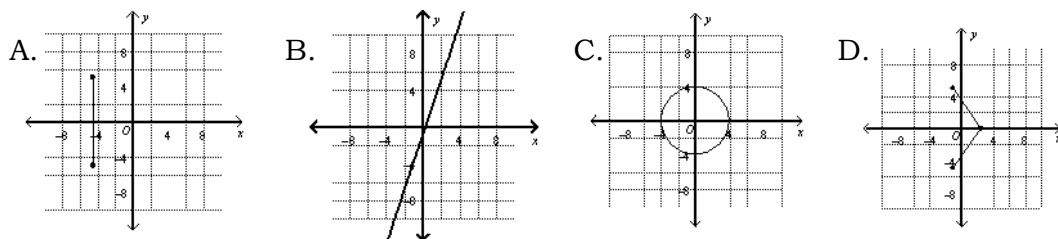
B. domain: positive integers; range: positive integers; No, it is not a function.

C. domain:  $x = 0$ ; range:  $y = 3$ ; No, it is not a function.

D. domain:  $x > 3$ ; range:  $y > 0$ ; Yes, it is a function.



\_\_\_ 10. Which of the following graphs represents a linear function?



\_\_\_ 11. What is the range of the function  $f(x) = 5x - 3$  defined by the domain  $\{0, 1, 2\}$ ?

- A.  $\{3, 8, 13\}$       B.  $\{3, 2, 7\}$       C.  $\{-3, 2, 7\}$       D.  $\{-3, 8, 13\}$

\_\_\_ 12. Angel wants to identify if the equation  $f(x) = 3x$  is a function or not. What will she discover?

- A. It is not a function      B. Maybe a function  
C. Sometimes a function      D. Yes, it is a function

\_\_\_ 13. Rona and Lito look for the domain of the function  $f(x) = 2x - 1$ . What is their correct answer?

- A. the domain of  $f$  is  $(-\infty, -\infty)$       B. the domain of  $f$  is  $(-\infty, \infty)$   
C. the domain of  $f$  is  $(\infty, \infty)$       D. the domain of  $f$  is  $(-\infty, 0)$

\_\_\_ 14. Find the range of  $f(x) = 5x - 3$  given the domain  $\{0, 1, 2\}$ .

- A.  $\{3, 8, 13\}$       B.  $\{3, 2, 7\}$       C.  $\{-3, 2, 7\}$       D.  $\{-3, 8, 13\}$

\_\_\_ 15. Given that  $R = \{(4, 2) (4, -2), (9, 3) (9, -3)\}$  Which is the correct set of range?

- A.  $\{4, 9\}$       B.  $\{4, 4, 9, 9\}$       C.  $\{2, -2, 3, -3\}$       D.  $\{2, 3 -3\}$



**Jumpstart**

## Activity 1: DR. DR. I Am Set!

**Directions:** Consider the sets of ordered pairs and answer the following questions below. Write your answer on the space provided for.

**SET A:**  $\{(3, 4), (4, 5), (5, 6), (6, 7), (7, 8)\}$

**SET B:**  $\{(2, 2), (2, -2), (3, 3), (3, -3), (4, 4), (4, -4)\}$

**SET C:**  $\{(0, 1), (1, 1), (2, 1), (3, 1), (4, 1), (5, 1)\}$

### Questions:

- What is the domain of each set of ordered pairs? \_\_\_\_\_
- What is the range of each set of ordered pairs? \_\_\_\_\_
- Which set/s of ordered pairs is/are functions? Explain.

\_\_\_\_\_  
\_\_\_\_\_



## Activity 2. Arrange Me!

**Directions:** Study the form of a linear function. Arrange the jumbled letters to give the name of its parts. Write your answer on the space provided for.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

The diagram shows the linear function  $f(x) = mx \pm b$ . Arrows point from its components to five boxes containing jumbled letters:

- Arrow from  $f(x)$  points to box 1: UNTONFIC
- Arrow from  $m$  points to box 2: POLES
- Arrow from  $\pm$  points to box 3: PECTINETR -Y
- Arrow from  $b$  points to box 4: ANGRE
- Arrow from the entire equation points to box 5: INAMDO

## Activity 3. Write the Correct Function!

**Directions:** Represent each of the following mathematical phrase to form a linear. Write your answer on the space provided for. Number 1 is done for you.

- $f(x) = 2x - 6$  1. Twice a number minus 6.  
\_\_\_\_\_ 2. Four x added to ten.  
\_\_\_\_\_ 3. Twenty-five decreased by twice a number.  
\_\_\_\_\_ 4. If thrice a number is added to seven.  
\_\_\_\_\_ 5. The sum of a number x and 3.  
\_\_\_\_\_ 6. The difference between thrice a number and nine.  
\_\_\_\_\_ 7. The sum of a number and 5.  
\_\_\_\_\_ 8. The product of two and x.  
\_\_\_\_\_ 9. The area of the square whose side is four.  
\_\_\_\_\_ 10. Thrice the age of Sheila increased by 2.

How did you find the activity? Were you able to recall functions? Were you able to determine the domain and range of functions? Were you able to determine set/sets of ordered pairs that is/are function? Fantastic! Keep Going!



## Discover

### Determining the Domain and Range of a Function

The **domain** of a function is the set of all allowable numbers (x) or input values you can substitute into the function.

By using the word “allowable” one could assume there are some values which are simply not allowed into the function.

The **range** of a function is the set of resulting y or output values.

**Example 1.** State the domain and range of the following relation

$\{(2, -3), (4, 6), (3, -1), (6, 6), (2, 3)\}$ .

The **domain** is  $\{2, 3, 4, 6\}$  and  
the **range** is  $\{-3, -1, 3, 6\}$

The domain is all the x-values or independent variable, and the range or dependent variable is all the y-values.

**Example 2.** Give the domain and range of the following relation

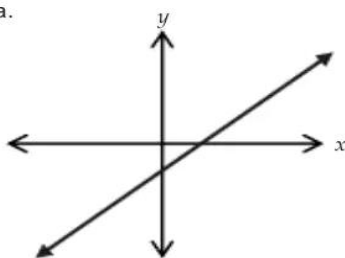
x	-3	-2	-1	0	1	2
f(x)	5	5	5	5	5	5

**domain:**  $\{-3, -2, -1, 0, 1, 2\}$

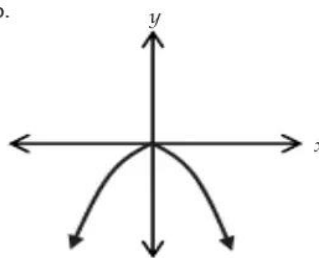
**range:**  $\{5\}$

**Example 3:** Find the domain and the range of each graph below.

a.



b.



*Graphs from Mathematics 8 Learner's module page 158.*

In (a), arrow heads indicate that the graph of the function extends in both directions. It extends to the left and right without bound; thus, the domain D of the function is the set of real numbers. Similarly, it extends upward and downward

without bound; thus, the range  $R$  of function is the set of all real numbers  $\mathbb{R}$ . In symbols,  $D_f = \{x | x \in \mathbb{R}\}$ ;  $R_f = \{y | y \in \mathbb{R}\}$ .

In (b), arrow heads indicate that the graph of the function extended to the left and right without bound, and downward, but not upward, without bound. Thus, the domain of the function is the set of real numbers, while the range is any real number less than or equal to 0. That is,  $D_f = \{x | x \in \mathbb{R}\}$ ;  $R_f = \{y | y \leq 0\}$ .

If function  $f$  is defined by  $f(x) = mx + b$ , then the domain of the function  $D_f$  is  $\mathbb{R}$  and its range of the function  $R_f$  is  $\mathbb{R}$ . In symbols,  
 $D_f = \{x | x \in \mathbb{R}\}$ , read as: “the domain of the function  $f$  is the set of all  $x$  such that  $x$  is an element of the set of real numbers  $\mathbb{R}$ ,” and  
 $R_f = \{y | y \in \mathbb{R}\}$ , read as: “the range of the function  $f$  is the set of all  $y$  such that  $y$  is an element of the set of real numbers  $\mathbb{R}$ .”

**Example 4:** Find the domain of and range of  $f(x) = 3x$

Plug in any real numbers you want into this function and you get an answer.

If $x = -1$	If $x = 0$	if $x = 1$	if $x = 2$	if $x = 3$
$f(-1) = 3(-1)$	$f(0) = 3(0)$	$f(1) = 3(1)$	$f(2) = 3(2)$	$f(3) = 3(3)$
$= -3$	$= 0$	$= 3$	$= 6$	$= 9$

The domain is the set of real numbers. In interval notation this is written  $(-\infty, \infty)$  or  $\{x | x \in \mathbb{R}\}$ .

The range is the set of real numbers. In interval notation this is written  $(-\infty, \infty)$  or  $\{x | x \in \mathbb{R}\}$ .

**Example 5.**  $F(x) = x^2$ , what is the domain and range?

If $x = 0$	If $x = 1$	If $x = 2$
$F(0) = 0^2$	$F(1) = 1^2$	$F(2) = 2^2$
$= 0$	$= 1$	$= 4$
If $x = -1$	If $x = -2$	If $x = -3$
$F(-1) = -1^2$	$F(-2) = -2^2$	$F(-3) = -3^2$
$= 1$	$= 4$	$= 9$

You can plug in any real numbers you want into this function and you get an answer. So the domain are 0, 1, 2, -1, -2, -3, ... (all real numbers). In interval notation this is written  $(-\infty, \infty)$  or  $\{x | x \in \mathbb{R}\}$ .

The range is the set of all numbers you get out of the function. In this function, the range are 0, 1, 4, 9, ... In interval notation this is written  $[0, \infty)$  or  $\{x | x \geq 0\}$

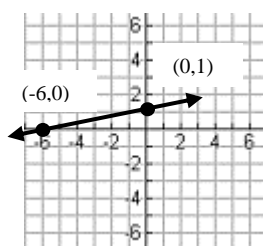
# Graphing and Illustrating Linear Functions

In graphing linear function, the graph is a line. Moreover, in constructing a line, at least one of the following conditions is needed;

- Given at least any two points
- Given its intercepts ( $x$  – and  $y$ - intercepts)
- Given its table of values
- Given its slope and  $y$ -intercept.

## Illustrative Examples:

1.  $\{(-6, 0), (0, 1)\}$

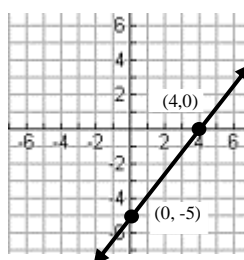


Given its ordered pair:

Steps:

1. Plot point  $(-6, 0)$ .
2. Plot point  $(0, 1)$ .
3. Connect the two points.

2.  $x$  – int. = 4,  $y$  – int. = -5



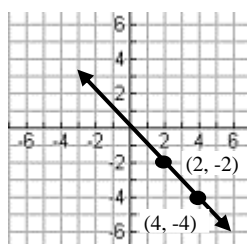
Given its intercepts:

Steps:

1. Plot  $x$ -int;  $(a, 0)$ .
2. Plot  $y$ -int;  $(0, b)$ .
3. Connect the  $x$ - and  $y$ -intercept.

3.

$x$	4	2
$f(x)$	-4	-2

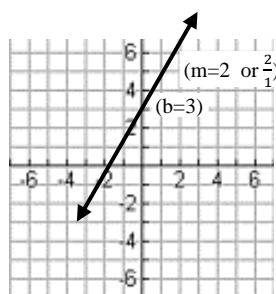


Given its table of values:

Steps:

1. Plot point  $(4, -4)$ .
2. Plot point  $(2, -2)$ .
3. Connect the two points.

4.  $f(x) = 2x + 3$



slope  $m = \frac{\text{rise}}{\text{run}} = 2 \text{ or } \frac{2}{1}$

$y$ -intercept = 3

Given its slope and  $y$ -intercept

Steps:

1. Plot  $b$ ;  $(0, b)$
2. Count rise of  $m$ ; if positive, move upward; if negative, move downward.
3. Count run of  $m$ ; if positive move to the right; if negative move to the left.
4. Connect the  $b$  and  $m$ .

## A GENERAL NOTE: GRAPHICAL INTERPRETATION OF A LINEAR FUNCTION

In the equation  $f(x) = mx + b$

- **$b$**  is the  $y$ -intercept of the graph and indicates the point  $(0, b)$  at which the graph crosses the  $y$ -axis.
- **$m$**  is the slope of the line and indicates the vertical displacement (rise) and horizontal displacement (run) between each successive pair of points. Recall the formula for the slope:

$$m = \frac{\text{change in output (rise)}}{\text{change in input (run)}} = \frac{y_2 - y_1}{x_2 - x_1}$$

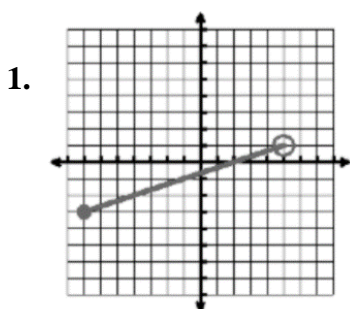


## Explore

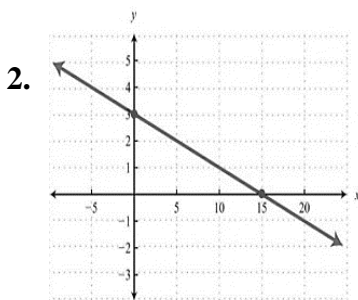
For you to understand the lesson well, do the following activities. Have fun and good luck!

### Activity 4: What's my Domain! What's my Range!

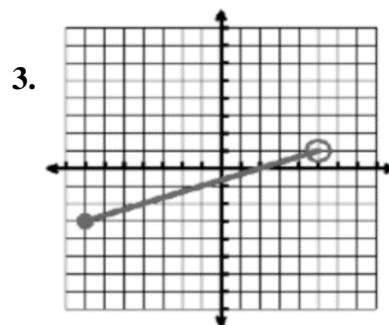
**Directions:** Determine the domain and the range of the graphs of functions below. Write your answer on the space provided for.



Domain: \_\_\_\_\_



Range: \_\_\_\_\_

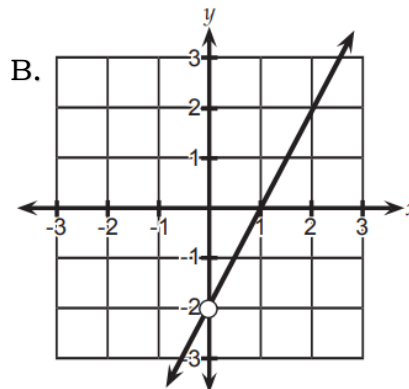
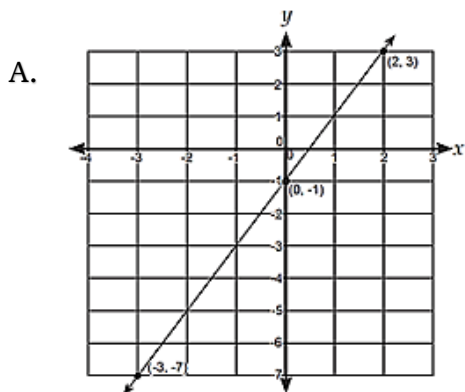


Range: \_\_\_\_\_

*Note: The broken line in item number 4 is an asymptote. This is a line that the graph of a function approaches, but never intersects.  
(Hint: The value of  $x = 0$  is not part of the domain of the function.)*

### Activity 5: Graph Analysis

**Directions:** Consider the graphs below. Answer the questions that follow. Write your answer on a separate sheet of paper.



**Questions:**

1. Does each graph represent a linear function? Why?

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2. What is the domain of the first graph? second graph?

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3. What is the range of the first graph? second graph?

---



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**Deepen**

*Here are some enrichment activities for you to explore on to master and strengthen your skills in determining domain and range of functions.*

**Activity 6: You Complete Me!**

**Complete the following table below.** Write your answer on the space provided for.

Function	Domain	Range
1. $f(x) = 2x$	$\{x x \in \mathbb{R}\}$	
2. $f(x) = 4x + 1$		$\{y y \in \mathbb{R}\}$
3. $f(x) = -7x - 4$	$\{x x \in \mathbb{R}\}$	
4. $f(x) = 8x - 5$		$\{y y \in \mathbb{R}\}$
5. $f(x) = x - 9$	$\{x x \in \mathbb{R}\}$	

**Activity 7: Plot Me in so Many Ways!**

**Directions:** Graph the linear function  $f(x) = 4x + 2$ ,

- using ordered pairs (domain and range),
- using intercepts,
- table of values
- slope and y-intercepts

*Bravo! You have understood the lesson.  
Are you now ready to summarize?*

## Activity 8: Journal Writing

Reflect on the activities you have done in this lesson by completing the following sentences. Write your answers on your journal notebook.

I learned that I \_\_\_\_\_

I was surprised that I \_\_\_\_\_

I noticed that I \_\_\_\_\_

I discovered that I \_\_\_\_\_

I was pleased that I \_\_\_\_\_

*Congratulations for reaching this far! You are now  
ready to take the assessment test. Good luck!*



## Gauge

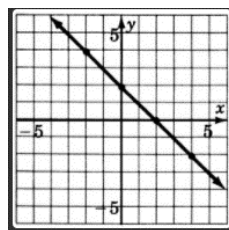
**Post Assessment:** Read each statement carefully. Choose the letter of the correct answer. Write your answer on the space provided for.

- \_\_\_ 1. Which of the following is **NOT** a step on graphing linear function using table?
- Count the rise and run of the slope.
  - Plot the first ordered pair of the table.
  - Plot the second ordered pair of the table.
  - Connect the two points.

- \_\_\_ 2. Which ordered pair could you add to the following list of points to create a function? **{(3, 5) (4, 9) (2, 5)}**
- (4, 5)
  - (3, 9)
  - (2, 9)
  - (1, 9)

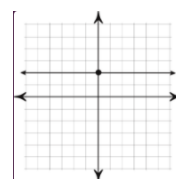
- \_\_\_ 3. What function is being represented by this line?

- $f(x) = \frac{1}{2}x + 2$
- $f(x) = 3x + 2$
- $f(x) = 3x - 4$
- $f(x) = -x + 2$



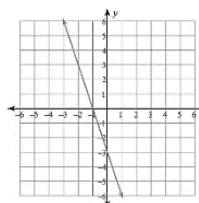
- \_\_\_ 4. Which function represent the graph below?

- $f(x) = \text{undefined}$
- $f(x) = 2x$
- $f(x) = 2$
- $x = 2$



- \_\_\_ 5. What is the function of the graph shown in the figure?

- $f(x) = -3x + 3$
- $f(x) = 2x$
- $f(x) = -3x - 3$
- $f(x) = -2x$





\_\_\_6. Does the table below represent a linear function if Mr. Lee will graph it?

- A. No
- B. Maybe
- C. Sometimes
- D. Yes

$x$	1	2	3
$f(x)$	1	4	9

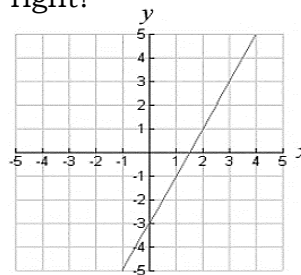
\_\_\_7. What is the range of the illustrated function below?

- A. R: {3, 5, 8}
- B. R: {5, 8}
- C. R: {-7, -7, 11}
- D. R: {-7, 11}

$x$	-7	11	11
$f(x)$	3	5	8

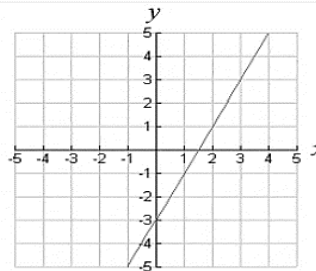
\_\_\_8. Which function matches the graph at the right?

- A.  $f(x) = 2x + 3$
- B.  $f(x) = 2x - 3$
- C.  $f(x) = -3$
- D.  $f(x) = -3x + 2$



\_\_\_9. What is the y-intercept of the linear function?

- A. 3
- B. 2
- C. -2
- D. -3

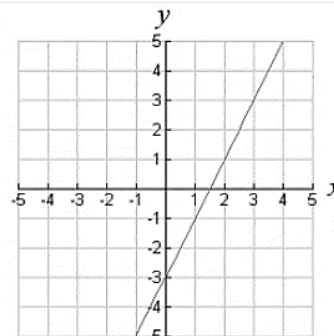


\_\_\_10. For the set of ordered pairs  $(x, f(x))$ : (2,10), (4,20), (7,35), (11, 55). What is the domain?

- A. (10,20,7,11)
- B. (2,4,7,11)
- C. (10, 20,35,55)
- D. (2,4,35,55)

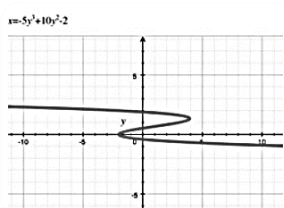
\_\_\_11. What is the slope of the linear function?

- A.  $\frac{3}{2}$
- B. 0
- C. 2
- D. -3

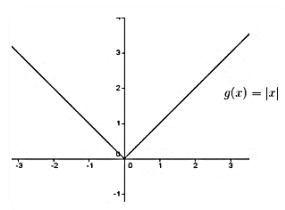


\_\_\_12. Which graph did not pass the vertical line test?

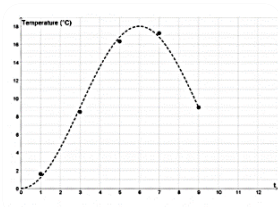
A.



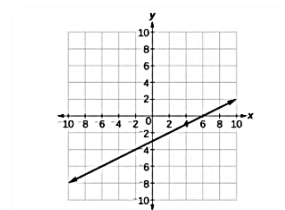
B.



C.



D.



\_\_\_13. Given the points (3, 5) (2, 4) (9, 0) and (x, 6). What could replace the x to create a non-function?

A. 3

B. 4

C. 5

D. 6

\_\_\_14. For the function,  $y = 2x + 3$ , which variable represents the input?

A. f

B. x

C. y

D. z

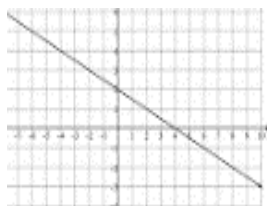
\_\_\_15. Given the graph below, what is x if  $f(x) = 2$ ?

A. 2

B. 4

C. 6

D. 8

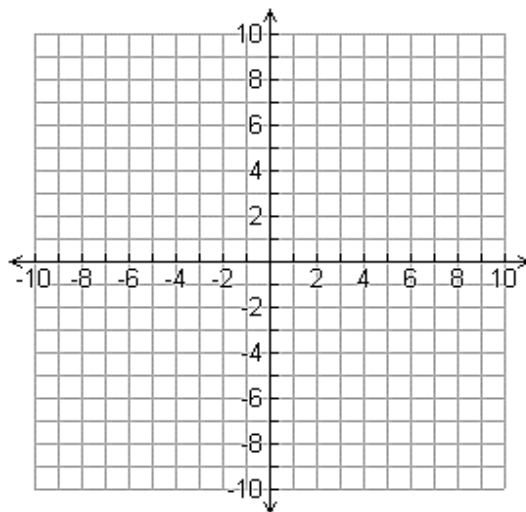


*Great job! You are awesome! You are almost done with this module.*

### Additional Activity:

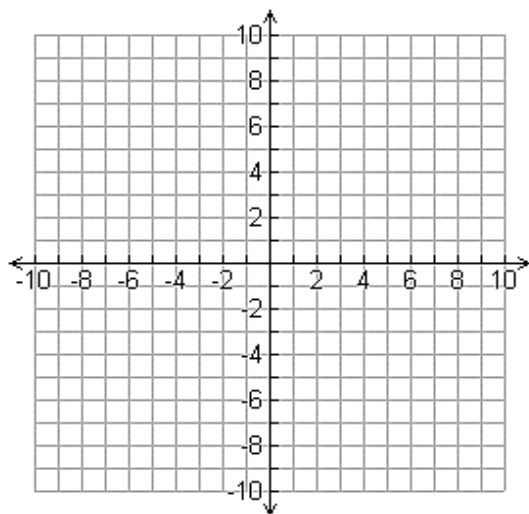
**Directions:** Use the different colors to graph the given linear functions. Give its domain and range of functions.

Red	Blue
$f(x) = -x + 5$	$f(x) = \frac{1}{2}x - 5$

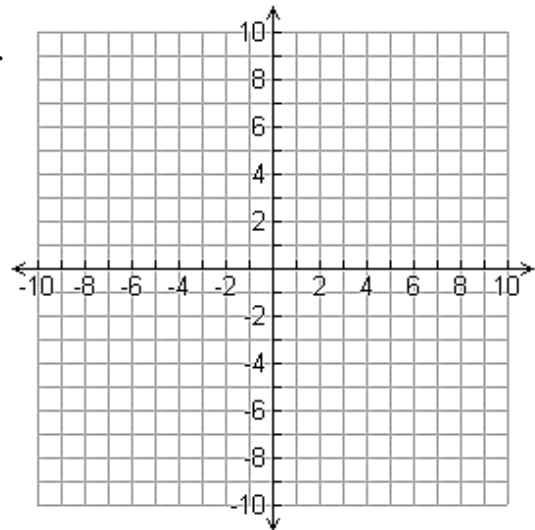


# GRAPHING PAPER:

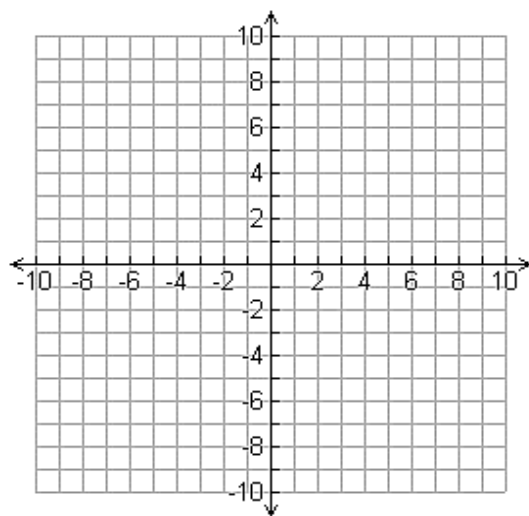
1.



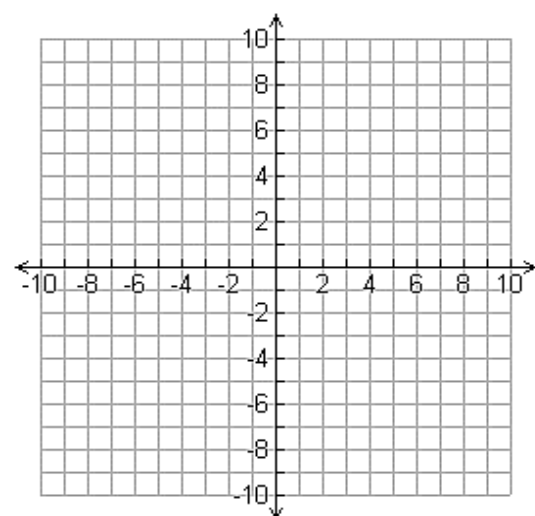
2.



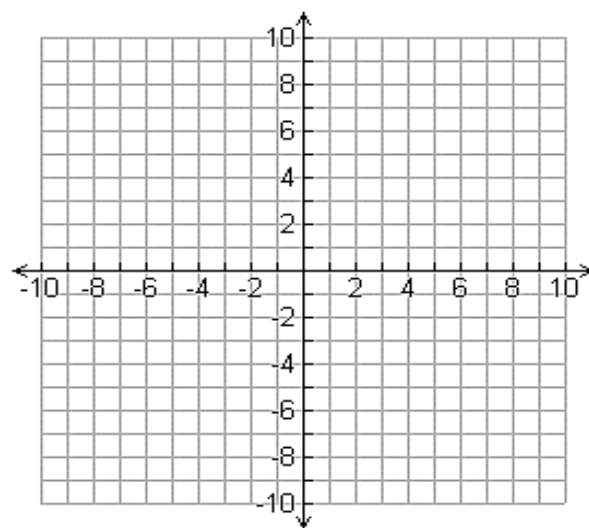
3.



4.



5.



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