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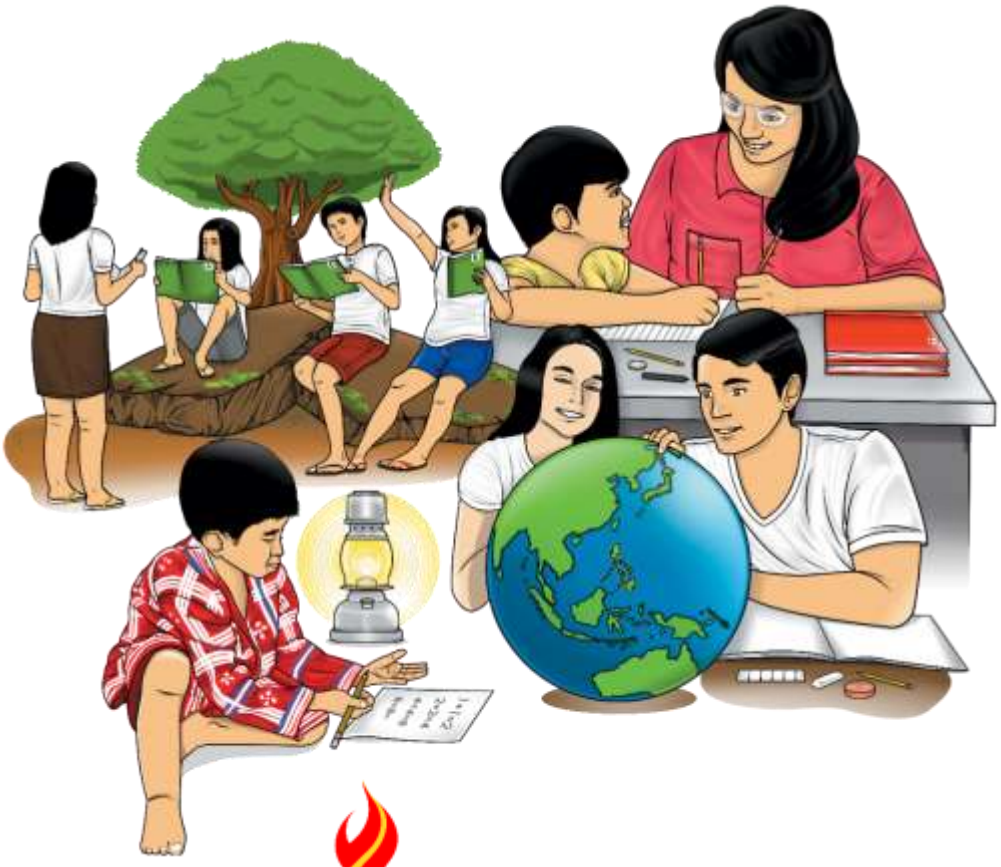
DEPARTMENT OF EDUCATION

Mathematics

Quarter 1 – Module 10

Graphing Linear Equations



ALTERNATIVE DELIVERY MODE
ADM

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NOT FOR SALE

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

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8

Mathematics

Quarter 1 – Module 10

Graphing Linear Equations

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Introductory Message

For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Graphing Linear Equations!

This module was collaboratively designed, developed and reviewed by educators both from public and private institutions to assist you, the teacher or facilitator in helping the learners meet the standards set by the K to 12 Curriculum while overcoming their personal, social, and economic constraints in schooling.

This learning resource hopes to engage the learners into guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st century skills while taking into consideration their needs and circumstances.

In addition to the material in the main text, you will also see this box in the body of the module:

Notes to the Teacher

This contains helpful tips or strategies that will help you in guiding the learners.

As a facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their own learning. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the module.

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Graphing Linear Equations!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

What I Need to Know	This will give you an idea of the skills or competencies you are expected to learn in the module.
What I Know	This part includes an activity that aims to check what you already know about the lesson to take. If you get all the answers correct (100%), you may decide to skip this module.
What's In	This is a brief drill or review to help you link the current lesson with the previous one.
What's New	In this portion, the new lesson will be introduced to you in various ways; a story, a song, a poem, a problem opener, an activity or a situation.
What is It	This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.
What's More	This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.
What I Have Learned	This includes questions or blank sentence/paragraph to be filled in to process what you learned from the lesson.
What I Can Do	This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.
Assessment	This is a task which aims to evaluate your level of mastery in achieving the learning competency.
Additional Activities	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned.
Answer Key	This contains answers to all activities in the module.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your teacher/facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

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. realize the importance of graphing linear equations in dealing real-life problems.

What I Know

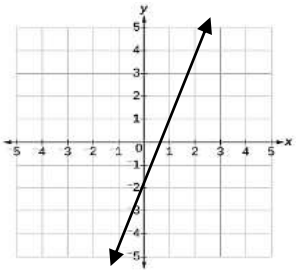
Choose the letter of the correct answer. Write your answer on a separate sheet of paper.

1. Which is TRUE about a linear equation?
   A. It is an equation whose graph is a parabola.
   B. It is an equation which has two solutions.
   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 C. line
   B. hyperbola D. parabola

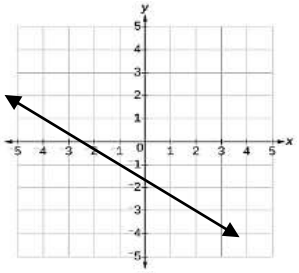
3. The following can be used in graphing a linear equation EXCEPT:
   A. slope
   B. two points
   C. slope and a point
   D. x and y- intercepts

4. Which of these linear equations represents 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.



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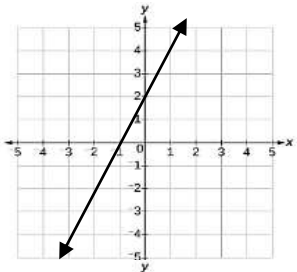

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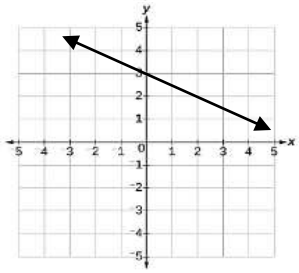

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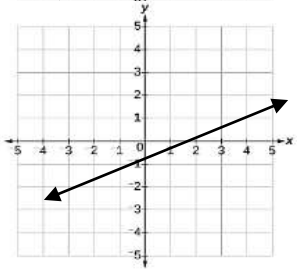
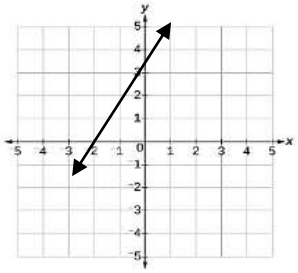
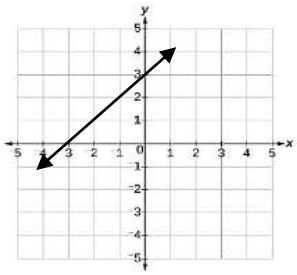
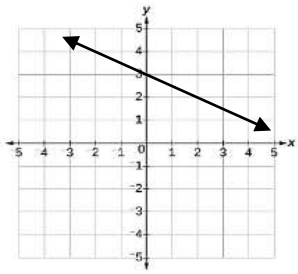
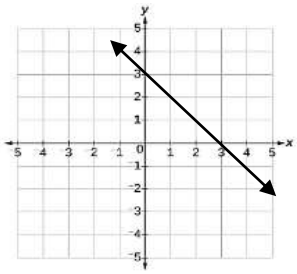


6. Which of the following is the graph of the equation $y = x + 3$?

A. 

C. 

B. 

D. 

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

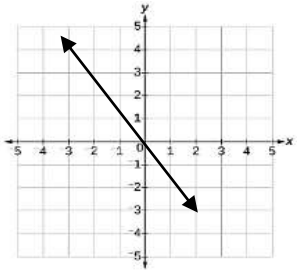
A. $y = x + 4$

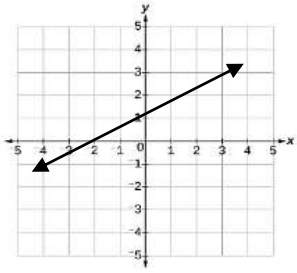
C. $y = -x + 4$

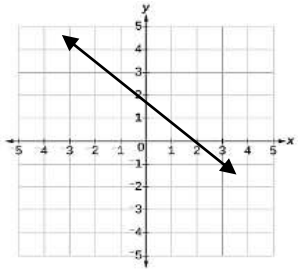
B. $y = x - 4$

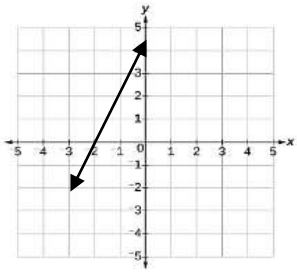
D. $y = -x - 4$

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

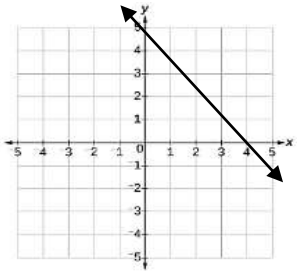
A. 

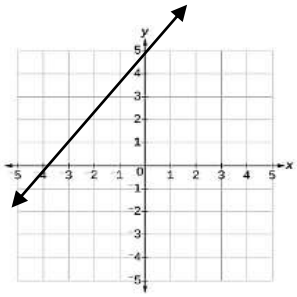
C. 

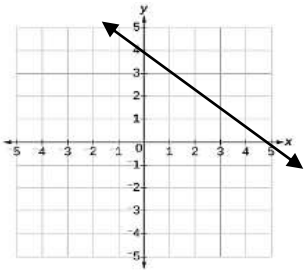
B. 

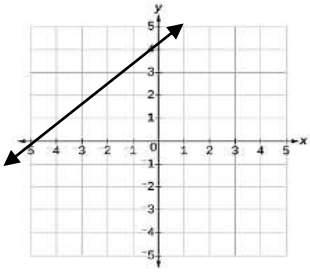
D. 

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

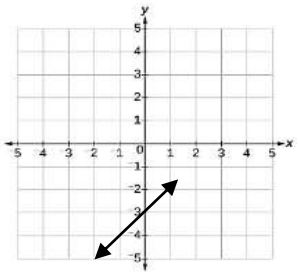
A. 

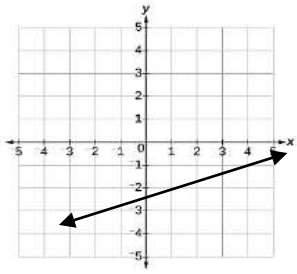
C. 

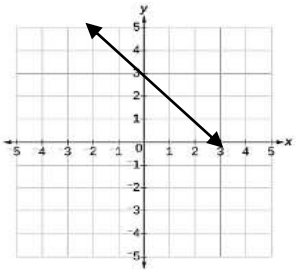
B. 

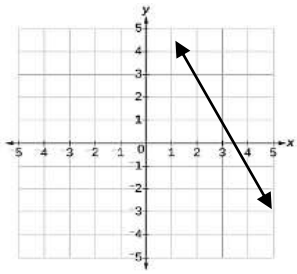
D. 

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

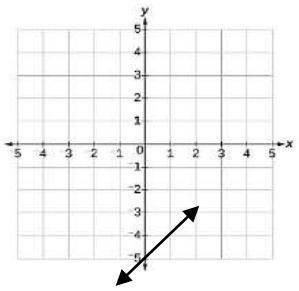
A. 

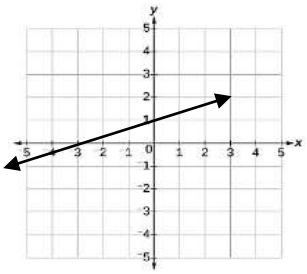
C. 

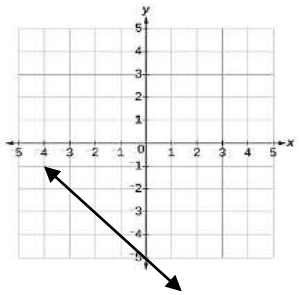
B. 

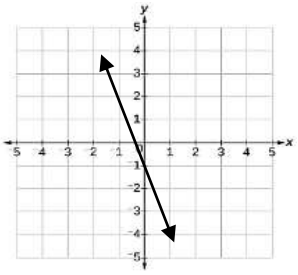
D. 

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

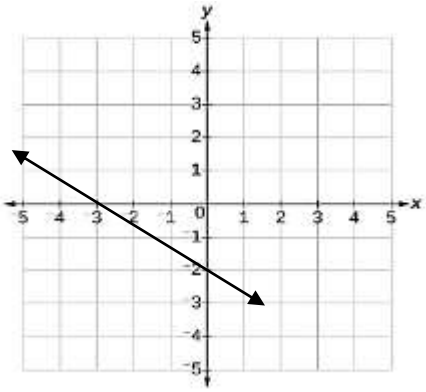
A. 

C. 

B. 

D. 

For items 12-14, consider the graph below.



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

A. -3

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

B. -2

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

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

A. -3

C. 2

B. -2

D. 3

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

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

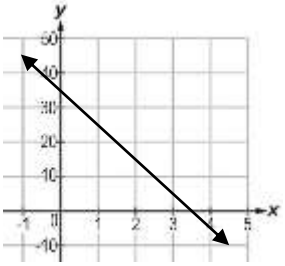
C. $y = -\frac{3}{2}x - 3$

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

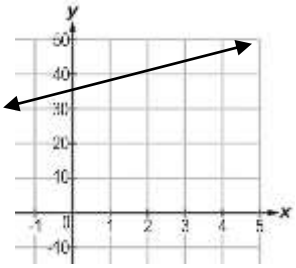
D. $y = \frac{3}{2}x + 3$

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.



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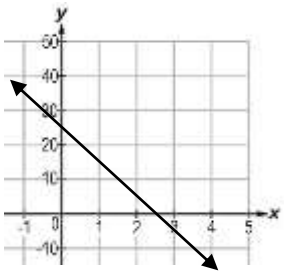

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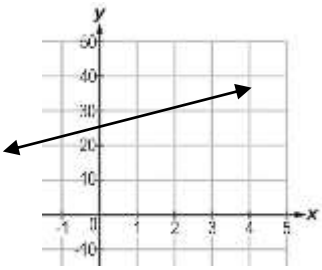


Lesson 1	Graphing a Linear Equation Given (a)Any Two Points; (b)the x- and y – Intercepts; (c) the Slope and a Point on the Line

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.

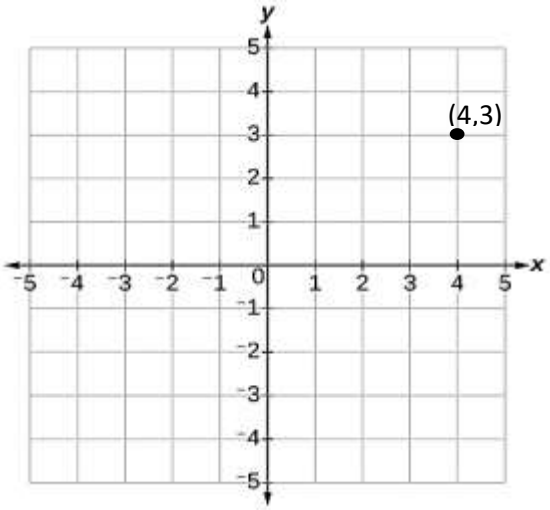
What's In

Recall that, the Cartesian Plane is consist of two perpendicular number lines 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, divided the plane into four regions, Quadrant I, II, III, and IV. Then, we can describe any point of the plane 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. $(-3,-4)$



Notes to the Facilitator

This module is designed for learners to cope up with the lessons they failed to attend. Please facilitate in the conduct of the module. In answering the activities in What's More phase, allow the learners to use a graph paper. Queries and clarifications will be entertained however this module is self-directed thus, encouraging learners to learn and work self-reliantly.

What's New

In this activity, the students will be able to learn the different ways of drawing a line. This will also guide them how to graph a linear equation in 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:

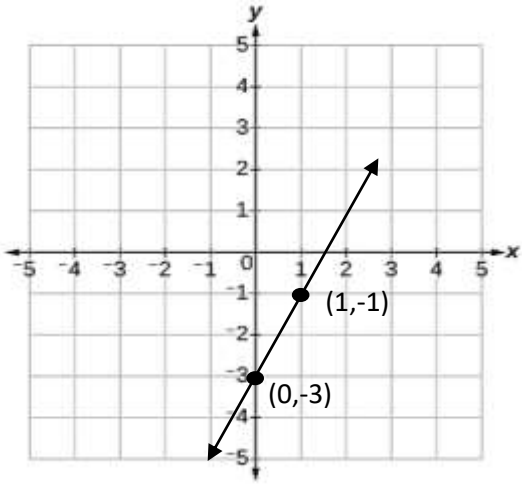
You may assign any two arbitrary values of x, say 0 and 1, and then solve for the corresponding value of y.

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
$0 - 2x = (2x - 2x) - 3$	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.

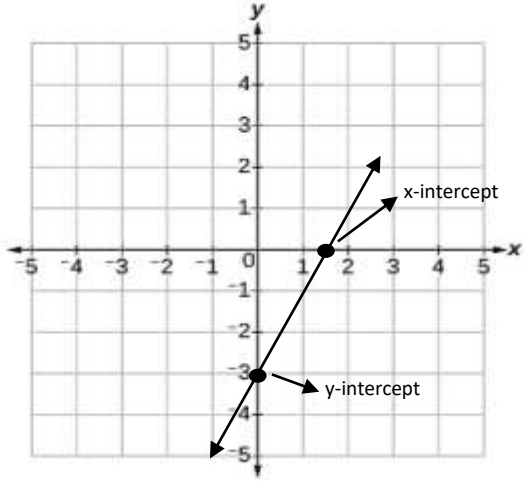
Letting $x = 0$, $y = 2x - 3$ becomes;

$y = 2(0) - 3$	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

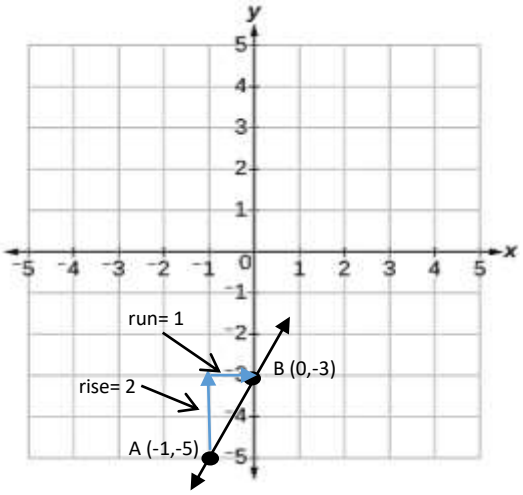
Graphing linear equation can also be done using the slope and one point.

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 $\frac{2}{1}$.
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 perform 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 all the equations given? 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 all the equations given?
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

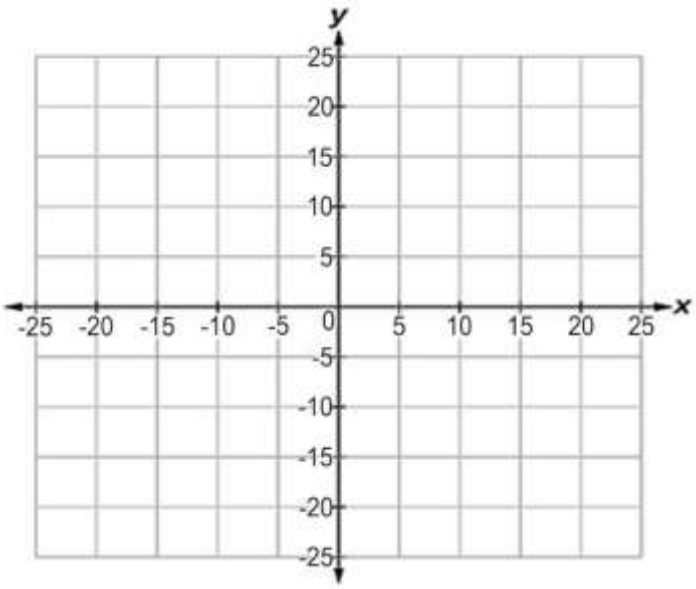
Directions: Read and analyze the problem, then give what is asked.

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. Give the equation that models the situation and show the graph representing the cost (y) of using the bike for (x) hours.

Solution:

Equation:



Questions:

1. What are your thoughts and feelings as you perform the activity?
2. What method did you use in graphing the linear equation?

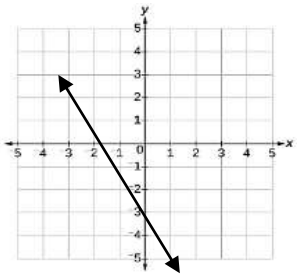
Assessment

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

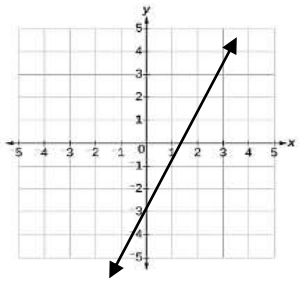
1. Which of the following is true about the graph of a linear equation?
   A. It is a line.
   B. It is an ellipse.
   C. It is a parabola.
   D. It is a hyperbola.

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

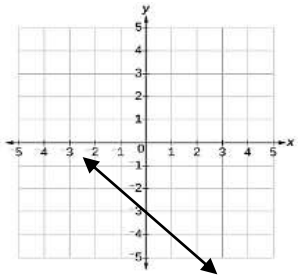
A.



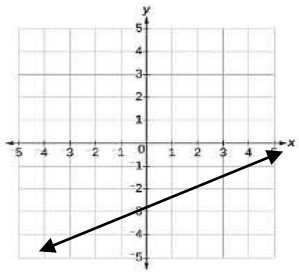
C.



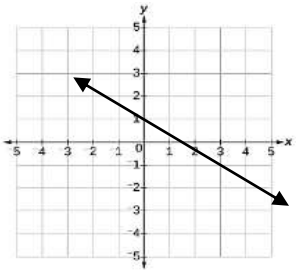
B.



D.



3. Which linear equations represents the graph?



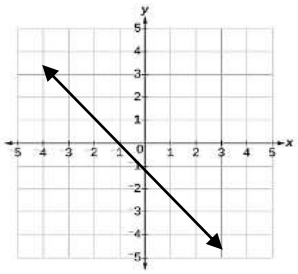
A. $y = -\frac{2}{3}x + 1$

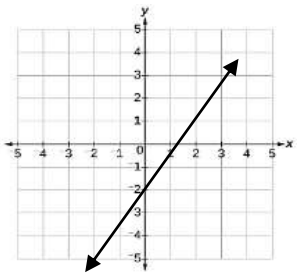
B. $y = -\frac{3}{2}x + 1$

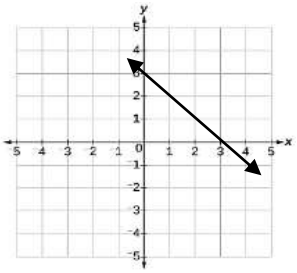
C. $y = 2x + 1$

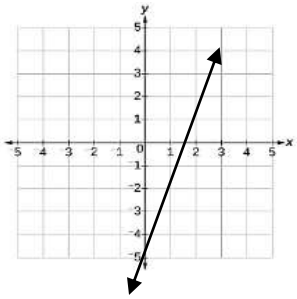
D. $y = x + 2$

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

A. 

C. 

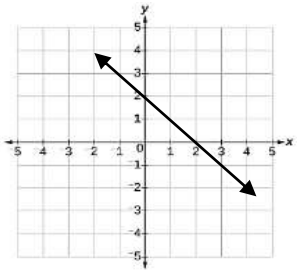
B. 

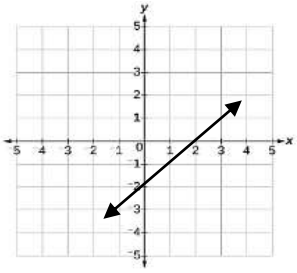
D. 

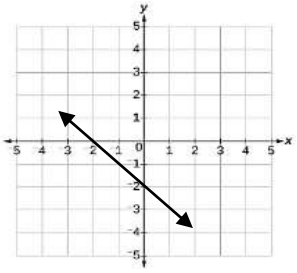
5. Which line passes through the points $(-1, 0)$ and $(0, -2)$?

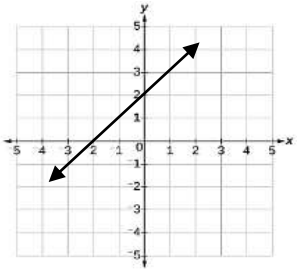
A. $y = 2x + 2$
B. $y = 2x - 2$
C. $y = -2x + 2$
D. $y = -2x - 2$

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

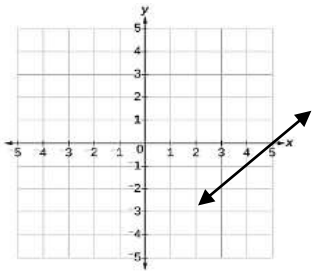
A. 

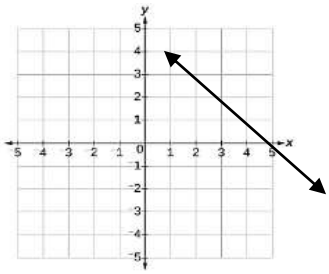
C. 

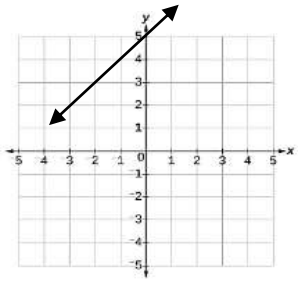
B. 

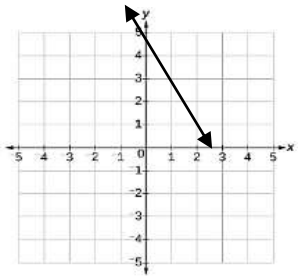
D. 

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

A. 

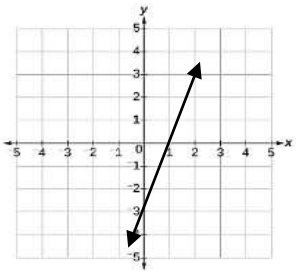
C. 

B. 

D. 

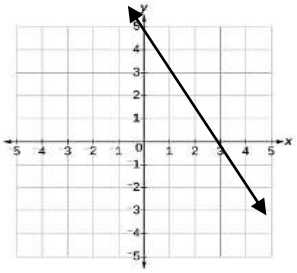
8. What is the slope of the linear equation whose graph is shown below?

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?

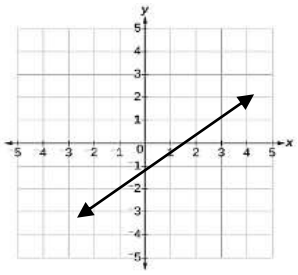
A. $x - intercept: 3; y - intercept: 5$
B. $x - intercept: 5; y - intercept: 3$
C. $x - intercept: -3; y - intercept: -5$
D. $x - intercept: -5; y - intercept: -3$

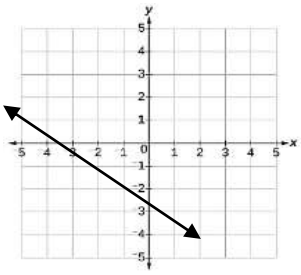


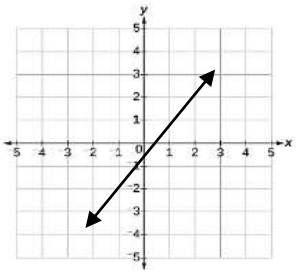
10. Which among the choices is the abscissa of a point?

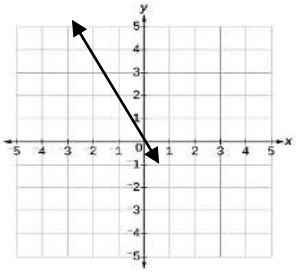
A. $x-$ intercept
B. $x-$ coordinate
C. $y-$ intercept
D. $y-$coordinate

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

A. 

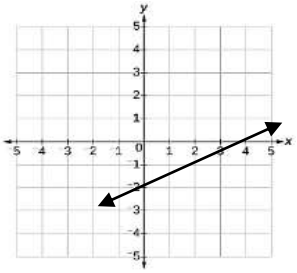
C. 

B. 

D. 

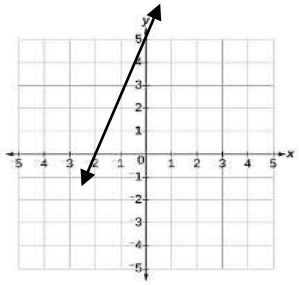
12. What are the intercepts of the linear equation whose graph is shown below?

A. $x - intercept: 2; y - intercept: -4$
B. $x - intercept: 4; y - intercept: -2$
C. $x - intercept: -2; y - intercept: -4$
D. $x - intercept: -4; y - intercept: -2$



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

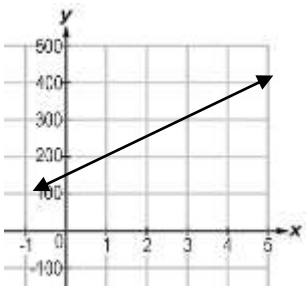


14. You are asked by your teacher to graph the linear equation whose slope and a point are given. What will you do first?

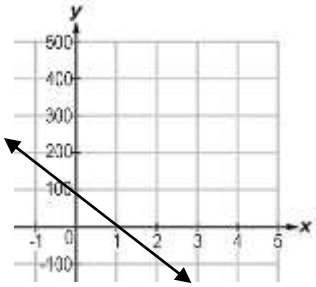
A. Plot the given point.
B. Draw a line passing the points.
C. Use the slope to identify the rise and the run.
D. From the given point, count out the rise and run.

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?

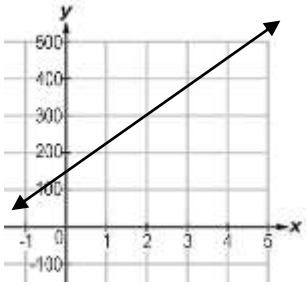
A.



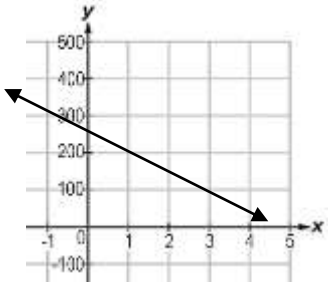
C.



B.



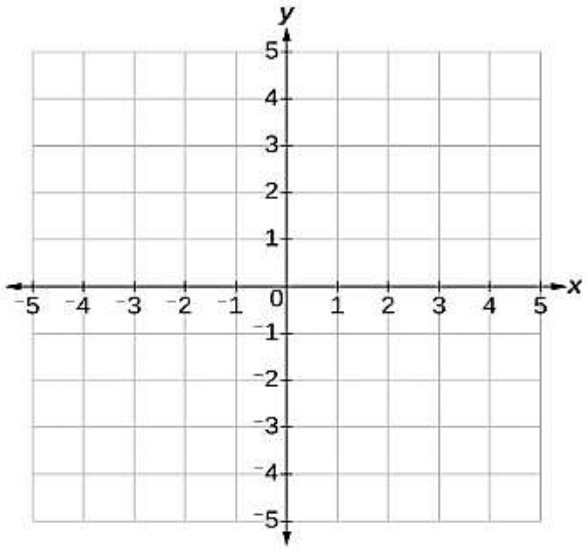
D.



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:

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