8

DepED
DEPARTMENT OF EDUCATION

Mathematics
Quarter 1 – Module 10: Graphing Linear Equations

ALTERNATIVE DELIVERY MODE
ADM

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 10 Graphing a Linear Equation Given (a) Any Two Points; (b) the x – and y – Intercepts; (c) the Slope and a Point on the Line
First Edition, 2020

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

Development Team of the Module

Writer: Fritch A. Paronda

Language Editor: Merjorie G. Dalagan

Content Evaluator: Melody C. Gapa

Layout Evaluator: Jake D. Fraga

Reviewers: Rhea J. Yparraguirre**,** Lewellyn V. Mejias, Severiano D. Casil, Villaflor D. Edillor, Florangel S. Arcadio, Alma R. Velasco, Crisante D. Cresino, Juliet P. Utlang, Mercedita D. Gonzaga

Illustrator: Fritch A. Paronda

Layout Artist: Fritch A. Paronda, Jake D. Fraga

Management Team: Francis Cesar B. Bringas, Isidro M. Biol, Jr., Maripaz F. Magno, Josephine Chonie M. Obseñares, Josita B. Carmen, Celsa A. Casa, Regina Euann A. Puerto, Bryan L. Arreo, Leopardo P. Cortes, Lieu Gee Keeshia C. Guillen, Claire P. Gonzaga

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 1 – Module 10: "Graphing Linear Equations"

DepED
DEPARTMENT OF EDUCATION

What I Need to Know

In this module, you will recognize the different methods of graphing a linear equation in two variables as an important tool to understand, visualize, and assess easily a linear equation. The scope of this module enables you to use it in many different learning situations. The lesson is arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

Content Standards: The learner demonstrates understanding of key concepts of linear equations in two variables.

Performance Standards: The learner is able to formulate real-life problems involving linear equations in two variables and solve these problems accurately using a variety of strategies.

Learning Competency: The learner graphs a linear equation given (a) any two points: (b) the x - and y – intercepts; (c) slope and a point on the line.

Learning Code: M8AL-If-2

After going through this module, you are expected to:

1. identify the three methods of graphing a linear equation;
2. graph a linear equation given any two points, x- and y-intercepts, the slope and a point; and
3. select any method in graphing linear equations in dealing with real life problems.

What I Know

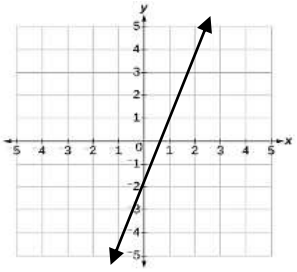
Choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which is TRUE about a linear equation?
   A. It is an equation which has two solutions.
   B. It is an equation whose graph is a parabola.
   C. It is an equation having a polynomial of degree 1.
   D. It is an equation having a polynomial of degree 2.

2. What do you call the graph of a linear equation?
   A. ellipse
   B. hyperbola
   C. line
   D. parabola

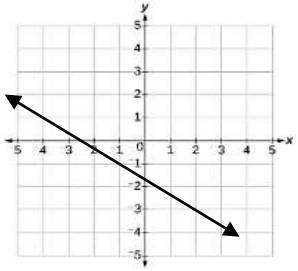
3. The following methods can be used in graphing a linear equation EXCEPT:
   A. slope
   B. two points
   C. slope and a point
   D. x and y- intercepts

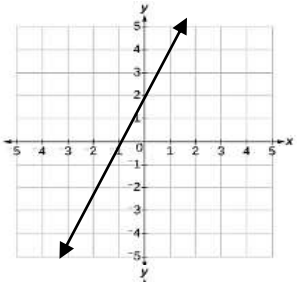
4. Which of these linear equations represent the graph?

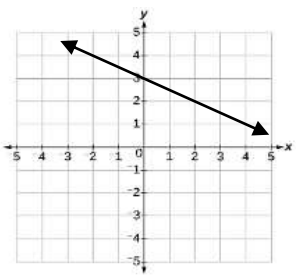


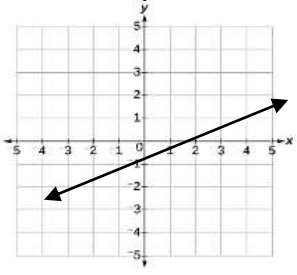
   A. $y = 3x - 2$
   B. $y = -3x - 2$
   C. $y = \frac{2}{3}x + 3$
   D. $y = -\frac{2}{3}x - 3$

5. What does the graph look like when points $(2, -3)$ and $(-4,1)$ are plotted and connected on the Cartesian Plane?

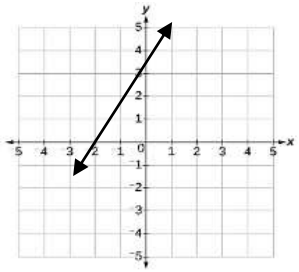
   A.


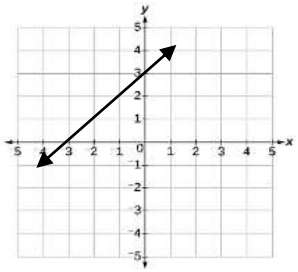
   C.


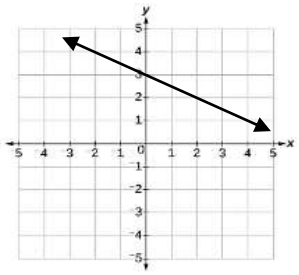
   B.


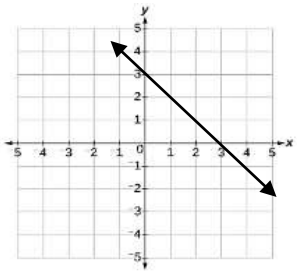
   D.


6. Which of the following is the graph of the equation $y = x + 3$?

A. 

C. 

B. 

D. 

7. Which line passes through the points (1,3) and (−1,5)?

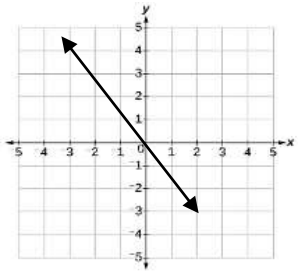
A. $y = x + 4$

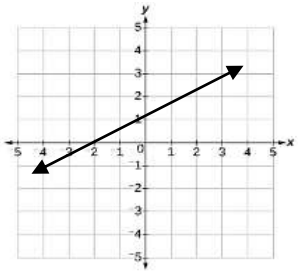
B. $y = x - 4$

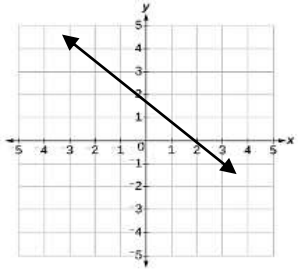
C. $y = -x + 4$

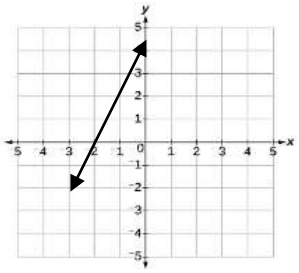
D. $y = -x - 4$

8. What is the graph of a linear equation whose slope is 2 and passes through point (−2,0)?

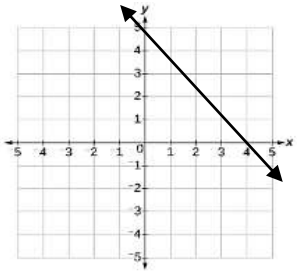
A. 

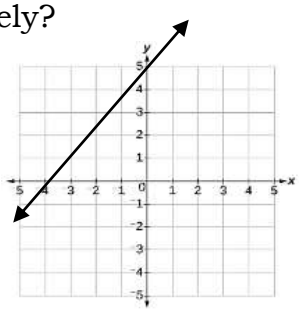
C. 

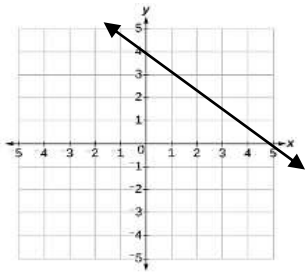
B. 

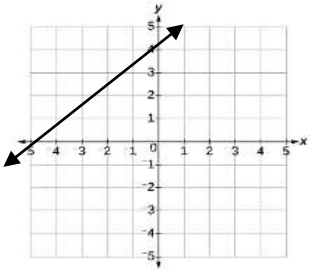
D. 

9. What does the graph look like if the x and y- intercepts of the linear equation are (4,0) and (0,5), respectively?

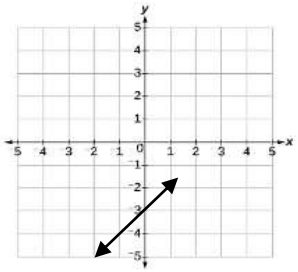
A. 

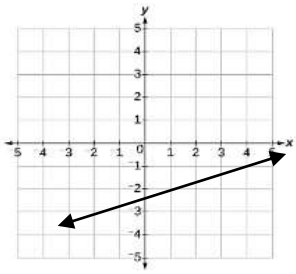
C. 

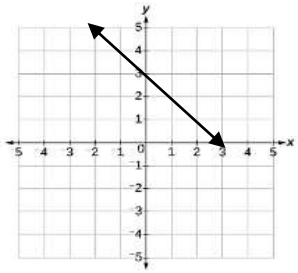
B. 

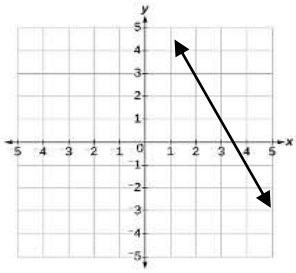
D. 

10. Which of the following shows the graph of a line whose slope is -2 and contains the point $(4,-1)$?

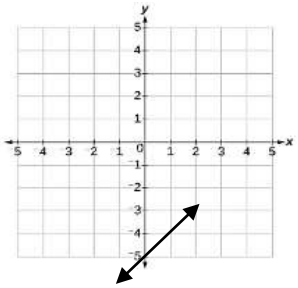
A. 

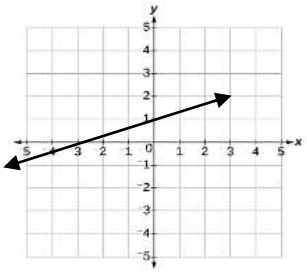
C. 

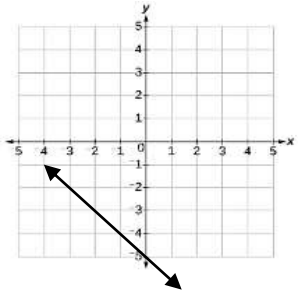
B. 

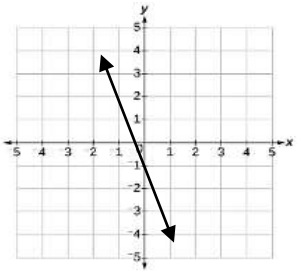
D. 

11. Which of the following shows the graph of $y = x - 5$?

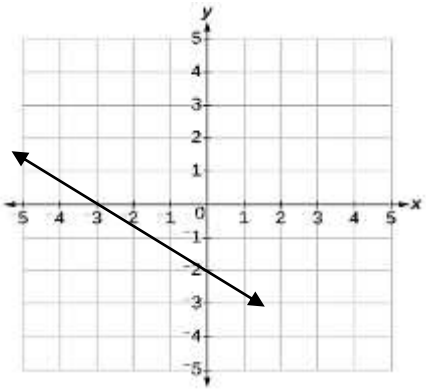
A. 

C. 

B. 

D. 

For items 12-14, consider the graph below.



12. What is the x-intercept of the graph?

A. -3

B. -2

C. $-\frac{2}{3}$

D. $\frac{2}{3}$

13. What is the y-intercept of the graph?

A. -3

B. -2

C. 2

D. 3

14. Which of the following linear equations represents the graph?

A. $y = -\frac{2}{3}x - 2$

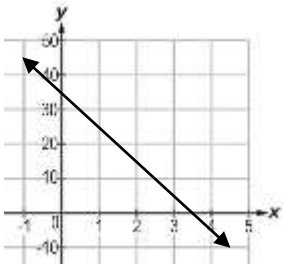
B. $y = \frac{2}{3}x + 2$

C. $y = -\frac{3}{2}x - 3$

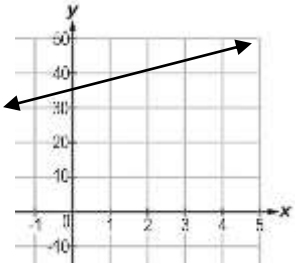
D. $y = \frac{3}{2}x + 3$

15. Due to oil price rollback, Keren fills her car with 35 liters of unleaded gasoline. On the average, her car consumes 10 liters of fuel per hour of travel. Which of the following graphs represent the fuel left in her car (y), after driving for (x) hours?

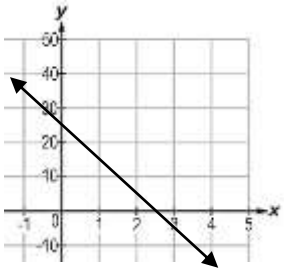
A.



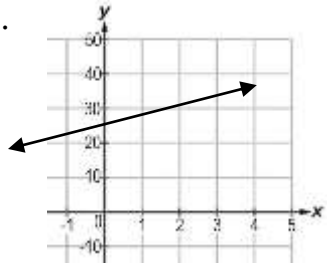
C.



B.



D.



Lesson 1 Graphing a Linear Equation Given (a)Any Two Points; (b)the x- and y – Intercepts; (c) the Slope and a Point on the Line

A first-degree polynomial equation in two variables is said to be a linear equation. The graph of linear equation is a line. It can be drawn in the coordinate plane using different methods such as using any two points on the line, x and y-intercepts on the line, and a slope and a given point.

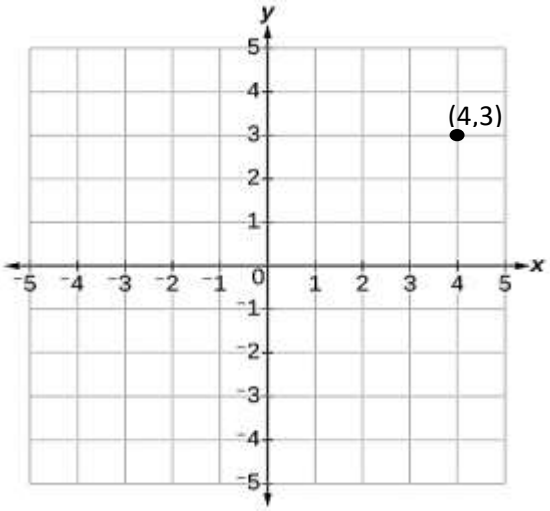
What's In

Recall that, the Cartesian Plane consists of two perpendicular lines x-axis and y-axis intersecting at the origin. The position, direction, and distance of all points in the plane relative to the origin are given by its coordinates, the ordered pair (x, y). The *x-coordinate or abscissa of a point is its horizontal distance from the origin.* The *y-coordinate or the ordinate of a point is its vertical distance from the origin.* Hence, dividing the plane into four regions, Quadrant I, II, III, and IV. Then, any point of the plane can be described using ordered pair of numbers.

Thus, the ordered pair $(4,3)$ is located at quadrant I as it is shown below.

Plot the following ordered pairs on the Cartesian Plane.

1. (2,1)
2. (1,0)
3. (3,2)
4. $(-1,-2)$
5. $(-3,-4)$



What's New

In this activity, you will be able to learn the different ways of drawing a line. This will also guide you on how to graph a linear equation using different methods.

Activity: Let's Begin...

Do as directed. Use a graph paper.

1. Plot the ordered pairs $(2, -3)$ and $(3, 5)$ on the Cartesian Plane. Draw a line that passes through these points and label it l_1.

   Questions:
   a. What have you observed after drawing a line through the given points?
   b. What have you realized about the number of points that we need so that a line can be drawn? Explain briefly.

2. Given the equation $y = x + 4$. If you let $x = 0$, what is the value of y? On the other hand, if you let $y = 0$, what is the value of x? Plot these two points on a Cartesian Plane. Draw a line that passes through these points and label it l_2.

   Questions:
   a. How did you find the value of x and y in the linear equation $y = x + 4$.?
   b. Why did you need to find the value of x and y? Expound your answer

3. The line has a slope of 2 and passes through point (2,4). Show the graph by plotting the points on the Cartesian Plane? Label the graph as l_3.

   Questions:
   a. Is it possible to show the graph if you have a slope of 2 and passes through point (2,4)? Why?

   b. How will you graph if you are given a slope of 2 and passes through point (2,4) respectively?

What is It

A linear equation in two variables can be written either in the form $Ax + By = C$ or $y = mx + b$ where A, B, and C are real numbers, and A and B are not equal to zero. Graphing linear equations can be done using any of the three methods.

1. Using any two points on the line
2. Using x and y- intercepts
3. Using the slope and a point

Using Any Two Points

One method of graphing a linear equation is using any two points. Remember that two points are enough to draw the graph of a linear equation.

Line Postulate

Two points determine a line.

Example 1

Graph the linear equation $y = 2x - 3$.

Solution:

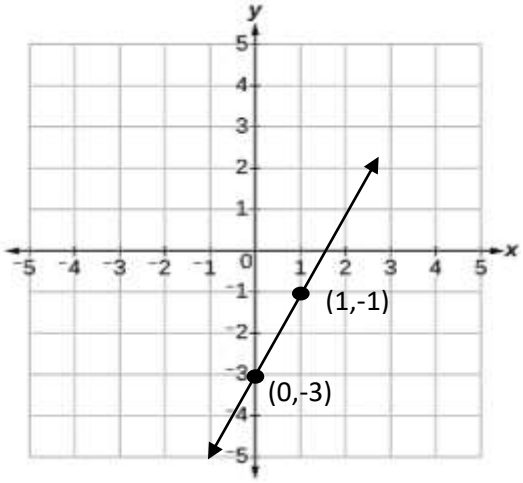
You may assign any two arbitrary values of x, say 0 and 1, and then solve for the corresponding value of y.

By substitution,

$y = 2x - 3$	When $x = 1$
$y = 2(0) - 3$	$y = 2x - 3$
$y = 0 - 3$	$y = 2(1) - 3$
$\boldsymbol{y = -3}$	$y = 2 - 3$
	$\boldsymbol{y = -1}$

The solution shown above implies that if $x = 0$, then $y = -3$. Also, if $x = 1$, then $y = -1$. Thus, the ordered pairs are $(0, -3)$ and $(1, -1)$, respectively. This means that the line passes through these points.

Plot these points and draw a line through them.



Using x and y-intercept

Another way of graphing a linear equation in two variables is by using the x-intercept $\boldsymbol{a}$ and the y-intercept $\boldsymbol{b}$. The x and y- intercepts of the line could represent two points, which are $\boldsymbol{(a, 0)}$ and $\boldsymbol{(0, b)}$**.** So, the intercepts are enough to draw the graph of a linear equation.

Note

The ***x*-intercept** is the abscissa of the point where the graph or line crosses the x-axis. This implies that the point is on the $x - axis$ then the ordinate is 0, $(x, 0)$. Similarly, since the ***y*-intercept** is the ordinate of the point where the graph or line crosses the y-axis, this implies that the point is on the y-axis, hence, the abscissa is 0, $(0, y)$.

Example 2

Graph the linear equation $y = 2x - 3$.

Solution:

To find the x-intercept of a line given its equation, let $y = 0$, then solve for x. To find the y-intercept, let $x = 0$, then solve for y.

Letting $y = 0$, the equation $y = 2x - 3$ becomes;

$0 = 2x - 3$	Substitution
$0 + (-2x) = 2x - 3 + (-2x)$	Inverse Property for Addition
$0 - 2x = 2x - 3 - 2x$	Distributive Property
$0 - 2x = 2x - 2x - 3$	Commutative Property
$0 - 2x = (2x - 2x) - 3$	Associative Property for Addition
$0 - 2x = 0 - 3$	Simplified
$-2x = -3$	Identity Property for Addition
$\left(\frac{1}{2}\right)(-2x) = \left(\frac{1}{2}\right)(-3)$	Inverse Property for Multiplication
$-x = -\frac{3}{2}$	Simplified
$(-1)(-x) = (-1)\left(-\frac{3}{2}\right)$	Multiplication Property
$\boldsymbol{x = \frac{3}{2}}$	

Hence, the x -intercept is $\frac{3}{2}$. In symbol, $a = \frac{3}{2}$. Then the point in the x - axis is $\left(\frac{3}{2}, 0\right)$.

To find the y-intercept, let $x = 0$, then solve for y.

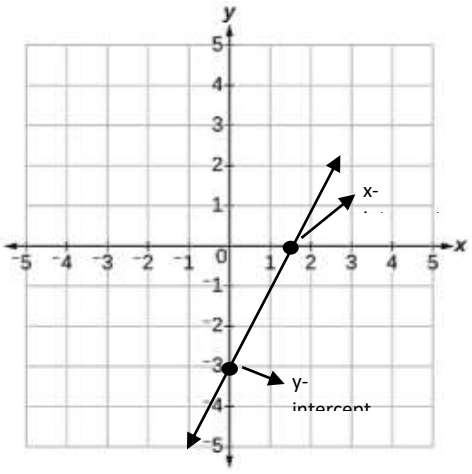
Letting $x = 0$, $y = 2x - 3$ becomes;

$y = 2(0) - 3$	Substitution
$y = 0 - 3$	Identity Property for Addition
$\boldsymbol{y = -3}$	

Hence, the y-intercept is -3. In symbol, $b = -3$. The point in the y-axis is $(0, -3)$.

The x-intercept $\boldsymbol{a}$ is $\frac{3}{2}$ while the y-intercept $\boldsymbol{b}$ is -3.

Now, plot the x and y-intercepts, then draw a line that passes through them.



Using Slope and One Point

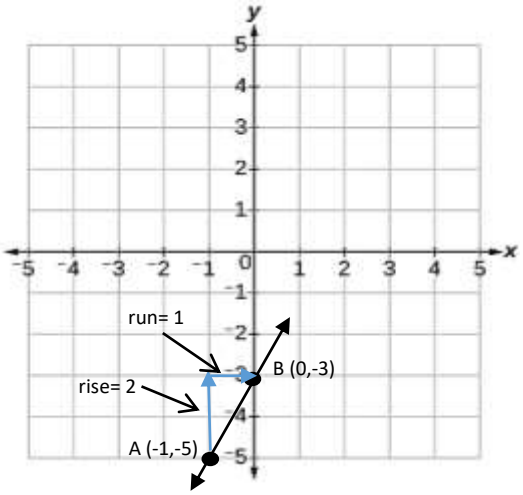
Graphing linear equation can also be done using the slope and one point.

Example 3

Graph the line whose slope is 2 and contains the point $(-1, -5)$.

Solution:

1. Plot the given point. $(-1, -5)$
2. Use the slope formula $m = \frac{rise}{run}$ to identify the rise and the run.
   The slope of the line is 2 which is equal to $\frac{2}{1}$.
   Note: *If the slope is positive, the graph moves upward; if the slope is negative, the graph moves downward.*
3. Starting at the given point $(-1, -5)$, count out the rise *(2 units up)* and run
   (1 unit to the right) to mark the second point. (Note that the slope is positive)
4. Draw a line passing the points.



What's More

Activity 1: Using Two Points

Graph each linear equation that passes through the given pair of points. Use graph paper.

1. (2, 2) and (4, 5)
2. $(0, \frac{1}{2})$ and $(2, \frac{3}{2})$
3. (-1, 2) and (5, 0)
4. (-5, -3) and (-3, 5)

Questions:

a. What did you feel as you performed the activity?
b. Were you able to plot the given pair of points on the Cartesian Plane?
c. Did you find any difficulty in the conduct of the activity? Elaborate your answer.

Activity 2: Using x-Intercept and y-Intercept

Using a graph paper, graph each linear equation whose x-intercept a and y-intercept b are given below, then answer the questions that follow.

1. a = -2 and b = -4
2. a = 1 and b = 3
3. a = 3 and b = -5
4. a = 4 and b = 2

Questions:

1. Were you able to graph a line given the intercept? How did you graph a linear equation whose x and y- intercepts are given?
2. Is graphing a linear equation given its x- and y- intercepts easy? Why or why not?

Activity 3: Using Slope and One Point

Graph each linear equation given slope m and a point, then answer the questions that follow. Use graph paper.

1. (3, 1) and m = 2
2. (-1, 4) and m = -1
3. (0, 1) and $m = \frac{3}{2}$
4. (2, -1) and m = -3

Questions:

1. Were you able to graph a line given a slope and a point?
2. How did you graph a linear equation whose slope and a point are given?

What I Have Learned

Fill in the diagram below the steps in graphing a linear equation using different methods.

Using Two Points

STEPS

1.
2.

Using x- and y- Intercepts

STEPS

1.
2.
3.

Using Slope and One Point

STEPS

1.
2.
3.
4.

What I Can Do

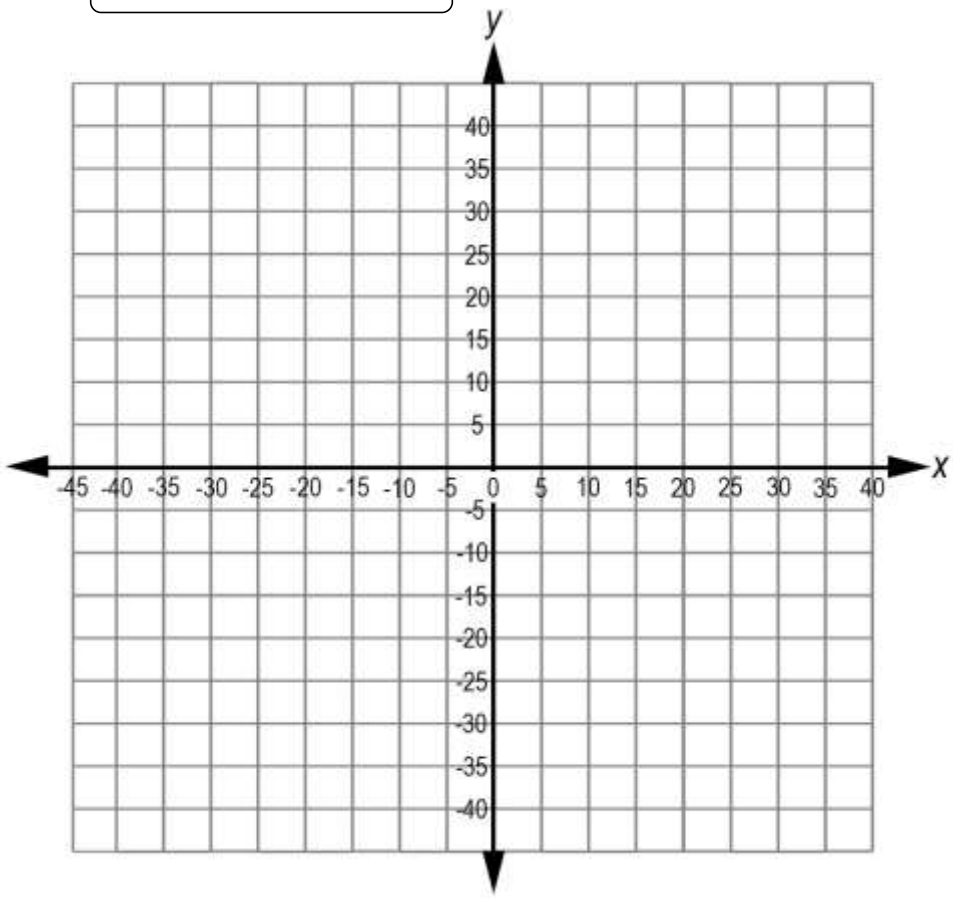
Direction: Read and analyze the problem, then give what is asked.

Problem

Mr. Vasco operates a bike rental service in the park. Initially it costs Php 15 to rent a bike, and an additional Php 5 for every hour you use it. Brian rent a bike for 4 hours, how much will he pay? Plot the points in the graph paper.

Solution:

Equation: _____



Questions:

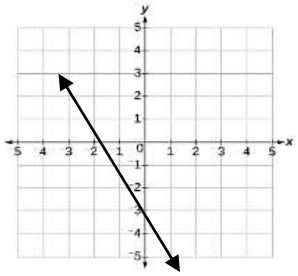
1. How much did you spend after 4 hours?
2. What method did you use in graphing the linear equation?

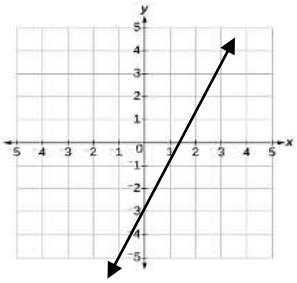
Assessment

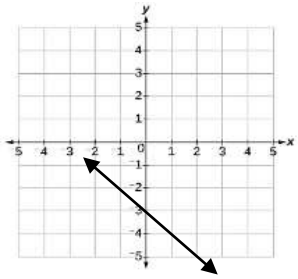
Multiple Choice: Choose the letter of the correct answer for each item below and write them on your answer sheet.

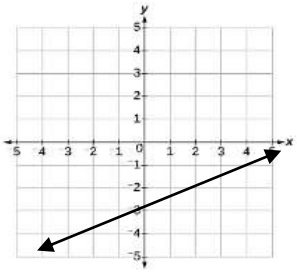
1. Which of the following is true about the graph of a linear equation?
   A. It is a line.
   B. It is an ellipse.
   C. It is a parabola.
   D. It is a hyperbola.

2. Which of the following shows the graph of the equation $x + y = -3$?

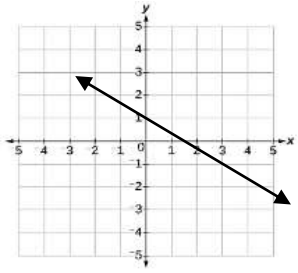
A. 

C. 

B. 

D. 

3. Which linear equations represents the graph?



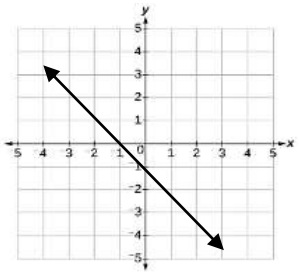
A. $y = -\frac{2}{3}x + 1$

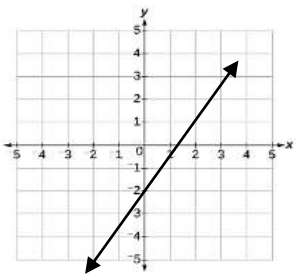
B. $y = -\frac{3}{2}x + 1$

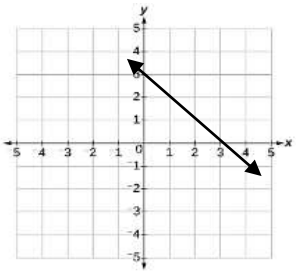
C. $y = 2x + 1$

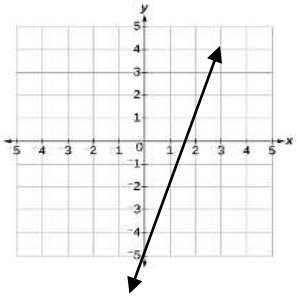
D. $y = x + 2$

4. Which of the following shows the graph of a line whose slope is 3 and passes through point (2,1)?

A. 

C. 

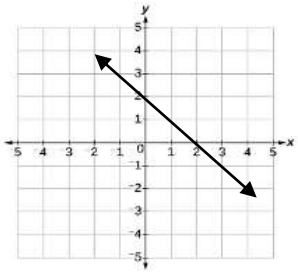
B. 

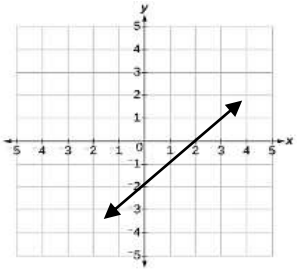
D. 

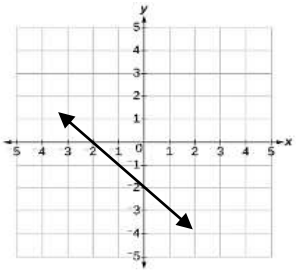
5. Which line passes through the points $(-1, 0)$ and $(0, -2)$?

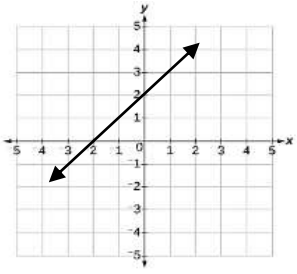
A. $y = 2x + 2$
B. $y = 2x - 2$
C. $y = -2x + 2$
D. $y = -2x - 2$

6. What does the graph of the line look like if the x and y-intercepts are (2,0) and (0,2), respectively?

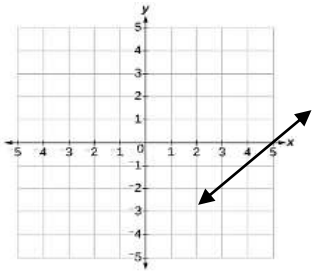
A. 

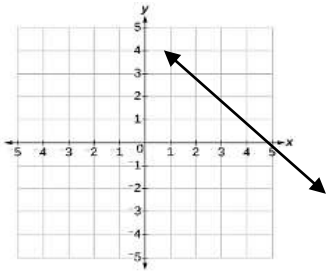
C. 

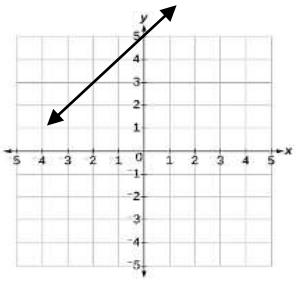
B. 

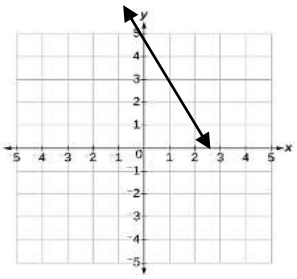
D. 

7. Which of the following shows the graph of the equation $y = x + 5$?

A. 

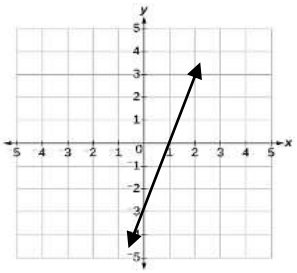
C. 

B. 

D. 

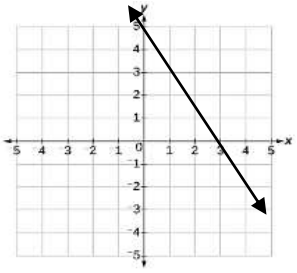
8. What is the slope of the linear equation whose graph is shown below?

A. 3
B. -3
C. $\frac{1}{3}$
D. $-\frac{1}{3}$



9. What are the intercepts of the linear equation whose graph is shown below?

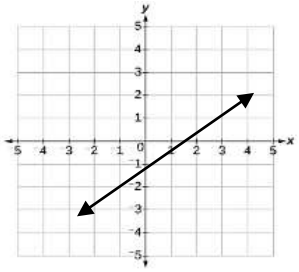
A. $a = 3; b = 5$
B. $a = 5; b = 3$
C. $a = -3; b = -5$
D. $a = -5; b = -3$

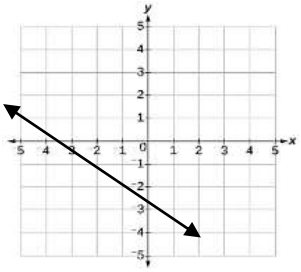


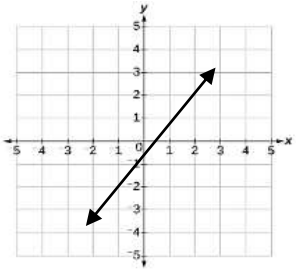
10. Which among the choices is the abscissa of a point?

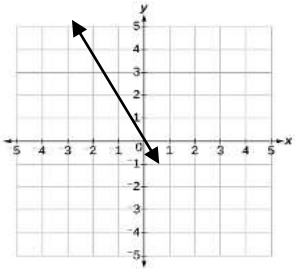
A. $x-$ intercept
B. $x-$ coordinate
C. $y-$ intercept
D. $y-$coordinate

11. What is the graph of the linear equation whose slope is $-\frac{3}{4}$ and passes through the point $(-1, -2)$?

A. 

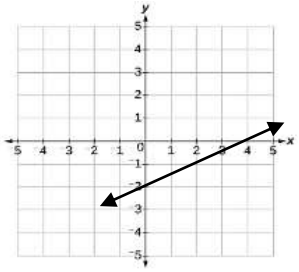
C. 

B. 

D. 

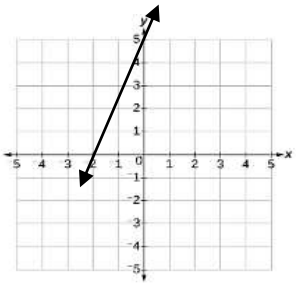
12. What are the intercepts of the linear equation whose graph is shown below?

A. $a = 2; b = -4$
B. $a = 4; b = -2$
C. $a = -2; b = -4$
D. $a = -4; b = -2$



13. Which of the following linear equations represents the graph?

A. $y = \frac{5}{2}x + 5$
B. $y = \frac{2}{5}x + 5$
C. $y = -\frac{5}{2}x - 2$
D. $y = \frac{2}{5}x - 2$

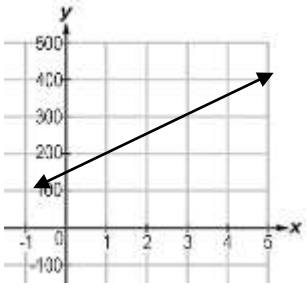


14. You are asked by your teacher to graph the linear equation whose slope and a point are given. What will you do first?

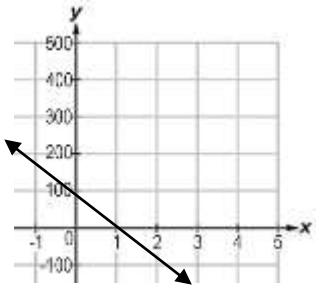
A. Plot the given point.
B. Draw a line passing the points.
C. Use the slope to identify the rise and the run.
D. From the given point, count out the rise and run.

15. Miss Reyes provides math tutorial services. The initial charge for each session is Php 150, with an additional fee of Php 50 per hour. Which of the graphs below reflect the total tutorial session payment (y) in (x) hours?

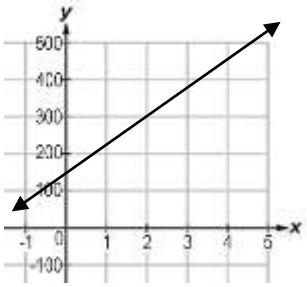
A.



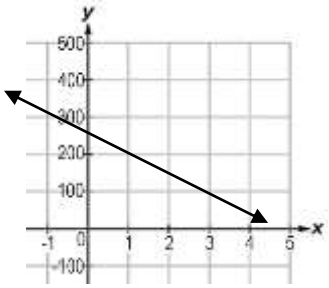
C.



B.



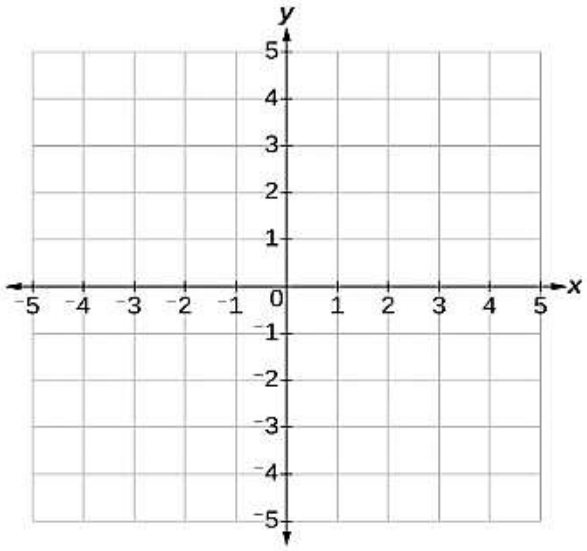
D.



Additional Activities

Directions: Sketch the graph of each linear equation using any of the three methods presented. Use a graphing paper.

1. $x - y + 3 = 0$
2. $y = \frac{1}{4}x - 2$
3. $y = -\frac{3}{2}x + 1$



Answer Key

Additional Activities

What I have Learned

USING TWO POINTS

1. Plot the given points on the Cartesian Plane.
2. Draw a line that passes through these points.

USING x- AND y-INTERCEPTS

1. Solve the x- and y-intercepts by letting y=0 and x=0, respectively.
2. Plot the x- and y- intercepts on the Cartesian Plane.
3. Draw a line that passes through these points.

USING SLOPE AND A POINT

1. Plot the given point on the Cartesian Plane.
2. Use the slope formula to identify the rise and the run.
3. Starting at the given point, count out the rise and run to mark the second point.
4. Draw a line passing the points.

Assessment

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

What Can I Do

Equation

$y = 5x + 15$

What's More

Activity 1

Activity 2

Activity 3

What's New

What I Know

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

References

Abuzo, Emmanuel P., Bryant, Merden L., Cabrella, Jem Boy B. Caldez, Belen P., Callanta, Melvin M., Castro, Anastacia Preserfina I., Halabaso, Alicia R., Javier, Sonia P., Nocom, Roger T., and Ternida, Conception S. (2013). Grade 8 Mathematics Learners Module. pp. 181-183. Philippines. Book Media Press, Inc. and Printwell, Inc.

Orines, Fernando B., et.al. (2017). Second Edition Next Century Mathematics, pp. 101-105, Manila, Philippines.

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