

8

Mathematics

Quarter 1 – Module 6: Linear Equation



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Mathematics – Grade 8

Alternative Delivery Mode

Quarter 1 – Module 6: Writing linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa

Graphing linear equation given a) any two points; b) the x- and y-intercepts; c) the slope and a point on the line

Describing the graph of a linear equation in terms of its intercepts and slope

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Mathematics 8

Quarter 1 – Module 6:

Writing linear equation

$Ax + By = C$ in the form $y = mx + b$ and vice versa

**Graphing linear equation given
a) any two points; b) the x- and
y-intercepts; and c) the slope
and a point on the line**

**Describing the graph of a linear
equation in terms of its
intercepts and slope**

Introductory Message

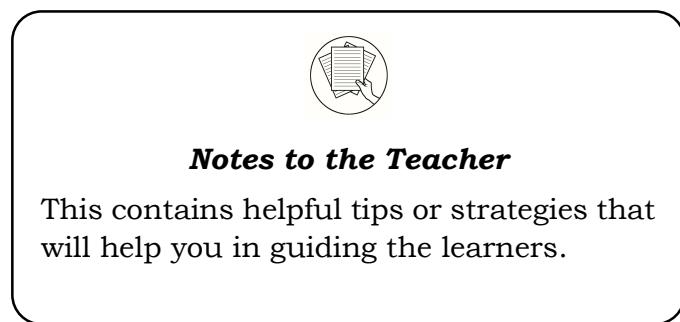
For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Writing linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa; Graphing linear equation given a) any two points; b) the x- and y-intercepts; c) the slope and a point on the line; and Describing the graph of a linear equation in terms of its intercepts and slope!

This module was collaboratively designed, developed and reviewed by educators from both public and private institutions to assist you, the teacher or facilitator in helping 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 students into guided and independent learning activities at their own pace. 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:



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 learners as they do the tasks included in the module.

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Writing linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa; Graphing linear equation given a) any two points; b) the x- and y-intercepts; c) the slope and a point on the line; and Describing the graph of a linear equation in terms of its intercepts and slope!

The hand is one of the most symbolized parts of the human body. It is often used to depict skill, action and purpose. Through our hands we may learn, create and accomplish many things. Hence, the hand in this learning resource signifies that you as a learner are capable and empowered to successfully achieve the relevant

competencies and skills at your own pace and time. Your academic success lies in your own hands!

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace. 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 you are to take. If you get all the answers correctly (100%), you may 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 such as 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 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 part offers questions, or a fill-in-the-blank sentence/paragraph, to enable you to process what you have 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, other activities will be given to you to enrich your knowledge or skill of the



Answer Key

lesson learned. This also aids in the retention of learned concepts.

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 instructions 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

This module was designed and written with you in mind. It is here to help you master writing linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa; graphing linear equation given a) any two points; b) the x- and y-intercepts; c) the slope and a point on the line; and describe the graph of a linear equation in terms of its intercepts and slope. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are 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.

The module is divided into three lessons, namely:

Lesson 1 – Writing linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa

Lesson 2 – Graphing linear equation given a) any two points; b) the x- and y-intercepts; c) the slope and a point on the line

Lesson 3 – Describing the graph of a linear equation in terms of its intercepts and slope

After going through this module, you are expected to:

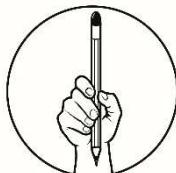
1. write a linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa;
2. graph a linear equation given any two points, the x- and y-intercepts, and the slope and a point on the line;
3. describe the graph of a linear equation; in terms of its intercepts and slope;
4. exhibit patience and perseverance in working with each topic.

Lesson 1

Writing linear equation $Ax + By = C$ By $= C$ in the form $y = mx + b$ and vice versa

A linear equation in the form $Ax + By = C$ where A, B, and C are real numbers and A & B cannot both be zero can be written in the form $y = mx + b$. Take note that we are going to use capital letters to represent the coefficients of x, and y to differentiate B, the coefficient of y, from b which represents the y-intercept.

This equation $y = mx + b$ is called the **slope-intercept form**. In this form of equation, you can easily identify the value of the slope (m) and the y-intercept (b).



What I Know

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

1. In the linear equation $Ax + By = C$, which of the following statements is always **TRUE**?

A. a, b & c are whole numbers	C. a & b can be both zero
B. a, b, & c cannot be negative	D. a & b cannot both be zero
2. What is the slope and y-intercept of the line whose equation is $y = 4x - 5$?

A. $m = 4$, $b = 5$	C. $m = 5$, $b = 4$
B. $m = 4$, $b = -5$.	D. $m = -5$, $b = 4$
3. Convert the equation $2x - 4y = 8$ in the form $y = mx + b$.

A. $y = \frac{1}{2}x - 2$	C. $y = 2x - 4$
B. $y = \frac{1}{2}x - 4$	D. $y = \frac{1}{2}x + 2$
4. Write the linear equation $y = 3x + 5$ in the form $ax + by = c$.

A. $3x + y = 5$	C. $-3x + y = -5$
B. $3x + y = -5$	D. $3x - y = -5$
5. The equation of a line given by $y = mx + b$ is also called _____.

A. slope & intercept form	C. slope-intercept form
B. slope-point form	D. point-slope form



What's In

In the previous lesson, you learned how to find the slope. Let's say, you were asked to find the slope of $2x + 3y = 6$.

To find the slope of $2x + 3y = 6$, we need to transform this equation into slope-intercept form, so you need to arrange it in the form $y = mx + b$. Here's how:

$$2x + 3y = 6$$

given

$$3y = -2x + 6$$

subtract 2x from both sides

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

divide both sides by 3

Now that $2x + 3y = 6$ is in the form

$y = \frac{-2}{3}x + 2$, you can already identify

the slope which is the coefficient of x. Slope is $\frac{-2}{3}$.

Writing the equation $2x + 3y = 6$ in the form $y = \frac{-2}{3}x + 2$ is just like transforming

$Ax + By = C$ in the form $y = mx + b$

Find the slope of the following:

1. $5x + 3y = 8$
2. $2x - 5y = 4$
3. $6x + 3y = -9$



What's New

In this lesson, you will learn the transformation of $Ax + By = C$ in slope-intercept form ($y = mx + b$). Remember to use capital letter A for the coefficient of x and capital letter B for the coefficient of y, to differentiate B (the coefficient of y) from b (y-intercept) for the coefficient of x.

In the equation $Ax + By = C$; A, B, & C are real numbers and neither A nor B should zero.

To write the equation $Ax + By = C$ in the form $y = mx + b$.

$$Ax + By = C \quad \text{given}$$

$$By = -Ax + C \quad \text{subtract } Ax \text{ from both sides}$$

$$y = \frac{-A}{B} x + \frac{C}{B} \quad \text{divide both sides by } B$$

$$y = \frac{-A}{B} x + \frac{C}{B}$$



$$y = mx + b \quad \text{replace } \frac{-A}{B} \text{ by } m \text{ and } \frac{C}{B} \text{ by } b$$

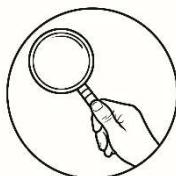
To write the linear equation $y = mx + b$ in the form $Ax + By = C$, we just have to reverse the process.

$$y = mx + b \quad \text{given}$$

$$y = \frac{-A}{B} x + \frac{C}{B} \quad \text{replace } m \text{ by } \frac{-A}{B} \text{ and } b \text{ by } \frac{C}{B}$$

$$By = -Ax + C \quad \text{multiply both sides by } B$$

$$Ax + By = C \quad \text{add } Ax \text{ on both sides}$$



What is It

How do we write a linear equation $Ax + By = C$ in the form $y = mx + b$? The following examples will guide you and show you the process.

Example 1. Write the linear equation $2x + y = 6$ in the form $y = mx + b$.

$$\text{Solution: } 2x + y = 6 \quad \text{given}$$

$$2x - (2x) + y = 6 - (2x) \quad \text{subtract } 2x \text{ from both sides}$$

$$y = 6 - 2x \quad \text{simplify}$$

$$y = -2x + 6 \quad \text{arrange the terms on the right side}$$

To write the equation in the form $Ax + Bx = C$, we will just reverse the process.

$$y = -2x + 6 \quad \text{given}$$

$$y + 2x = -2x + (2x) + 6 \quad \text{add } 2x \text{ on both sides}$$

$$y + 2x = 6$$

simplify

$$2x + y = 6$$

arrange the terms on the left side

Example 2. Write the linear equation $\frac{1}{2}x + 3y = -6$ in the form $y = mx + b$.

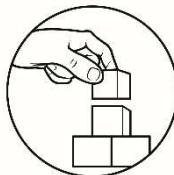
Solution 1: $\frac{1}{2}x + 3y = -6$	given
$3y = -\frac{1}{2}x - 6$	subtract $\frac{1}{2}x$ from both sides
$y = -\frac{1}{6}x - 2$	multiply both sides by $\frac{1}{3}$
Solution 2: $\frac{1}{2}x + 3y = -6$	given
$x + 6y = -12$	multiply both sides by 2
$6y = -x - 12$	subtract x from both sides
$y = -\frac{1}{6}x - 2$	divide both sides by 6

Example 3. Write the equation $y = 4x + 3$ in the form $Ax + By = C$.

Solution: $y = 4x + 3$	given
$-4x + y = 3$	subtract $4x$ from both sides
or	
$4x - y = -3$	multiply both sides by -1

Example 4. Transform the equation $y = \frac{1}{2}x - 5$ to $Ax + By = C$.

Solution: $y = \frac{1}{2}x - 5$	given
$-\frac{1}{2}x + y = -5$	add $-\frac{1}{2}x$ on both sides
or	
$x - 2y = 10$	multiply both sides by -2 if the answer is required with integral coefficients



What's More

A. Write the following equations in the form $y = mx + b$.

- | | |
|-------------------|-----------------------------|
| 1. $x + y = 3$ | 4. $-6x + y = \frac{1}{3}$ |
| 2. $x - 3y = 12$ | 5. $\frac{1}{3}x + 9y = 15$ |
| 3. $5x + 2y = 10$ | |

B. Write the following equations in the form $Ax + By = C$. Express each equation with integral coefficients.

1. $y = 5x + 7$ 4. $2y = 4x - 3$

2. $y = -7x + 2$ 5. $y = \frac{3}{4}x - 8$

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



What I Have Learned

Fill in the missing phrase/word to complete the following derivation of linear equations.

To write the equation $Ax + By = C$ in the form $y = mx + b$

$Ax + By = C$

$By = -Ax + C$

subtract Ax from both sides

$y = \frac{-A}{B}x + \frac{C}{B}$

replace $\frac{-A}{B}$ by m & $\frac{C}{B}$ by b



What I Can Do

Write the letter that corresponds to the correct answer for each number.

1. The equation $5x = 2 + y$ when transformed to $y = mx + b$ is equal to _____.

- | | |
|-----------------|-----------------|
| A. $y = 2x + 5$ | C. $y = 2 - 5x$ |
| B. $y = 2 + 5x$ | D. $y = 5x - 2$ |

2. What is the equivalent transformation of $y = \frac{2}{3}x + 5$ to $Ax + By = C$?

- | | |
|----------------------------|---------------------------|
| A. $\frac{2}{3}x + y = -5$ | C. $\frac{2}{3}x + y = 5$ |
|----------------------------|---------------------------|

- | | |
|----------------------------|-----------------------------|
| B. $\frac{2}{3}x - y = -5$ | D. $-\frac{2}{3}x + y = -5$ |
|----------------------------|-----------------------------|

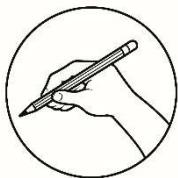
3. The equation $-3y + \frac{1}{5} = \frac{2}{3}x$ in the form $Ax + By = C$ is _____.

A. $\frac{2}{3}x + 3y = -\frac{1}{5}$

C. $10x - 45y = 2$

B. $\frac{2}{3}x + 3y = \frac{1}{5}$

D. $6x - 3y = 15$



Assessment

Match column A with column B. Write the letter of the corresponding linear equation on the right before each number on the left.

Column A

1. $x + 6y = 7$

2. $5x - 3y = 1$

3. $-4x + 2y + 8 = 12$

4. $y = 7x - 2y$

5. $y = 5y + 3$

Column B

a. $4y = -3$

b. $y = 2x + 2$

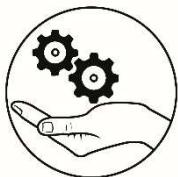
c. $4x - 2y = 4$

d. $y = \frac{5}{3}x - \frac{1}{3}$

e. $6y = x + 7$

f. $y = -\frac{1}{6}x + \frac{7}{6}$

g. $7x - 3y = 0$



Additional Activity

- The perimeter of a rectangle is given by the formula $P = 2l + 2w$. How do you solve for l in terms of P and w ?
- The volume of a cylinder is $V = \pi r^2 h$. How do you solve for h in terms of r and V ?
- Marianne works as an office clerk in Makati. She is paid Php100 per hour plus additional Php500 per week as transportation allowance. Write a linear equation for her total salary (y) for one week working for (x) hours.

Lesson

2

Graphs of Linear Equations

One of the ways to describe a linear equation is by its graph.
 The graph of a linear equation $Ax + By = C$ is a straight line.

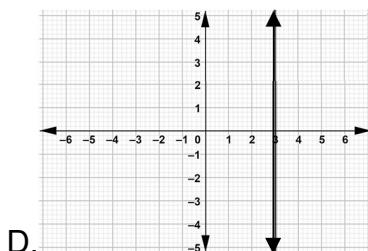
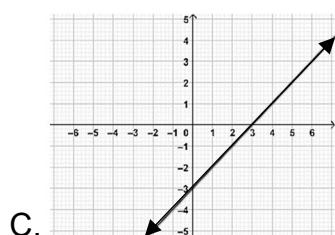
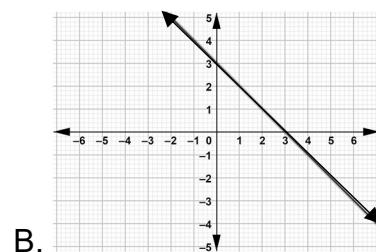
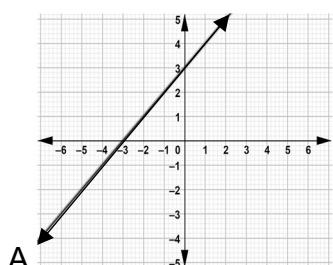
- Every point on the line is a solution on the equation.
 - Every solution of this equation is a point on this line.
- There are different ways of graphing linear equations.



What I Know

Direction: Choose the letter of the correct answer.

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

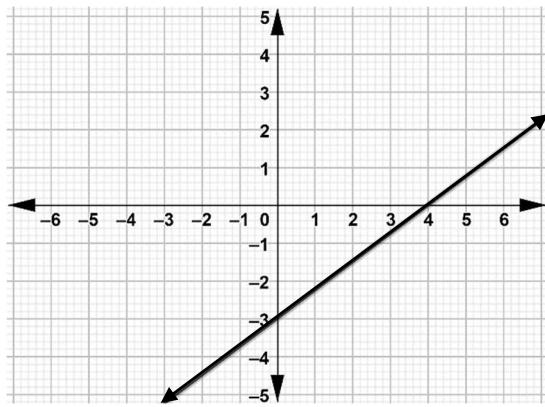


2. Which line passes thru the points $(-1, 1)$ and $(3, 2)$?

- A. $x+y=5$ B. $x-4y=-5$ C. $3x+2y=1$ D. $2x+y=3$

For nos.3-4

Given the graph below



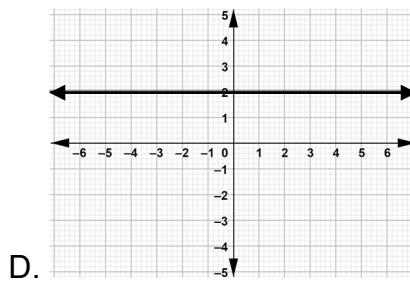
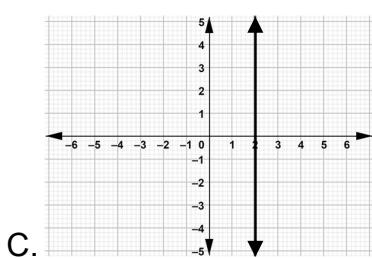
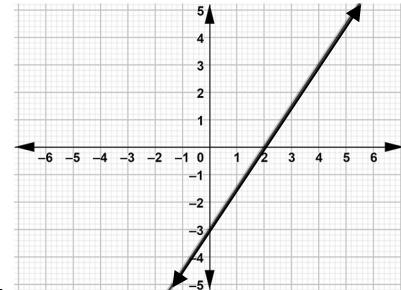
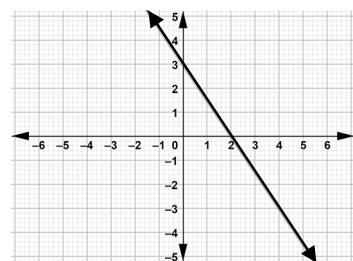
3. What is the x-intercept of the graph?

- A.0 B.-3 C.4 D.5

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

- A.0 B.-3 C.4 D.5

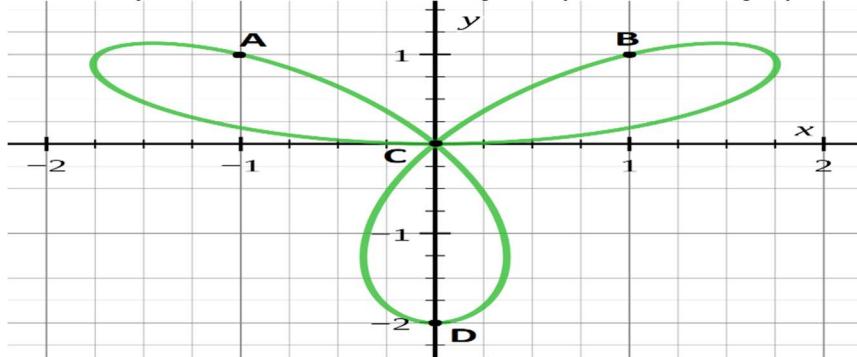
5. Which of the following graph passes through the point (2,0) and has a slope of $-3/2$?





What's In

A. Identify the coordinates of the given point on the graph.



- 1.A 2.B 3.C 4.D

B. Plot the following points on the cartesian plane.

1. M (2,1) 2. A(-3,1) 3. S (-3,-3) 4. K(0,-4)



What's New

Market Day!

One day, Aling Nena went to market. She saw cucumber. She asked the vendor how much does a cucumber cost. The vendor answered, Php 80.00 per kilo. How much will she pay for $\frac{1}{2}$ kg of cucumber? $1\frac{1}{2}$ kg? 2kg?

1. What is the relationship between the weight of the cucumber and its corresponding cost?

2. How does the graph of the equation looks like?

Solution:

1. Let x be the number of kilograms of cucumber and y be the cost in pesos.

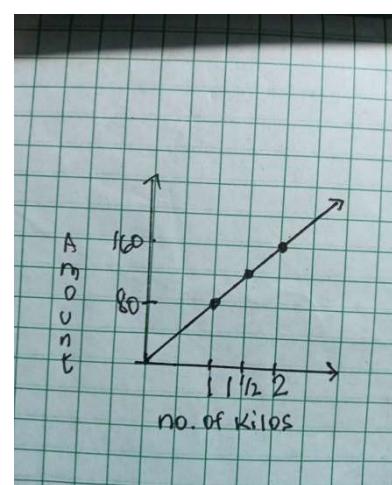
x	1	$1\frac{1}{2}$	2
y	80	120	160

From the table, we can see that $y=80x$.

2. Let us draw the graph of $y=80x$.

We now have three points: $(1, 80)$, $(1\frac{1}{2}, 120)$, $(2, 160)$

Notice that if we connect the points, we have a line. The graph of $y=80x$ is limited to the first quadrant because weight cannot be negative and cost cannot also be negative.





What is It

GRAPHING LINEAR EQUATIONS USING TWO POINTS

There is a postulate in Geometry known as the Line Postulate. The Line Postulate states that for every two points, there is exactly one line that contains both points.

Example 1. Graph $x+2y=6$

Solution:

$$\text{Let } x = -2$$

Choose any value for x

$$-2 + 2y = 6$$

Substitute in the equation

$$-2 + 2 + 2y = 6 + 2$$

Addition Property of Equality

$$2y = 8$$

$$(1/2)(2y) = (1/2)(8)$$

Multiplication Property of Equality

$$y = 4$$

Thus the ordered pair is $(-2, 4)$

$$\text{Let } x = 2$$

Choose again any value for x

$$2 + 2y = 6$$

Substitute in the equation

$$-2 + 2 + 2y = 6 + (-2)$$

Addition Property of Equality

$$2y = 4$$

$$\frac{2y}{2} = \frac{4}{2}$$

Division Property of Equality

$$y = 2$$

The ordered pair is $(2, 2)$.

We now have two points, $(-2, 4)$ and $(2, 2)$. We can determine the line that will contain the two points.

Example 2. Graph $y = 4$

Solution:

The equation can be rewritten as $0x+y = 4$.

$$\text{Let } x = -1.$$

$$0(-1) + y = 4$$

$$0 + y = 4$$

$$y = 4$$

The first point is $(-1, 4)$.

$$\text{Let } x = 4$$

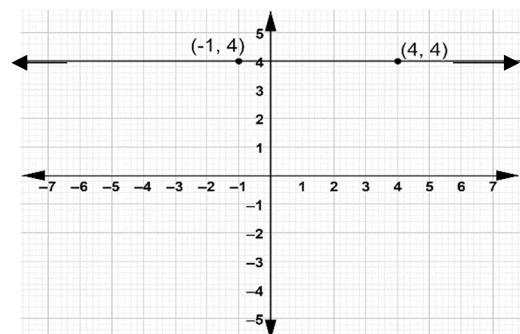
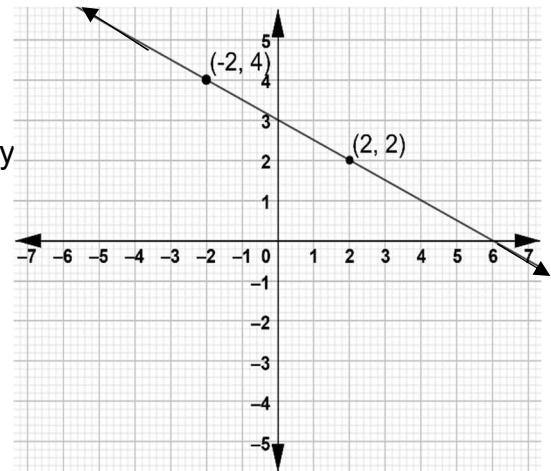
$$0(4) + y = 4$$

$$0 + y = 4$$

$$y = 4$$

The second point is $(4, 4)$.

Whatever the value of x, the value of y is always 4.

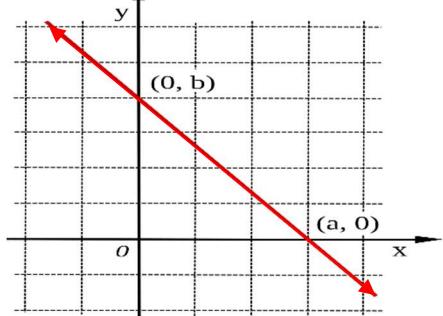


GRAPHING LINEAR EQUATION USING THE X-INTERCEPT AND Y-INTERCEPT

Another way of graphing linear equations is by using the x-intercept and y-intercept.

If a line crosses the x-axis at the point $(a, 0)$, then the number a is the x-intercept of the line.

If a line crosses the y-axis at the point $(0, b)$, then the number b is the y-intercept of the line.



The x-intercept of a line is the x-coordinate of a point where the line crosses the x axis. To find the x-intercept, let $y=0$. The y-intercept of a line is the y-coordinate where the graph crosses the y-axis. To find the y-intercept, let $x=0$.

Example 1. Graph $4x-3y=12$.

Solution:

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

$$4x-3(0)=12$$

$$4x-0=12$$

$$4x=12$$

$$x=3$$

The x-intercept is 3. The point is $(3, 0)$

To find the y-intercept, let $x=0$

$$4(0)-3y=12$$

$$-3y=12$$

$$y=-4$$

The y-intercept is -4. The point is $(0, -4)$.

Example 2. Graph $y = 2x + 1$

Solution:

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

$$0=2x+1$$

$$-1=2x$$

$$2x=-1$$

$$x=-\frac{1}{2}$$

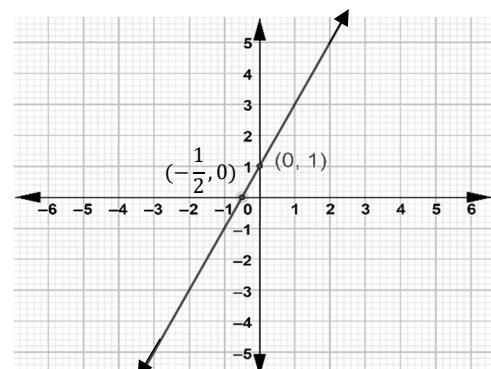
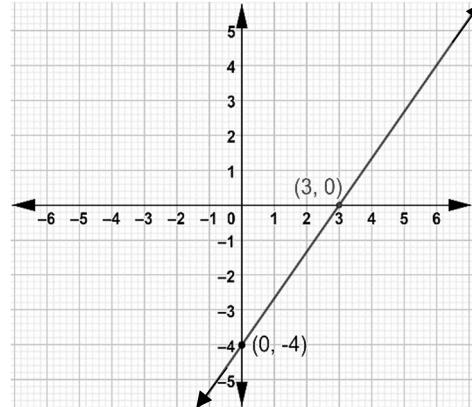
The x-intercept is $-\frac{1}{2}$. Then point is $(-\frac{1}{2}, 0)$.

To find the y-intercept, let $x=0$

$$y=2(0)+1$$

$$y=1$$

The y-intercept is 1. The point is $(0, 1)$.



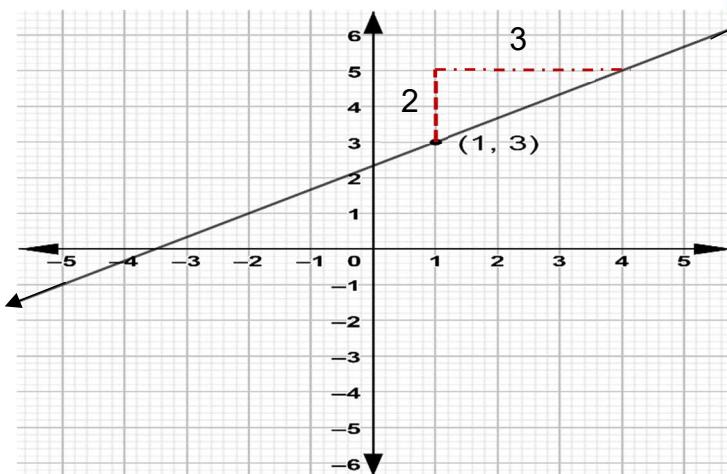
GRAPHING LINEAR EQUATIONS USING SLOPE AND ONE POINT

This can be done by first, plotting the given point and then using the slope to get the other point.

Example 1. Graph the linear equation given the point $(1, 3)$ and slope of $\frac{2}{3}$.

Solution.

Plot the point $(1, 3)$. Since the slope is rise / run, the rise is 2 and the run is 3. From the given point move 2 units upward and move 3 units to the right.

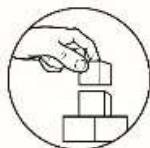
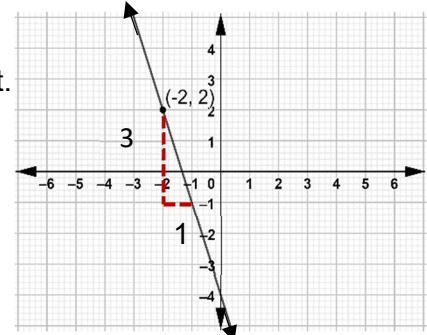


Example 2. Graph the linear equation given the point $(-2, 2)$ and slope of -3 .

Solution:

The slope of the line is -3 which is equal to $-3/1$.

From the point $(-2, 2)$ move 3 units downward and 1 unit to the right.



What's More

Activity: Graph Me

Description: This activity will enable you to graph linear equations.

Direction: Draw the graph of the following lines.

1. $3x+y=3$
2. $y= x+3$
3. $3x-2y=1$
4. slope is $-1/2$ and passes thru the point $(-1, 4)$.
5. slope is 3 and passes thru $(3, 3)$.

Questions

1. How did you draw the graph of the linear equations?
2. What difficulties did you encounter in graphing linear equations?

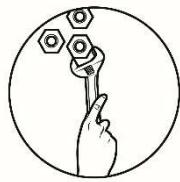


What I Have Learned

Strategy for Choosing the Most Convenient Way to Graph a Line

Consider the form of the equation

- If it only has one variable, it is a vertical or a horizontal line.
 $x=a$ is a vertical line passing through the x -axis at a
 $y=b$ is a horizontal line passing through the y -axis at b .
- If it is of the form $y=mx+b$, graph by using the slope and the y -intercept.
- If the equation is of the form $Ax+By = C$, find the intercepts.



What I Can Do

Activity

How can you help slow down the spread of corona virus?

Description: This activity will help enrich further your knowledge in graphing linear equations.

Directions: Graph the linear equation using the given in each letter. Copy the letter corresponding to each given condition and write it above the corresponding graph.

D slope is -3 and passes thru (1,-2)

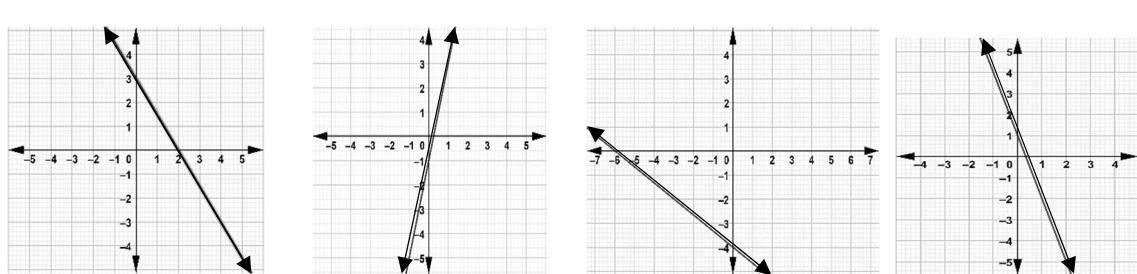
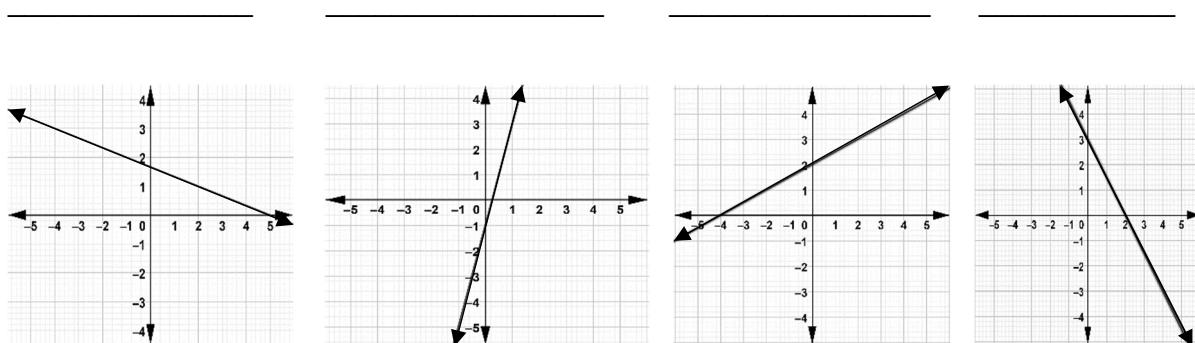
W $x+3y = 5$

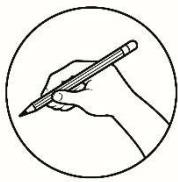
H x-intercept is 2 and y-intercept is 3

N slope is $-2/3$ and passes thru (0,-4)

A $y=4x-1$

S x-intercept is -4 and y-intercept is 2



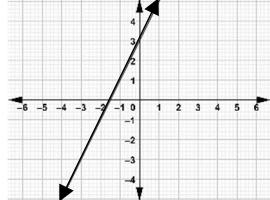


Assessment

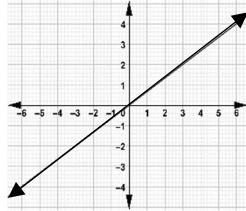
Answer the following.

1. Which of the following graph passes through the points $(-3, -2)$ and $(0, 0)$?

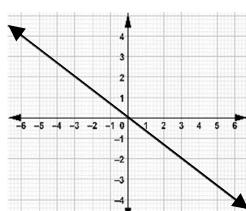
A.



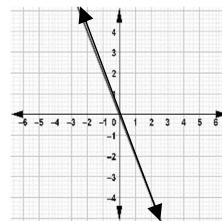
B.



C.



D.



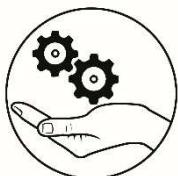
2. If $(x, 2)$ is a point on $2x - y = 4$, what is the value of x ?

3. If $(4, y)$ is a point on $y = x + 5$, what is the value of y ?

4. Which points lie on the graph of $3x + y = 4$?

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

5. What is the x -intercept of $2x + y = 3$?



Additional Activity

Draw the graph of the following linear equations.

1. passing through the points $(2, -2)$ and $(-4, 3)$.

2. x -intercept is 3 and y -intercept is -2 .

3. slope is -2 and passes through $(1, 1)$.

References:

https://d3bxxy9euw4e147.cloudfront.net/oscms-prodcms/media/documents/IntermediateAlgebra-OP_8dbGMu6.pdf

Grade 8 Mathematics Learner's Module by DepEd

Nievera, Gladys, Grade 8 Mathematics :Patterns and Practicalities

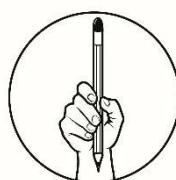
Oronce, Orlando and Mendoza, Marilyn, E-Math 8

Pascasio, Arlene, et.al., Math Ideas and Life Applications 8

**Lesson
3**

Describing the Graph of Linear Equations in terms of its Intercepts and Slope

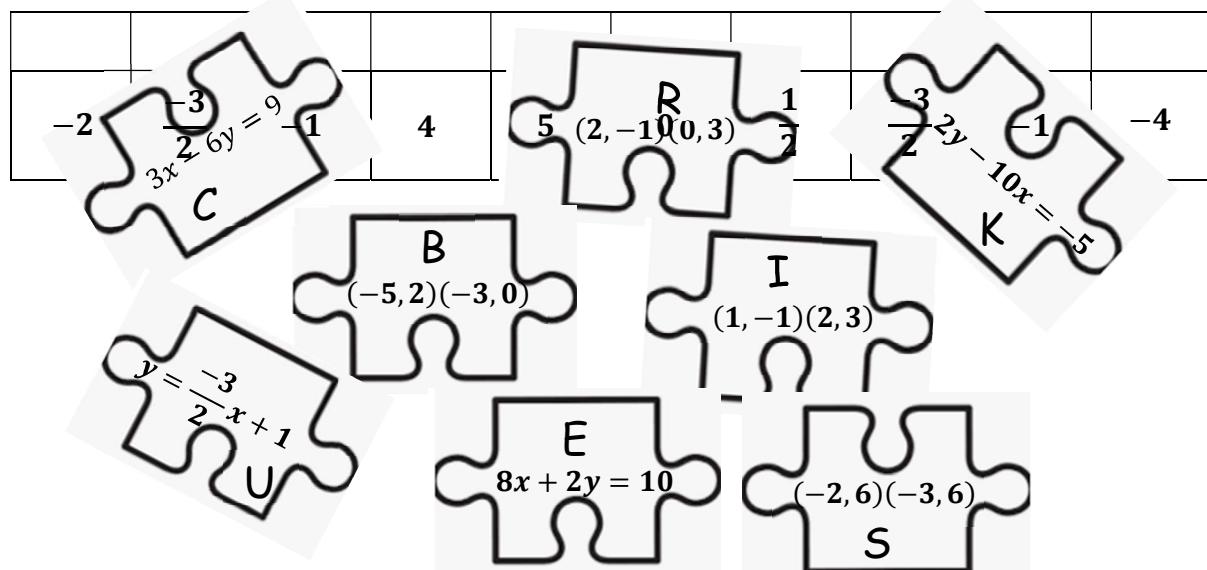
One of the most important lessons/topics on Relations and Functions is the equation of the line. This topic will discuss how to describe the graph of the line with or without an actual graph, provided there is an existing slope and its intercepts. “It will help enhance your skills in preparation for higher level Mathematics. You may now focus and do the required activities for you to better understand the lessons.”



What I Know

Riddle

What is the favorite puzzle of junior high school students? To reveal the puzzle, you need to find the slope and put the letter on the box with the corresponding answer.





What's In

The slope and y-intercept of the line can be determined using the following formulae:

1. slope(m) = $\frac{\Delta y}{\Delta x} = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$;
2. slope-intercept form: $y = mx + b \Rightarrow y - intercept$; and
 $\qquad\qquad\qquad \rightarrow slope(m)$
3. standard equation of the form: $Ax + By = C$

$$m = \frac{-A}{B} \quad \text{and} \quad y - intercept(b) = \frac{C}{B}$$

If the slope of the line is positive, then the line rises from left to right as x increases.

If the slope is negative, then the line falls from left to right as x decreases. If the slope is 0, then the line is horizontal but if the slope is undefined, the line is vertical."

Basically, we can find the slope of a line given two points with the formula

$m = \frac{y_2 - y_1}{x_2 - x_1}$. However, if there is a given graph, it is better to use rise over run for the slope. But if an equation is given, convert the equation either in slope-intercept form or in standard form to determine the slope and y-intercept. The slope and the y-intercepts of the line are important factors to describe the nature of the lines without the actual graph of the line.



Notes to the Teacher

Knowing the *slope* and its *y – intercept* of the line should be mastered by the students to be able to describe the nature of the line without the actual graph of the line. Remember the nature of the line that: "If the slope is positive, then the line is rises from left to right as x increases but if the slope is negative, then the line is falls from left to right as x decreases. If the slope is 0, then line is horizontal but if it is undefined slope, then the line is vertical.



What's New

Graph and describe each line using the slope and y -intercept.

Example 1) Graph and describe the equation $y = \frac{5}{2}x - 3$.

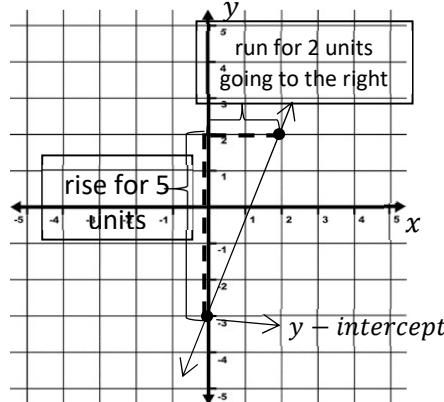
The slope-intercept form of a line.

$$y = mx + b \rightarrow y\text{-intercept}$$

$\xrightarrow{\hspace{1cm}}$ slope(m)

Given $m = \frac{5}{2}$ and $b = -3$

Since the slope of the line is positive, it implies that the line rises from left to right as x increases.



Example 2. Graph and describe the equation $2x + 5y = -10$.

Solution: The slope-intercept form of a line.

$$y = mx + b \rightarrow y\text{-intercept}$$

$\xrightarrow{\hspace{1cm}}$ slope(m)

Given $m = \frac{5}{2}$ and $b = -3$

$2x + 5y = -10$ Solve for y in terms of x .

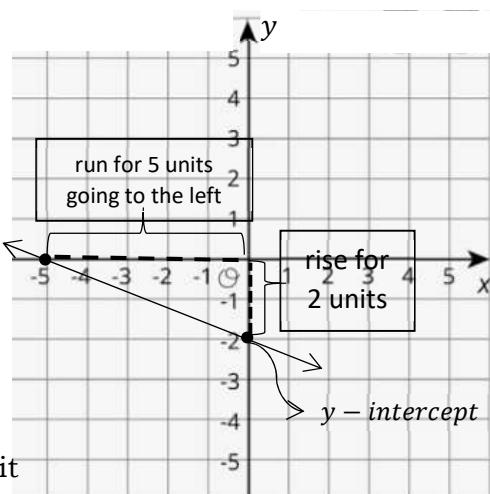
$$5y = -2x - 10$$

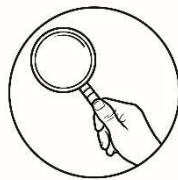
$$\frac{5y}{5} = \frac{-2}{5}x - \frac{10}{5} \quad \text{Divide both sides by 5.}$$

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

$$m = \frac{-2}{5} \quad \text{and} \quad b = -2$$

Since the slope of the line is negative, it implies that the line falls from left to right as x increases.





What is It

To describe the graph of a linear equation, we need to know the slope and its y-intercepts,

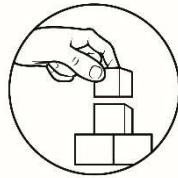
- write the equation in slope – intercept form

$$y = mx + b \rightarrow y - \text{intercept} \xrightarrow{\text{slope}}$$

- write in standard form

$$Ax + By = C, \quad m = \frac{-A}{B} \quad \text{and} \quad b = \frac{C}{B}$$

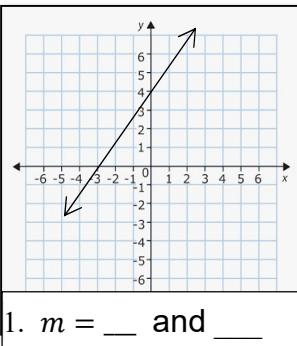
If the slope of a line is positive, then the line rises from left to right as x increases. But if it is negative, then the line falls from left to right as x decreases.



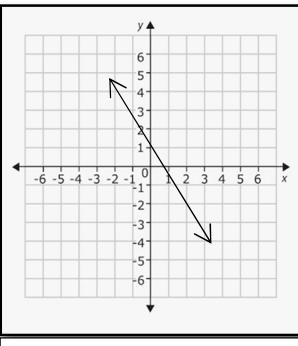
What's More

slope Matching Activity # 1

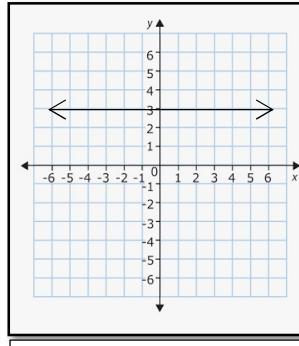
Find the slope of the line on the graph. Choose the answer on the x and y table and write on the blank below with the correct nature of the line: a) rises from left to right; b) falls from left to right; and c) horizontal. Write only the letters of the correct description of each line below.



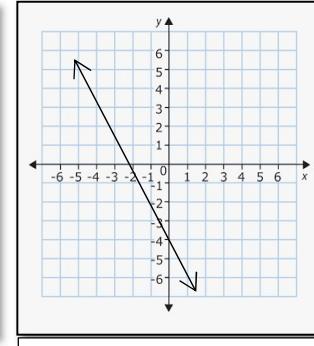
1. $m = \underline{\hspace{2cm}}$ and $\underline{\hspace{2cm}}$



2. $m = \underline{\hspace{2cm}}$ and $\underline{\hspace{2cm}}$



3. $m = \underline{\hspace{2cm}}$ and $\underline{\hspace{2cm}}$



4. $m = \underline{\hspace{2cm}}$ and $\underline{\hspace{2cm}}$



Let's do this . . .

x	y
-3	-3
-4	3
3	2
4	4

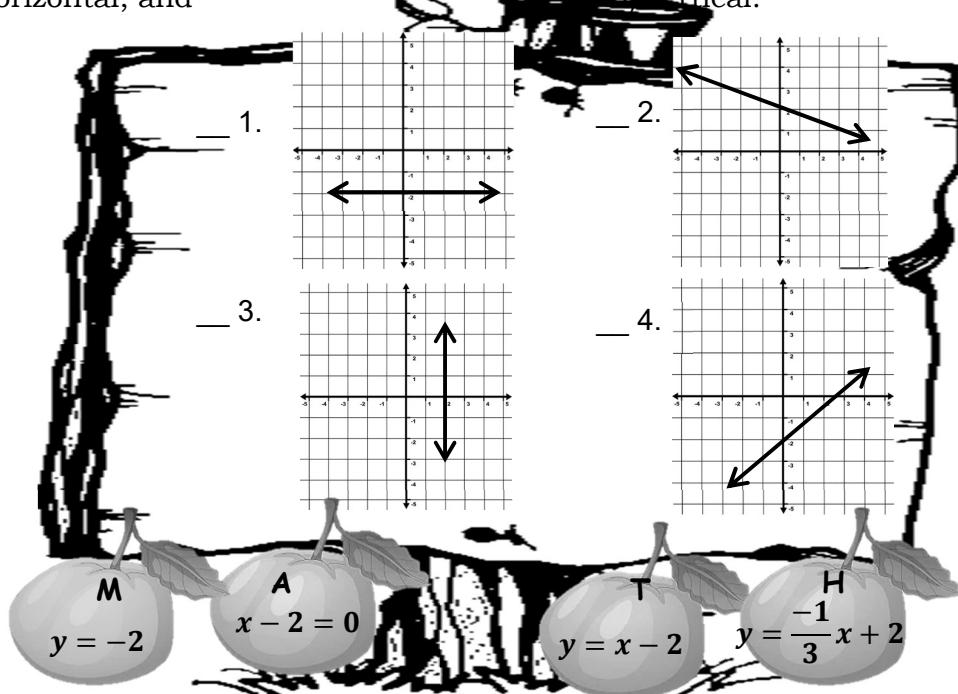
x	y
-1	-1
0	0
1	1
2	2

x	y
-1	-1
0	0
1	2
2	3

x	y
-1	-1
-4	-2
4	1
3	2

Slope-Intercept Matching Activity # 2

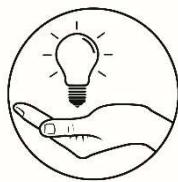
Match the equation to its corresponding graph and write the letters of the correct answer. Describe the line as: A) rises from left to right; B) falls from left to right; C) horizontal; and D) vertical.



Activity # 3

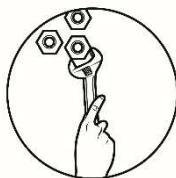
Complete the table below. Write the equation in slope-intercept form and determine the slope, y-intercept and its nature.

Linear Equation	$y = mx + b$	Slope (m)	y – intercept (b)	Nature of the Line
Example: $y - 2x = -7$	$y = 2x - 7$	2	-7	rises from left to right
1. $x + y = 3$				
2. $9x - 3y = 18$				
3. $3x - y = 0$				
4. $2x + 5y - 10 = 0$				
5. $5x - \frac{2}{3}y = -4$				



What I Have Learned

1. If the slope of a line is positive, then the line rises from _____ as x increases.
2. If the slope of a line is negative, the line falls from _____ as x decreases.
3. If the slope of a line is 0, then the line is _____. But if the slope is undefined, then it is _____.

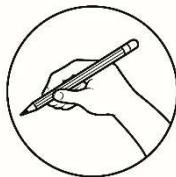
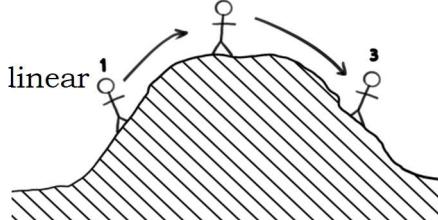


What I Can Do

Read carefully and analyze before you answer the problem below.

John was climbing the mountain slope to search for

a signal to attend to his online classes. Describe the linear path stages of John in terms of slope.

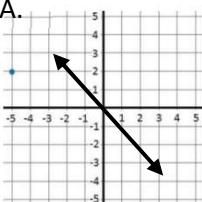
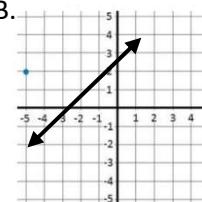
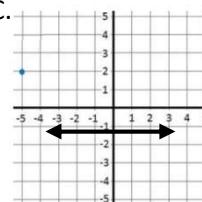
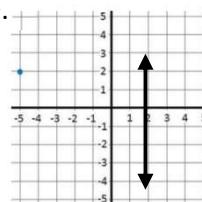


Assessment

Multiple Choice. Choose the letter of the correct answer.

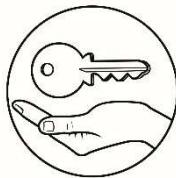
1. Which of the following is a linear equation in two variables?

A. $xy + 2 = 0$	C. $f(x) = x + 5$
B. $y = x^2 - 3$	D. $y - 3 = 5x$
2. Which of the following is TRUE about the slope of linear equation in two variables?
 - A. The slope of a vertical line is zero.
 - B. The slope of a line is always positive.
 - C. The slope of a vertical line is undefined.
 - D. The slope of a horizontal line is negative.
3. How do you describe the graph of the line passing through $(5, 2)$ and $(-3, 2)$?
 - A. vertical
 - B. horizontal
 - C. constant
 - D. increasing
4. At what point will the graph of $x + y = 4$ intersect the y -axis?
 - A. $(4, 0)$
 - B. $(0, 4)$
 - C. $(-4, 0)$
 - D. $(0, -4)$

5. If a line rises from left to right, then its slope is ____.
- negative
 - positive
 - undefined
 - zero
6. If the slope of the line is negative, then the line ____.
- rises from left to right
 - falls from left to right
 - is vertical
 - is horizontal
7. What is the nature of the line $y = -\frac{3}{2}x + 5$ in terms of the slope and y – intercepts?
- The line rises from left to right.
 - The line falls from left to right.
 - The slope of the line is negative.
 - The y – intercept is positive.
8. Which of the following lines fall from left to right?
- A. 
- B. 
- C. 
- D. 
9. Which of the following statements is TRUE?
- The slope of the line $3y - 2x = 4$ is $-\frac{2}{3}$.
 - The slope of the line $y = 5$ is undefined.
 - The graph of the line $x = \frac{2}{3}$ is parallel to the x – axis.
 - The line that falls from left to right has a negative slope.
10. If the graph of the line falls from left to right, then the line is said to be ____.
- constant
 - decreasing
 - increasing
 - undefined

References

- Dr. Gladys C. Nivera.2013. *Grade 8 Mathematics*. Makati, Metro Manila. Salesiana Books
- Melvic C. Borja and Neylinda M. Moldogo. 2017. *Alternative Delivery Mode for Grade 8*. Quezon City. SDOQC
- Orlando A. Oronce and Marilyn Mendoza. 2013. E-Math 8 Worktext in Mathematics
- Pascasio, Arlene,et.al.,Math Ideas and Life Applications 8



Answer Key

LESSON 1

Assessment

1. f
2. d
3. b
4. g
5. a

What's More

A.

1. $y = -x + 3$
2. $y = \frac{1}{3}x - 4$
3. $y = -\frac{5}{2}x + 5$
4. $y = 6x + \frac{1}{3}$
5. $y = -\frac{1}{27}x + \frac{5}{3}$

B.

1. $5x - y = -7$
2. $7x + y = 2$
3. $\frac{2}{3}x - y = 0$ or
 $2x - 3y = 0$
4. $4x - 2y = 3$
5. $\frac{3}{4}x - y = 8$ or
 $3x - 4y = 32$

What I Know

1. D
2. B
3. A
4. D
5. C

Additional Activity

1. $l = \frac{1}{2}P - w$
2. $h = \frac{V}{\pi r^2}$
3. $y = 100x + 500$

What I Can Do

1. D
2. B
3. B

What's In

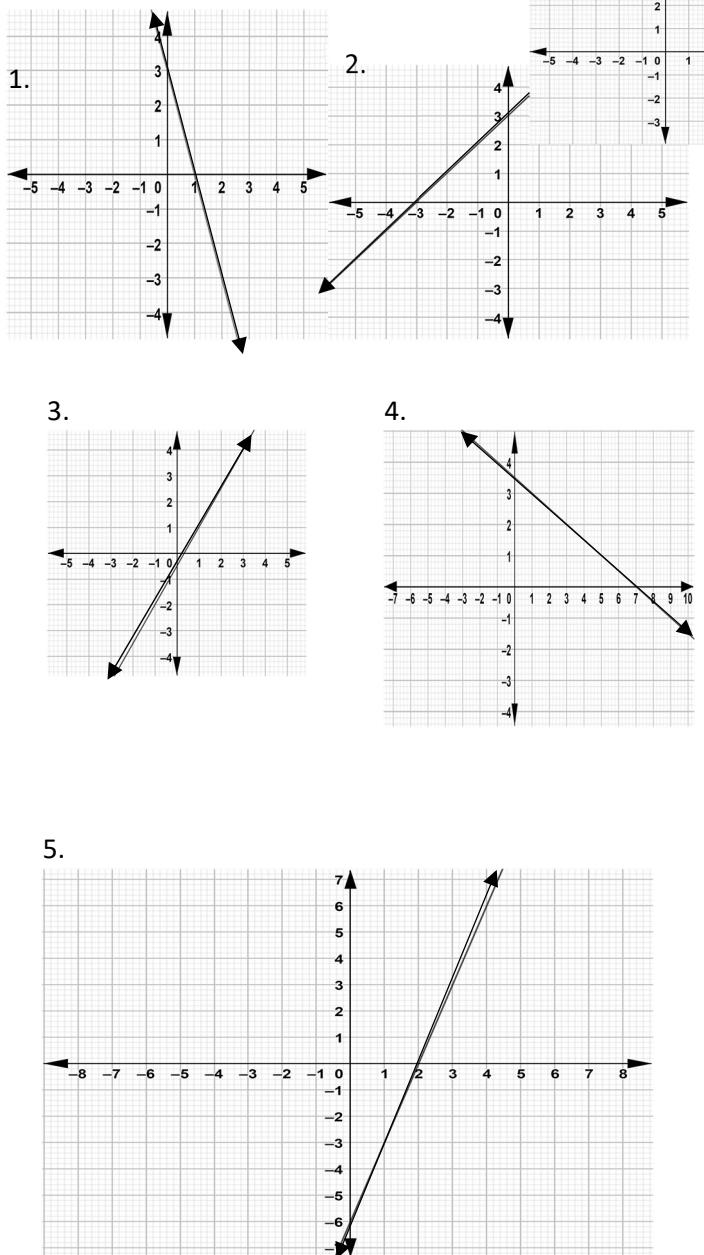
1. $-\frac{5}{3}$
2. $\frac{2}{5}$
5. -2

LESSON 2

What I Know

- 1.A
- 2.B
- 3.C
- 4.B
- 5.A

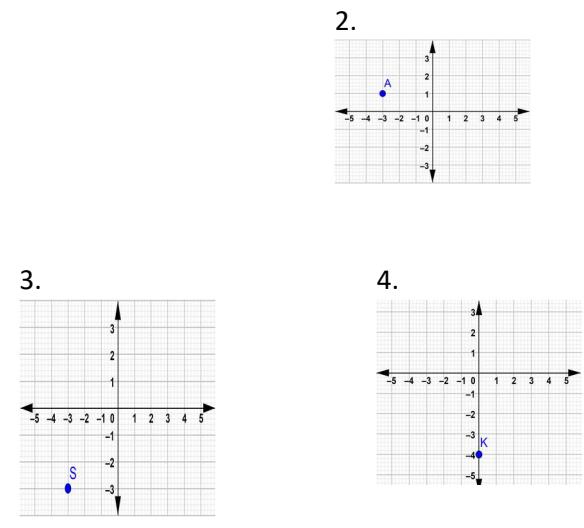
What's More



What's In

- A. 1.(-1,1)
- 2.(1,1)
- 3.(0,0)
- 4.(-2,0)

B.



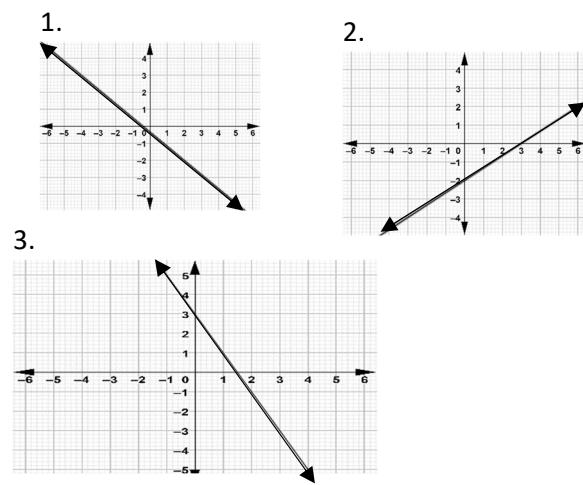
What I Can Do

Wash Hand

Assessment

- 1.B 2. 3 3. 9 4.B 5.3/2

Additional Activity



What I Know

R	U	B	I	K	S	C	U	B	E
-2	$\frac{-3}{2}$	-1	$\frac{-1}{4}$	5	0	$\frac{1}{2}$	$\frac{-3}{2}$	-1	-4

Activity # 1

1. $\frac{4}{3}$ and a
2. $\frac{-3}{2}$ and b
3. 0 and c
4. -2 and a

Activity # 2

1. M, C
2. H, B
3. A, D
4. T, A

What I Can Do

Stage 1 – Going up to the mountain represents a line that rises from left to right that implies positive slope.

Stage 2 – Passing through the mountain plateau represents horizontal line with zero slope.

Stage 3 - Going down to the mountain represents a line that rises from right to left which indicates negative slope.

Assessment

1. D 6. B
2. C 7. B
3. B 8. A
4. B 9. D
5. B 10. B

Activity # 3

Linear Equation	$y = mx + b$	m	b	Nature of the Line
1. $x + y = 3$	$y = -x + 3$	-1	3	falls from left to right
2. $9x - 3y = 18$	$y = 3x - 6$	3	-6	rises from left to right
3. $3x - y = 0$	$y = 3x$	3	0	rises from left to right
4. $2x + 5y - 10 = 0$	$y = -\frac{2}{5}x + 2$	$-\frac{2}{5}$	2	falls from left to right
5. $5x - \frac{2}{3}y = -4$	$y = \frac{15}{2}x + 6$	$\frac{15}{2}$	6	rises from left to right

For inquiries or feedback, please write or call:

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