8

DepED
DEPARTMENT OF EDUCATION

Mathematics

Quarter 2 – Module 7:
"Illustrating and Graphing a Linear Function"

ALTERNATIVE DELIVERY MODE
ADM

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 2 – Module 7: Illustrating and Graphing a Linear Function
First Edition, 2020

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

Development Team of the Module

Writers:	Harry P. Jabahab, Noli V. Antallan
Language Editor:	Vicente P. Balbuena
Content Evaluator:	Marielou Y. Lorenzana, Nilbeth S. Merano, Rosalita A. Bastasa, Merjorie G. Dalagan
Layout Evaluator:	Jay R. Tinambacan
Reviewers:	Villaflor D. Edillor, Shirley C. Compe, Imelda B. Llasos, Caren L. Alamin, JayroldVirtudazo Navarra
Illustrators:	Harry P. Jabahab, Noli V. Antallan
Layout Artists:	Harry P. Jabahab, Noli V. Antallan, Fritch A. Paronda
Management Team:	Francis Cesar B. Bringas, Isidro M. Biol, Jr., Rhea J. Yparraguirre Maripaz F. Magno, Josephine Chonie M. Obseñares, Josita B. Carmen, Celsa A. Casa, Regina Euann A. Puerto, Bryan L. Arreo, Leopardo P. Cortes, Claire Ann P. Gonzaga, Lieu Gee Keeshia C. Guillen

Printed in the Philippines by _____

Department of Education – Caraga Region

Office Address: Learning Resource Management Section (LRMS)
J.P. Rosales Avenue, Butuan City, Philippines 8600
Tel. No./Telefax No.: (085) 342-8207 / (085) 342-5969
E-mail Address: caraga@deped.gov.ph

8

Mathematics

Quarter 2 – Module 7: "Illustrating and Graphing a Linear Function"

DepED
DEPARTMENT OF EDUCATION

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.

What I Need to Know

In this module, you will be acquainted with linear function and its graph. The scope of this module enables you to use it in many different learning situations. The lesson is arranged to follow the standards sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module contains:

Lesson 1 - Illustrating and Graphing a Linear Function

After going through this module, you are expected to:

1. illustrate a linear function;
2. describe the domain, range, intercepts, slope and the table of values of a linear function;
3. graph linear function using different methods; and
4. apply the concepts of linear functions in real-life situation.

What I Know

Directions: Choose the letter of the best answer. Write the chosen letter on a separate sheet
of paper.

1. Which of the following functions is linear?

   A. $f(x) = x^2 - 1$

   B. $f(x) = 1 - 2x$

   C. $f(x) = \frac{x+1}{x}$

   D. $f(x) = 2^x + 1$

2. Which of the following table of values describes a linear function?

   A.

x	-2	-1	0	1
f(x)	2	-1	-4	-7

   B.

x	-2	-1	0	1
f(x)	4	1	0	1

   C.

x	1	2	3	4
f(x)	2	4	8	16

   D.

x	1	2	3	4
f(x)	3	-2	1	-4

3. What is the domain of the linear function *f(x) = 4x – 3*?

   A. D = {x | x ≠ 0}

   B. D = {x | x ≥ 0}

   C. D = {x | x ≤ 0}

   D. D = {x | x ϵ ℝ}

4. Which of the following best describes the x-intercept of a line?

   A. The x-intercept of a line is point of origin.

   B. The x-intercept a of a line has the coordinate $(0, a)$.

   C. The x-intercept of a line is the turning point of the graph.

   D. The x-intercept of a line is the intersection of the graph and the x-axis.

5. Which of the following is the coordinates of the y-intercept?

   A. $(0, 0)$ B. $(0, b)$ C. $(b, 0)$ D. (a, b)

6. What is the x-intercept of the function $f(x) = x + 3$?

   A. $(-3, 0)$ B. $(-1, 0)$ C. $(0, 3)$ D. $(0, 1)$

7. What is the y-intercept of the function $f(x) = 2x + 5$?

   A. $(-5, 0)$ B. $(-2, 0)$ C. $(0, 2)$ D. $(0, 5)$

8. Which of the following DOES NOT describe the slope of a line?

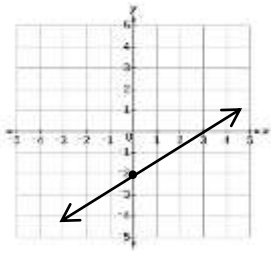
A. The slope is zero if the line is horizontal.

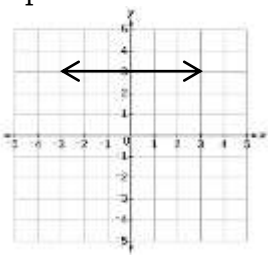
B. The slope refers to the steepness of the line.

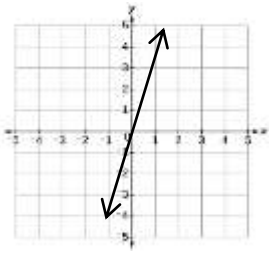
C. The slope of a line depends on the value of the y-intercept.

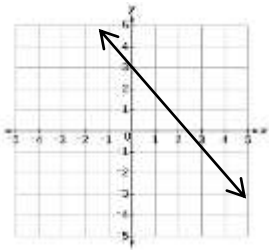
D. The slope of a line is described as the vertical change over the horizontal change.

9. Which of the following graphs has negative slope?

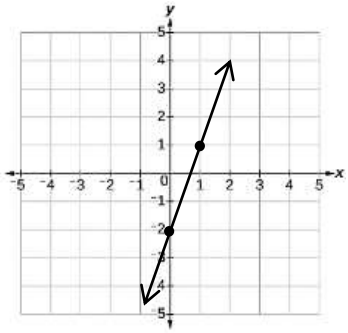
A. 

C. 

B. 

D. 

10. What is the slope of the graph shown at the right?



A. -2

B. 1

C. 2

D. 3

11. As x increases in the equation $5x + y = 7$, the value of y _____.

A. increases

B. decreases

C. does not change

D. cannot be determined.

12. What is $f(-2)$ in a linear function $f(x) = x - 5$?

A.-7

B.-3

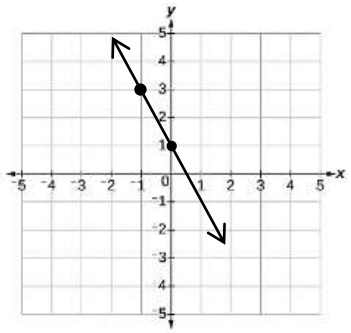
C. 3

D. 10

13. The following are points on the graph of a linear function $f(x) = 2x - 1$ **EXCEPT**:

A. $(0, -1)$ B. $(3, 5)$ C. $(-2, 3)$ D. $(2, 3)$

14. Which of the following linear functions describes the graph at the right?



A. $f(x) = 2x + 1$

B. $f(x) = 3x + 1$

C. $f(x) = -2x + 1$

D. $f(x) = -3x + 1$

15. In a certain municipality, the Rural Health Unit recorded the number of *Persons Under Investigation (PUI)* for COVID-19 starting on the first month of the implementation of community quarantine. They observed a constant increased as shown in the table below.

Month(x)	1st Month	2nd Month	3rd Month	4th Month
Number of *PUIs* (y)	13	25	37	49

If the pattern continues, can you predict the number of *PUIs* in the7th Month?

A. Yes, the number of *PUIs* in the7th month is 85.

B. Yes, the number of *PUIs* in the7th month is 97.

C. No, because it is not stipulated in the problem.

D. No, because the data is insufficient.

Lesson 1 Illustrating and Graphing a Linear Function

A linear function is the most basic algebraic function. It is particularly useful in describing real-life situations where there is a constant change in the variables and the phenomena involved one to two variables such as a total income in terms of the number of working hours, distance travelled in terms of the time consumed in travelling, and many others. This module will enable you to illustrate and graph a linear function.

What's In

You have learned from the previous lesson the domain and range of the different functions. Let us try to recall key concepts about the topic.

Given the graphs below, answer the following guide questions:

Figure A

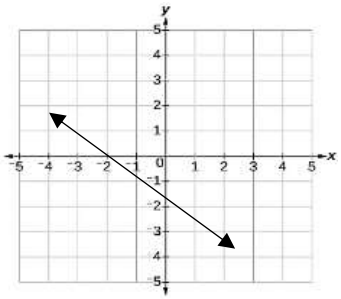
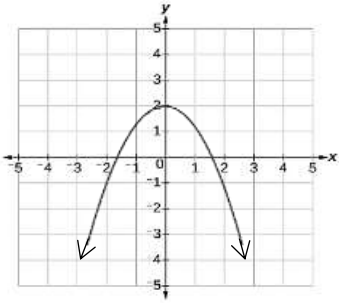


Figure B



a. Where will the graph extend in figure A? Put a check mark (✓) in the space provided. Tick all that applies.
   _____ to the left _____ upward
   _____ to the right _____ downward
b. Where will the graph extend in figure B? Put a check mark (✓) in the space provided. Tick all that applies.
   _____ to the left _____ upward
   _____ to the right _____ downward
c. What is the domain of the function in figure A? In figure B?
d. What is the range of the function in figure A? In figure B?

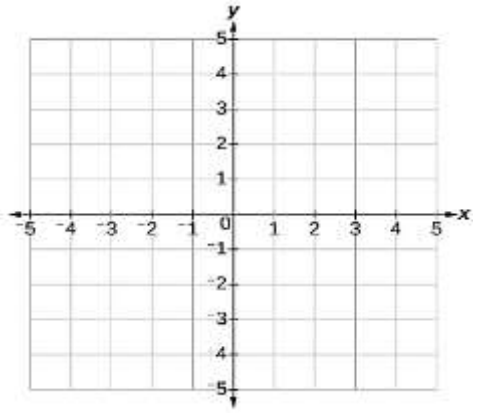
There are many functions, but the discussion in this module will focus on linear function and its application.

What's New

Activity: Look and Observe

Directions: Plot and connect the points to draw the line that will pass through the given ordered pairs and answer the questions that follow. Write you answer on a separate sheet of paper or graphing paper.

{(-3, -5), (-2, -3), (-1, -1), (0, 1), (1, 3)}



Guide Questions:

1. Describe the graph.

2. What is the domain and range of the graph?
   Domain = _____
   Range = _____

3. Which among the equations describes the graph?
   a. $y = 3x - 1$
   b. $y = 2x + 1$
   c. $y = -x + 1$

4. How did you find the equation of the line?

What Is It

A. Linear Function

A linear function is a function which ordered pairs satisfy a linear equation. Any linear function can be written in the form of $y = mx + b$ or $f(x) = mx + b$, where m and b are real numbers and m is the slope of the line, while b is its y-intercept. If $m \neq 0$, then the degree of the function is 1. If $m = 0$ and $b \neq 0$, then the degree of the function is 0. If $m = 0$ and $b = 0$, then the degree of the function is not defined.

Furthermore, a linear function has one dependent variable and one independent variable. Its graph is a non-vertical straight line. If a function is linear, then it can be represented by a linear equation. Recall that a linear equation can be written in different forms which are shown in the table below.

Forms of Linear Equations		
Slope-Intercept Form	$y = mx + b$	where m is the slope and b is the y-intercept
Standard Form	$Ax + By = C$	where A, B, and C are integers and $A \geq 0$. A and B can be zero but not both at the same time.
General Form	$Ax + By + C = 0$	where A or B can be zero but not both at the same time.

When a linear equation is written in standard form, notice that both x and y have exponents of 1, x and y are not multiplied together, and x and y do not appear in denominators, exponents, or radicands.

Illustrative example1

Which of the following functions inside the box are linear?

$f(x) = x - 2$	$f(x) = 3x^2 + 2x - 1$	$f(x) = -2x$
$f(x) = 2x^3 - x^2 + 1$	$f(x) = 2^x - 3$	$f(xy) = 5xy$

Solutions:

- The function $f(x) = x - 2$ is a linear function since the highest exponent of x is 1 and it is written in the form of $f(x) = mx + b$.
- The function $f(x) = 3x^2 + 2x - 1$ is not a linear function since the highest exponent of x is not 1.
- The function $f(x) = -2x$ is a linear function since the highest exponent of x is 1 and it can be written in the form of $f(x) = mx + b$, where $b = 0$.
- The function $f(x) = 2x^3 - x^2 + 1$ is not a linear function since the highest exponent of x is not 1.
- The function $f(x) = 2^x - 3$ is not a linear function since it is not written in the form $f(x) = mx + b$.
- The function $f(xy) = 5xy$ is not a linear function since the two variables are multiplied together and cannot be written in the form $y = mx + b$ or $f(x) = mx + b$.

Linear functions can also be presented in table of values.

Illustrative example 2

Verify whether the function described by the given table of values is linear.

a.

x	1	2	3	4
$f(x)$ *or* y	2	6	10	14

b.

x	-2	0	2	4
$f(x)$ *or* y	7	4	1	-2

c.

x	-2	0	2	4
$f(x)$ *or* y	4	0	4	16

Solutions:

If the first differences on x-coordinates are equal and the first differences on y-coordinates are equal, then the function is linear. However, if the first differences on x-coordinates are equal but the first differences on y-coordinates are not equal then the function is not linear.

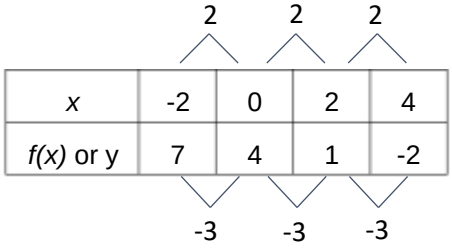
a. Examine the first differences on *x-coordinates* and *y-coordinates*.

Since the first differences on *x-coordinates* are equal and the first differences on *y-coordinates* are also equal, then the table of values describes a linear function.

	1	1	1	
x	1	2	3	4
f(x) or y	2	6	10	14
	4	4	4	

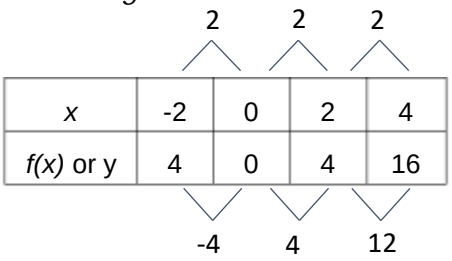
b. Examine the first differences on *x-coordinates* and *y-coordinates*.

Since the first differences on *x-coordinates* are equal and the first differences on *y-coordinates* are also equal, then the table of values describes a linear function.



c. Examine the first differences on *x-coordinates* and *y-coordinates*.

The first differences on *x-coordinates* are equal but the first differences on *y-coordinates* are not equal. Thus, the table of values does not describe a linear function.



B. Domain and Range of a Linear Function

If a function is defined by $f(x) = mx + b$, where $m \neq 0$, the domain D of the function is the set of real numbers and the range R of the function is the set of real numbers. In symbols,

$D = \{x \mid x \in \mathbb{R}\}$, reads as "the domain of the function is the set of all x such that x is an element of the set of real numbers".

$R = \{y \mid y \in \mathbb{R}\}$, reads as "the range of the function is the set of all y such that y is an element of the set of real numbers".

Illustrative example

Find the domain and range of the following linear functions.

a. $f(x) = 3x + 5$
b. $f(x) = 7x$

Solutions:

a. Since the function is in the form $f(x) = mx + b$, the domain and range of the function are both the set of real numbers. In symbol,

$$D = \{x \mid x \in \mathbb{R}\}$$
$$R = \{y \mid y \in \mathbb{R}\}$$

b. Since the function is in the form $f(x) = mx + b$, where $b = 0$, the domain and range of the function are both the set of real numbers. In symbol,

$$D = \{x \mid x \in \mathbb{R}\}$$
$$R = \{y \mid y \in \mathbb{R}\}$$

C. Slope of a Linear Function

The slope (m) is usually referred to as the rate of change in y over the rate of change in x.

$$m = \frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run}$$

To find the slope m, you need to determine how much the values of x and y change.

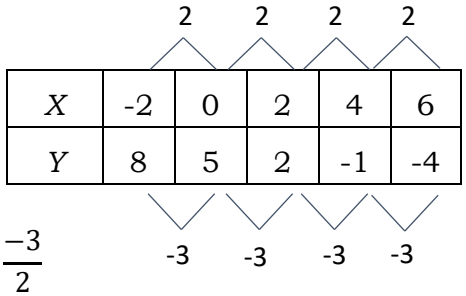
Illustrative example

Suppose the graph has the following coordinates written in tabular form. Determine the slope of the graph.

x	-2	0	2	4	6
y	8	5	2	-1	-4

Solution:

The values of x constantly increase by 2 and the values of y constantly decrease by 3. Thus, the slope is



$$m = \frac{\Delta y}{\Delta x} = \frac{change\ in\ y}{change\ in\ x} = \frac{-3}{2}$$

D. Graphs of a Linear Function

Graphing linear functions can be done in any of the four methods:

a. Using two points
b. Using $x-$ and $y-$ intercepts
c. Using the slope and $y-$ intercept
d. Using a slope and a point

a. Using Two Points

In geometry, two points determine a line. Thus, two points are enough to graph a linear function.

Illustrative example

Graph the linear function $f(x) = x + 4$ using two of its points.

Step 1

Determine two points on the graph. You may assign two values of x then compute for $f(x)$. Let us consider -4 and 3 as the values of x.

When $x = -4$	$f(x) = x + 4$	*Given*
	$f(-4) = -4 + 4$	*Substitute -4 to x*
	$f(-4) = 0$	*Result*

This gives an ordered pair (-4, 0).

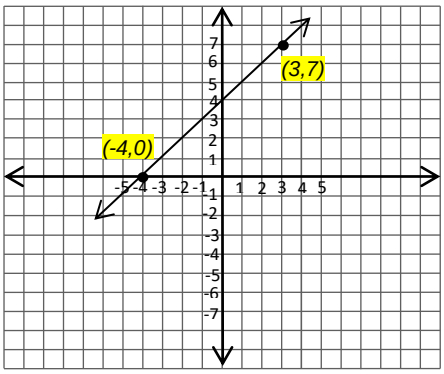
When $x = 3$	$f(x) = x + 4$	*Given*
	$f(3) = 3 + 4$	*Substitute 3 to x*
	$f(3) = 7$	*Result*

This gives an ordered pair (3, 7).

This implies that the graph will pass through the points (-4, 0) and (3, 7).

Step 2

Plot the ordered pairs (-4, 0) and (3, 7). Then, draw a line that passes through these two points.



b. Using $x-$ and $y-$ intercepts

Linear function can be graphed using the x-intercept a and y-intercept b. Remember that the x-intercept of the linear function is the point of intersection between the graph and the x-axis and is represented by the point $(a, 0)$. Meanwhile, the y-intercept of the linear function is the point of intersection between the graph and the y-axis, thus represented by the point $(0, b)$.

Illustrative example

Graph the function $f(x) = 2x - 6$ using the x- and y-intercepts.

Step 1

Find the x- and y-intercepts. Recall that in finding the x-intercept, you need to let $f(x) = 0$. Meanwhile, in finding the y-intercept, you need to let $x = 0$. That is,

For x-intercept:	$f(x) = 2x - 6$	*Given*
	$0 = 2x - 6$	*Let* $f(x) = 0$
	$0 + 6 = 2x - 6 + 6$	*Add both sides by 6*
	$6 = 2x$	*Simplify*
	$\left(\frac{1}{2}\right)(6) = (2x)\left(\frac{1}{2}\right)$	*Multiply both sides by* $\left(\frac{1}{2}\right)$
	$3 = x$	*Simplify*
	$x = 3$	*Symmetric Property of Equality*

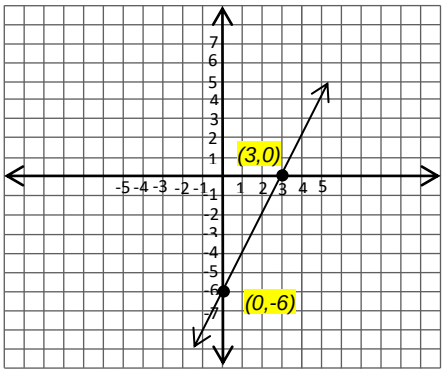
Thus, the x-intercept is (3, 0). This means that one of the points of the graph is (3, 0).

For y-intercept:	$f(x) = 2x - 6$	*Given*
	$f(0) = 2(0) - 6$	*Let* $x = 0$
	$f(0) = -6$	*Simplify*

Thus, the y-intercept is (0, -6). Hence, another point of the graph is (0, -6).

Step 2

Plot the x- and y-intercepts. Then, draw a line that passes through the intercepts.



c. Using Slope and y − intercept

The third method is by using the slope and the y-intercept. This can be done by identifying the slope and the y-intercept of the linear function.

Illustrative example

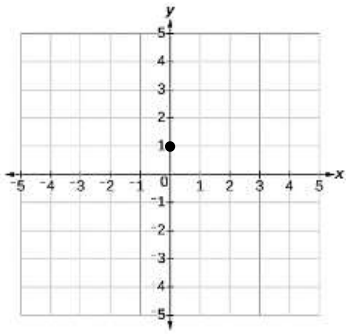
Graph the function $f(x) = 2x + 1$

Step 1

Identify the slope m and the y-intercept b. In the function, slope m is 2 and y-intercept b is 1.

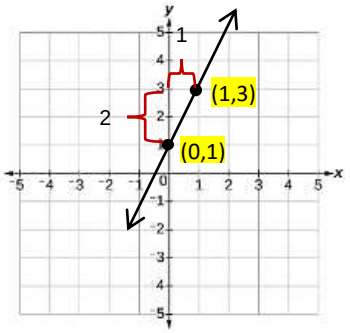
Step 2

Plot first the y-intercept b.



Step 3

Find the other point using the slope. Remember that slope $m = \frac{rise}{run}$ and the value of the slope m which is 2 can be written as $\frac{2}{1}$ which means *rise = 2* and *run = 1*. Using the y-intercept as the starting point, we move 2 units upward since *rise = 2*, and 1 unit to the right since *run = 1*. Then, make a line that passes through the two points.



d. Using Slope and One Point

The fourth method in graphing linear function is by using the slope and one point. This can be done by plotting first the given point, then finding the other point using the slope.

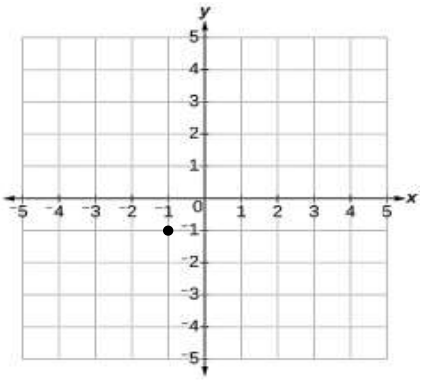
Illustrative example

Graph the linear function $f(x) = -2x - 3$ using a slope and a point.

Step 1

Find a point from the function. You may assign any value for x in the given function, let's say $x = -1$. Then, compute for $f(-1)$.

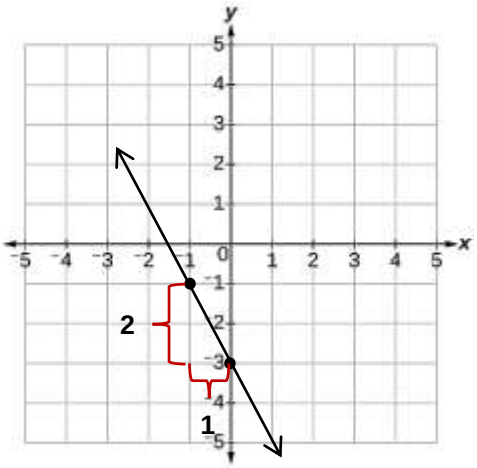
$f(x) = -2x - 3$	*Given*
$f(-1) = -2(-1) - 3$	*Substitute -1 to x*
$f(-1) = 2 - 3$	*Simplify*
$f(-1) = -1$	*Simplify*



Thus, the line passes through the point $(-1, -1)$.

Step 2

Find another point using the slope. The slope of the function is -2 which can also be written as $\frac{-2}{1}$, thus, *rise = -2* and *run = 1*. From the point (-1, -1), we move 2 units downward since *rise = -2* and one unit to the right since *run = 1*. Then, make a line that passes through the two points.



E. Related Problems on Linear Function

Linear function has varied applications to real-life situations such as the concepts of rate of change and direct variations.

Illustrative example

Fernan drives a motorcycle going back to his hometown. He travelled an average speed of 60 kph.

a. Make a table that relates the number of hours he travelled *(x)* and the distance he covered in travelling $(f(x))$.
b. Write the linear function that describes the given problem.
c. What would be the distance he covered after travelling for 4 hours?
d. If his hometown is 330 kilometers away from his starting point, how many hours should he travel?
e. Sketch the graph that describes the function.

Solutions:

a. The table below relates the number of hours he travelled (x) and the distance he covered in travelling $(f(x))$.

x	1	2	3
f(x)	60	120	180

b. Recall the concept of finding the linear equation given two points. From the table, consider (1, 60) to be the first point and (2, 120) to be the second point. That is,

$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$, *where* $P_1(1,60)$ *and* $P_2(2,120)$

$y - 60 = \frac{120-60}{2-1}(x - 1)$ *Substitute*

$y - 60 = \frac{60}{1}(x - 1)$ *Simplify*

$y - 60 = 60x - 60$ *Distributive Property*

$y = 60x - 60 + 60$ *Addition Property of Equality*

$\boldsymbol{f(x) = 60x}$

Thus, the linear function that describes the situation is $\boldsymbol{f(x) = 60x}$.

c. To find the distance he travelled after 4 hours

$f(x) = 60x$	The *given function*
$f(x) = 60(4)$	*Substitute 4 to x*
$\boldsymbol{f(x) = 240}$	*Simplify*

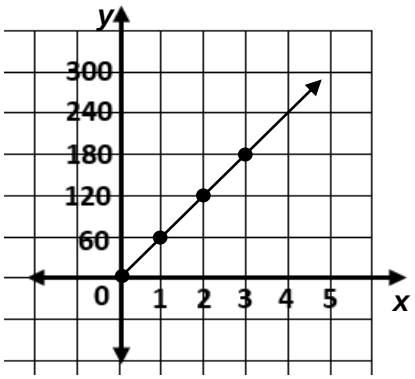
Thus, the distance travelled by Fernan after 4 hours is **240 kilometers**.

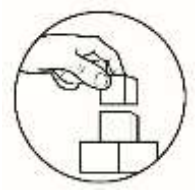
d. To find the number of hours needed to travel 330 km.

$f(x) = 60x$	*Given function*
$330 = 60x$	*Substitute 330 to f(x)*
$\frac{330}{60} = \frac{60x}{60}$	*Divide both sides by 60*
$5.5 = x$	*Simplify*

Thus, Fernan should travel for **5.5 hours or 5 hours and 30 minutes** to reach his hometown.

e. Below is the graph that describes the given problem.





What's More

Activity 1: My Other Side

The box below contains 4 linear equations in standard form and 4 linear functions. Your task is to match the given linear equation to its equivalent linear function. Then, determine the slope, the x-intercept, and the y-intercept of each equation. Write your answer in the following table.

$f(x) = 3x - 4$	$2x + 3y = 6$	$3x - y = 4$	$x + 2y = 4$
$f(x) = \frac{2}{5}x + 3$	$f(x) = -\frac{2}{3}x + 2$	$2x - 5y = -15$	$f(x) = -\frac{1}{2}x + 2$

Linear Equations in the Form $Ax + By = C$	Linear Function $f(x) = mx + b$	Slope (m)	x-intercept (a)	y-intercept (b)

Guide Questions:

1. How did you classify the equations and functions as to its form?
2. What did you do to identify the equivalent function from the given linear equation?
3. What did you do to determine the slope,x-intercept and y-intercept of each pair of linear equations and functions?

Activity 2: That's My Point!

The graph of a linear function $f(x) = mx + b$ consists of all points that satisfy the linear function. Since the domain of a linear function is the set of all real numbers, then any real number can be chosen as a value of the variable x. This activity enables you to describe a function by its table of values.

Directions: Complete table below by finding $f(x)$ given the values of x.

Functions	The value of *f(x)* at			Table of Values
	$x = -2$	$x = 0$	$x = 3$	
1.) $f(x) = 2x + 1$				x | | | | | *f(x)* | | | | |
2.) $f(x) = -3x$				x | | | | | *f(x)* | | | | |
3.) $f(x) = -4x + 1$				x | | | | | *f(x)* | | | | |
4.) $f(x) = 2 - 3x$				x | | | | | *f(x)* | | | | |

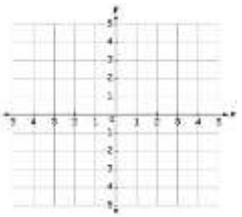
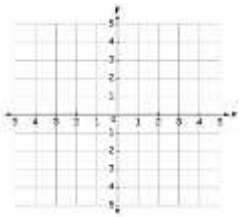
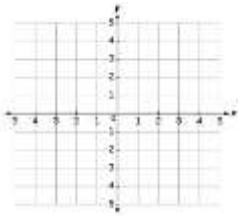
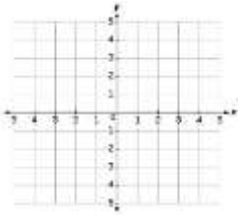
5.) $f(x) = -x + 4$					x				
					$f(x)$				

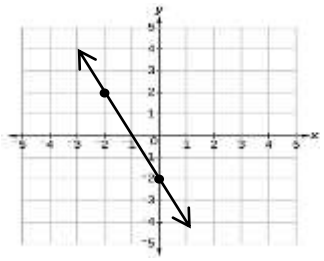
Guide Questions:

1. How did you determine the values $f(-2)$, $f(0)$, and $f(3)$ of each function?
2. In each of the function, what have you observed in the values of $f(x)$ as x increases? As x decreases?
3. What affects the change of $f(x)$?

Activity 3: How Do I Look?

Directions: For numbers 1 - 4, sketch the graph of a given linear function using the indicated method. For number 5, determine the function that best describes the given graph.

Equation	Method to use	Graph
1.) $f(x) = 2x - 1$	Two Points	
2.) $f(x) = \frac{3}{2}x - 2$	Slope and y-intercept	
3.) $f(x) = 2x - 4$	x-intercept and y-intercept	
4.) $f(x) = -3x + 2$	Slope and One Point	

5.) _____	

Guide Questions:

1. Among the four methods of graphing a linear function, which one is easiest to you? Why?
2. In item number 5, what are your bases in finding the function that describes the graph?
3. What difficulties have you encountered in graphing linear functions? How did you overcome these difficulties?

What I Have Learned

To determine how far you've gone with the lesson, answer the activities that follow.

Directions: Tell whether the following statements are true or false.

____1. In a linear function in the form $y = f(x) = mx + b$, the variable x is the dependent variable.

____2. The degree of a linear function could be higher than 1.

____3. The domain of a linear function $f(x) = mx + b$ where $m \neq 0$ is the set of real numbers.

____4. The range of a linear function $f(x) = mx + b$ where $m \neq 0$ is the set of real numbers.

____5. The slope of a line is described as the horizontal change (run) over vertical change (rise).

____6. Two points are enough to graph a linear function.

____7. The x-intercept is described as the intersection point of the graph and the x-axis.

____8. The y-intercept is described as the intersection point of the graph and the y-axis.

____9. The x-intercept a of the line has the coordinate $(0, a)$.

____10. The y-intercept b of the line has the coordinate $(b, 0)$.

What I Can Do

Due to the Corona Virus Disease 2019 (COVID-19) pandemic, Michelle prefers to stay at home and work in an online typing job to have an extra income while the crisis is going on. She receives a fixed daily pay of Php100.00 plus an incentive of Php5.00 per page.

a. Make a table that relates the number of pages she could type per day *(x)* and daily pay $f(x)$.

b. Based on the completed table, would the problem represent a linear function? Justify your answer.

c. What is the y-intercept? Explain your answer.

d. What linear function would represent the given problem?

e. What would be her income if she was able to type 21 pages at a certain day?

f. Sketch the graph that best describes the function.

Assessment

Directions: Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following functions is linear?

   A. $f(x) = 2x^2 + 1$ C. $f(x) = 3x - 2$

   B. $f(x) = \frac{x+1}{x}$ D. $f(x) = 3^x + 4$

2. Which of the following table of values **DOES NOT** describe a linear function?

   A.

x	-2	-1	0	1
f(x)	2	-1	-4	-7

   C.

x	1	2	3	4
f(x)	3	8	13	18

   B.

x	-2	-1	0	1
f(x)	4	1	0	1

   D.

x	1	2	3	4
f(x)	-3	-1	1	3

3. Which of the following equations is in the slope-intercept form?

   A. y = 5x + 3 C. 4x + y – 2 = 0

   B. 2x – y = 7 D. 2y = 5

4. What is the range of a linear function *f(x) = -3x + 2*?

   A. R = {y | y ≠ 0} C. R = {y | y ≤ 0}

   B. R = {y | y ≥ 0} D. R = {y | y ϵ ℝ}

5. Which of the following points describes the x-intercept a?

   A. (0, 0) C. $(a, 0)$

   B. $(0, a)$ D. (a, b)

6. What is the x-intercept of the function $f(x) = 3x$?

   A. (-1, 0) C. (1, 0)

   B. (0, 0) D. (3, 0)

7. What is the y-intercept of the function $f(x) = -2x - 1$?

   A. (0, -5) C. (0, -1)

   B. (0, -2) D. (0, 1)

8. Which of the following best describes a y-intercept?

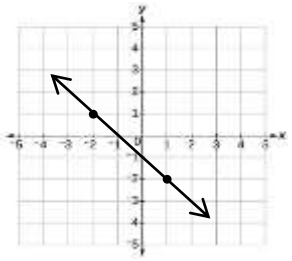
A. The y-intercept has the coordinate $(b, 0)$.

B. The y-intercept is the end point of a line.

C. The y-intercept is the point of intersection of the graph and the y-axis.

D. The y-intercept is the point of where the x-axis and the y-axis intersect.

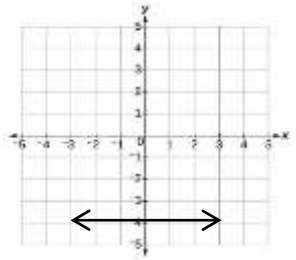
9. What is the slope of the graph shown at the right?



A. -2 C. 2

B. -1 D. 3

10. Which of the following statements best describe the graph at the right?



A. The range of the graph is the set of real numbers.

B. The slope of the graph is negative.

C. The slope of the graph is zero.

D. The graph is not a function.

11. What is $f(-1)$ in a linear function $f(x) = -2x + 3$?

A. -3 C. 3

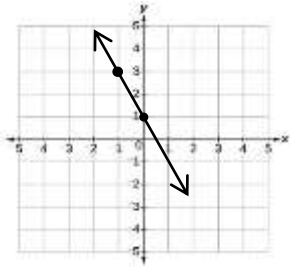
B. 1 D. 5

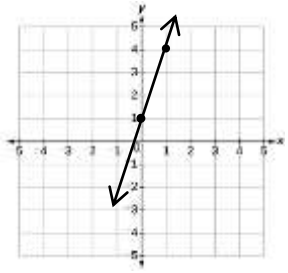
12. Which of the following points lies on the graph of the linear function $f(x) = -x - 1$?

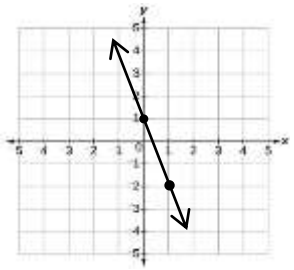
A. (1, -1) C. (2, 3)

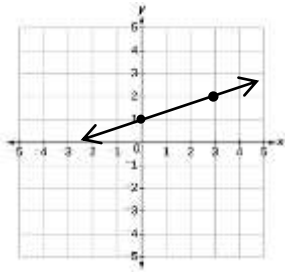
B. (-2, 1) D. (-2, 3)

13. Which of the following graphs describes the function $f(x) = 3x + 1$?

A. 

C. 

B. 

D. 

For numbers 14-15, refer to the situation below.

Danny works as delivery boy in a water refilling station. His monthly salary is Php 6,000.00 plus a commission of Php1.50 for every gallon of water he delivered.

14. Which table of values best describe the total monthly earnings $f(x)$ of Danny in terms of the number of gallons x he delivered for the whole month?

A.

x	400	500	600	700
f(x)	6,600	6,750	6900	7,050

C.

x	400	500	600	700
f(x)	6,500	7,000	7,500	8,000

B.

x	400	500	600	700
f(x)	6,600	6,700	6800	6,900

D.

x	400	500	600	700
f(x)	6,500	7,000	7,500	8,000

15. If Danny delivered 1 200 gallons in a particular month, what would be his salary for that month?

A. Php 7,000.00

B. Php 7,300.00

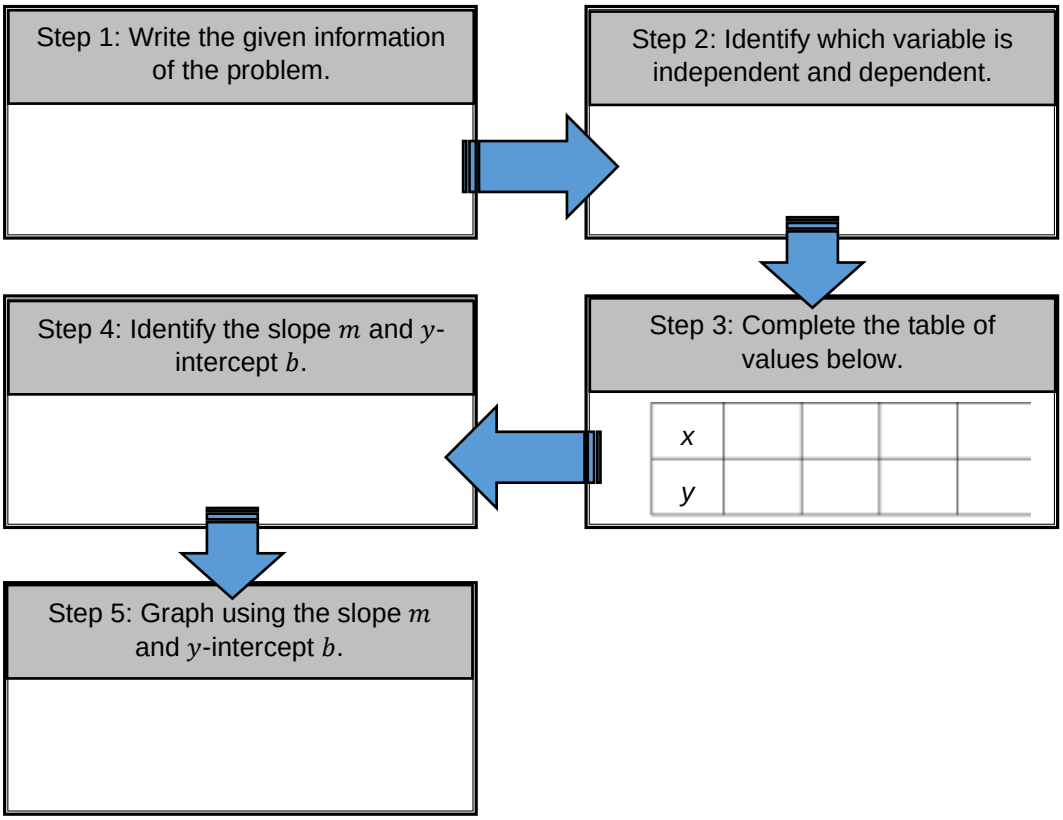
C. Php 7,500.00

D. Php 7,800.00

Additional Activities

Activity: My Own Problem

Directions: Formulate your own problem which involve linear functions and provide solutions to it by following the flow chart below. Be guided with the rubric that follows.



Score	Descriptors
5	Poses a more complex problem and finishes all parts of the solution and communicates ideas clearly; shows in-depth comprehension of the pertinent concepts and/or processes.
4	Poses a complex problem and finishes all parts of the solution and communicates ideas clearly; shows in-depth comprehension of the pertinent concepts and/or processes.
3	Poses a complex problem and finishes most significant parts of the solution and communicates ideas unmistakably; shows comprehension of the major concepts although neglects or misinterprets less significant ideas or details.
2	Poses a problem and finishes some significant parts of the solution and communicates ideas unmistakably but shows gaps on theoretical comprehension.
1	Poses a problem but demonstrates minor comprehension, not being able to develop and approach, no coherence.

Answer Key

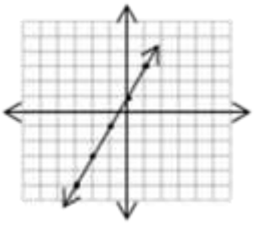
What I Know

1. B
2. A
3. D
4. D
5. B
6. A
7. D
8. C
9. D
10. D
11. B
12. A
13. C
14. C
15. A

What's In

a. to the left, to the right, upward, downward
b. to the left, to the right, downward
b. D={x|xϵℝ}, D={x|xϵℝ}
c. R={y|yϵℝ}, R={y|y≤2}

What's New



1. Answers vary
2. D={x|xϵℝ}
   R={y|yϵℝ}
3. b
4. Answers vary
5. Answers vary

What I have learned

1. False
2. False
3. True
4. True
5. False
6. True
7. True
8. True
9. False
10. False

What I Can Do

a.) Answers vary

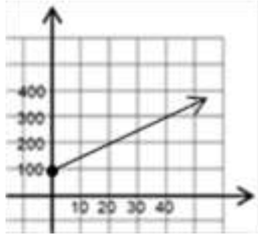
b.) Yes

c.) 100

d.) f(x)=5x+100

e.) ₱205

f.)



Assessment

1. C
2. B
3. A
4. D
5. C
6. B
7. C
8. C
9. B
10. C
11. D
12. B
13. C
14. A
15. D

What's More (Activity 1)

(answers can interchange)

1.) 3x-y=4, f(x)=3x-4, 3, 4/3, -4

2.) 2x+3y=6, f(x)=-2/3x+2, -2/3, 3, 2

3.) x+2y=4, f(x)=-1/2x+2, -1/2, 4, 2

4.) 2x-5y=-15, f(x)=2/5x+3, 2/5, -15/2, 3

What's More (Activity 2)

x	-2	0	3
$f(x)$	-3	1	7

x	-2	0	3
$f(x)$	6	0	-9

x	-2	0	3
$f(x)$	9	1	-11

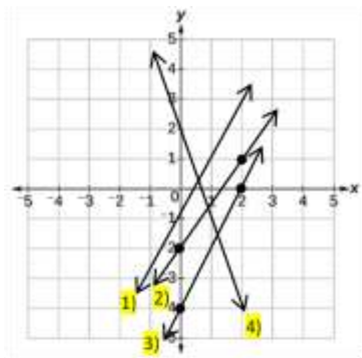
x	-2	0	3
$f(x)$	8	2	-7

x	-2	0	3
$f(x)$	6	4	1

What's More (Activity 3)

Item#1-4

Item #5: $f(x) = -2x - 2$



References

Abuzo, Emmanuel P., Merden L. Bryant, Jem Boy B. Cabrella, Belen P. Caldez, Melvin M. Callanta, Anastacia Proserfina I. Castro, Alicia R. Halabaso, Sonia P. Javier, Roger T. Nocom, Concepcion S. Ternida. *Mathematics 8 – Learner's Module*. Pasig City, Philippines: Department of Education, 2013.

Bernabe,J.G., Dilao,S.J., Orines, F.B. *Advance Algebra, Trigonometry, and Statistics*. Quezon City, Philippines: SD Publications, Inc., 2009.

Holliday, Bechie, Luchin, et.al. *California Algebra 2: Concepts, Skills, and Problem Solving – Interactive Student Edition, pp. 66*. The McGraw-Hill Companies, Inc., 2008.

For inquiries or feedback, please write or call:

Department of Education – Bureau of Learning Resource
Ground Floor, Bonifacio Building, DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax Nos.: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph