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Mathematics
Quarter 1- Module 5:
Finding the Equation of a Line

AIRs - LM

Mathematics 8
Quarter 1 - Module 5: Finding the Equation of a Line
Second Edition, 2021

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Mathematics

Quarter 1-Week 5 Module 5:

Finding the Equation of a Line

Introductory Message

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

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

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

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

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

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

Thank you.

Target

In this module, you will learn how to derive the equation of a line given the different conditions. This involves finding the equation of a line given two points; the slope and a point; and the slope and its y-intercept.

These knowledge and skills will help you better understand concepts about linear equations.

This module contains:

finding the equation of a line given (a) two points; (b) the slope and a point; (c) the slope and its intercepts. **M8AL-Ig-1**.

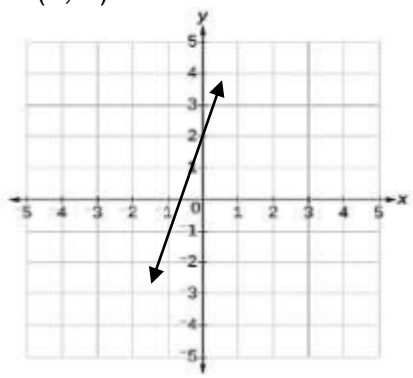
After going through this module, you are expected to:

1. identify slope and y-intercept of a line.
2. state the different conditions used in deriving linear equations.
3. translate the given information into a linear equation with accuracy.
4. apply properties of addition, subtraction, multiplication and division in finding the equation.
5. find the equation of a line given (a) two points; (b) the slope and a point; (c) the slope and its intercepts.

Pre-test:

Directions: Choose the letter of the correct answer. Write your answer on a separate sheet of paper. *(Take note of the items that you might not get correctly and discover the right answer as you go through this module.)*

1. The equation $Ax + By = C$ where A and B are not equal to zero is a linear equation. What form of linear equation is the given?
   A. point- slope form B. slope-intercept form
   C. standard form D. two-point form
2. Given two points (x_1, y_1) and (x_2, y_2) where $x_1 \neq x_2$, which of the following shall be used to determine the equation of the line?
   A. $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$ B. $\frac{x}{a} + \frac{y}{b} = 1$
   C. $y - y_1 = m(x - x_1)$ D. $y = mx + b$
3. What is the slope of the line $2x + y = 3$?
   A. -3 B. -2 C. 2 D. 3
4. In the equation $-3x + y = 3$, what is the $y-$ *intercept*?
   A. -3 B. -1 C. 1 D. 3
5. What is the y - *intercept* of the line $2x + 3y = -9$?
   A. -9 B. -3 C. 3 D. 9
6. Which of the following pair of points have a slope of −2?
   A. (2, 4) *and* (5, −2) B. (4, 2) *and* (−2, 5)
   C. (2 ,5) *and* (4, −2) D. (−2, 2) *and* (4, 5)
7. The line $y - 2 = 3(x - 4)$ passes through which point?
   A. (-2, -4) B. (-4, -2)
   C. (2, 4) D. (4, 2)
8. Which of the following equations is represented by the given graph on the right?



   A. $y = 2x + 3$ B. $y = 2x - 3$
   C. $y = 3x + 2$ D. $y = 3x - 2$
9. What are the slope and y - intercept of the equation $y = 3x - 4$?
   A. $m = 3$ and $b = 4$ B. $m = 4$ and $b = 3$
   C. $m = -3$ and $b = 4$ D. $m = 3$ and $b = -4$
10. What is the slope of a line if it contains the points (−2, 3) *and* (2, −3)?
    A. $\frac{-3}{2}$ B. $\frac{-2}{3}$ C. $\frac{2}{3}$ D. $\frac{3}{2}$
11. What is the equation of a line that passes through the points (0, 5) and (2, 2)?
    A. $y = \frac{-3}{2}x + 5$ B. $y = \frac{-2}{3}x + 5$ C. $y = \frac{2}{3}x + 5$ D. $y = \frac{3}{2}x + 5$
12. What is the equation of a line in slope-intercept form passing through the point (0,3) and has a slope of 2?
    A. $y = \frac{1}{2}x$ B. $y = 3$ C. $y = 2x + 3$ D. $y = 3x + 2$
13. What is the equation of a line that passes through the points (1, 3) *and* (−2, 5)?
    A. -2x + 3y = 11 B. 2x + 3y = 11 C. 2x - 3y = 11 D. 3x + 2y = 11

For # 14 - 15: Given a line with a slope $m = 3$ and a point at (-3, 1);

14. What is the equation of the line?
    A. $y = -3x - 6$ B. $y = -2x + 10$ C. $y = 3x - 6$ D. $y = 3x + 10$
15. What is its y -intercept?
    A. $b = -6$ B. $b = -10$ C. $b = 6$ D. $b = 10$

Jumpstart

Previously, you studied about the concepts of linear equations in two variables particularly on its standard and slope- intercept form. Likewise, you also learned graphing linear equations given the different conditions as well as identifying the trend of its graph.

For this module, you will be given a clearer perspective on how linear equations are derived through its points, its slope and a point and through its slope and y - intercept.

Activity1: Getting to know you

Classify each given linear equation by writing it under the column corresponding to the form it belongs. Use a separate sheet to write your answers.

Linear Equation	Slope - intercept Form ($y = mx + b$)	Point-slope Form $y - y_1 = m(x - x_1)$	Two-point Form $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$
1. $y = 3x + 1$			
2. $y - 3 = \frac{1}{2}(x + 2)$			
3. $y = x + 1$			
4. $y + 1 = \frac{3-2}{-1-3}(x - 2)$			
5. $y + 2 = -4(x - 1)$			

Questions:

1. What have you observed in the equations under ***Slope-intercept Form***? What do you need to have in order to form this equation?
2. What do the equations under ***Point-slope Form*** consist?
3. Do the equations in the Two-point Form column differ from those in the other two columns?
4. What information are required under each form of equations?

Discover

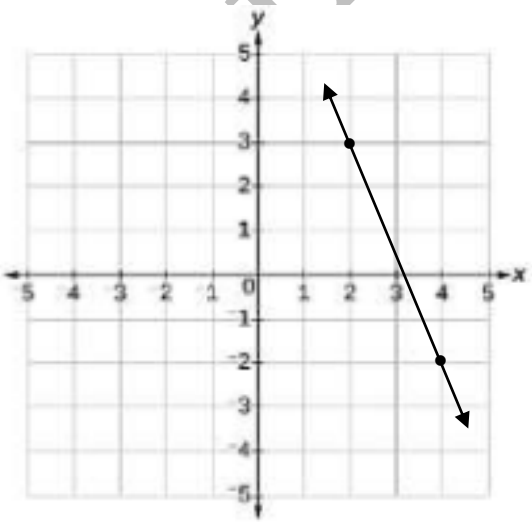
Finding the Equation of a line Using Two Points

You have learned in the previous activities the different forms of the equation of the line. Let us use these equations in finding the equation of the line.

Equation of the line can be determined if the given are:

Two points: (x_1, y_1) *and* (x_2, y_2)

Example :
Find the equation of a line that passes through the points (2,3) and (4, −2) as shown on the graph.



Solution:
Since, two points are given (2,3) and (4, −2), then, we will use ***the Two-point Form*** defined as,

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

Step 1. Identify (x_1, y_1) and (x_2, y_2) using the given two points (2,3) and (4, −2).

- $x_1 = 2$ and $y_1 = 3$; $x_2 = 4$ and $y_2 = -2$

Step 2. Substitute these values on the formula: $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

- $y - 3 = \frac{(-2) - (3)}{(4) - (2)}[x - (2)]$

Step 3. Simplify: $y - 3 = \frac{(-2) - (3)}{(4) - (2)}[x\text{-}(2)]$

- $y - 3 = \frac{-5}{2}(x\text{-}2)$

Step 4. Apply Distributive property.

- $y - 3 = \left(\frac{-5}{2}\right)(x) - \left(\frac{-5}{2}\right)(2)$
- $y - 3 = \frac{-5}{2}x - (-5)$
- $y - 3 = \frac{-5}{2}x + 5$

Step 5. Apply Addition Property of Equality.

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

Thus, the equation of a line that passes through the points (2,3) and (4, −2) is

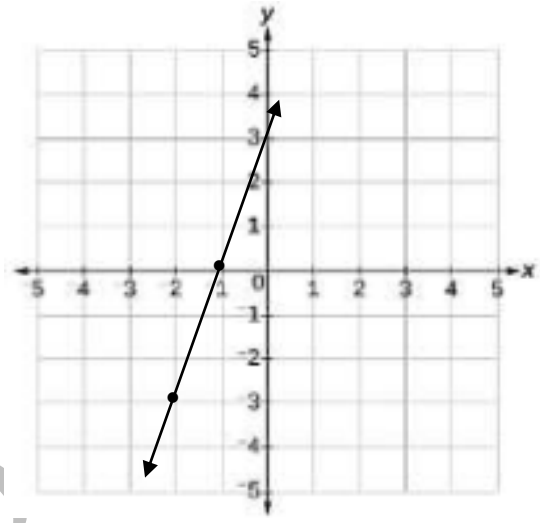
$y = \frac{-5}{2}x + 8$ or $\frac{-5}{2}x + y = 8$ in standard form.

Finding the Equation of a line Using Slope and a point

Slope and a point: m *and* (x_1, y_1)

Example:

Write the equation of a line whose graph has slope of 3 and a point (−2, −3).



Solution:
If given a slope and a particular point, then we will use the **Point-slope Form** defined as,

$$y - y_1 = m(x - x_1)$$

Step 1. Identify the slope and a point ($x1$, $y1$).

- $m = 3$; and $x_1 = -2$ and $y_1 = -3$

Step 2. Substitute the given values on the formula: $y - y_1 = m(x - x_1)$

- $y - (-3) = 3[x - (-2)]$

Step 3. Simplify: $y - (-3) = 3[x - (-2)]$

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

Step 4. Apply Distributive property.

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

Step 5. Apply Addition Property of Equality.

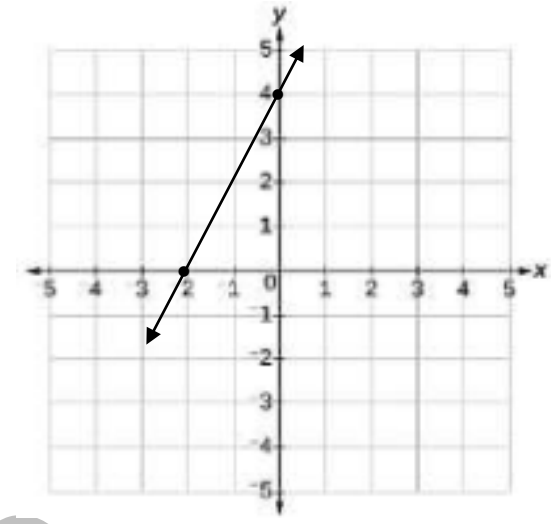
- $y + 3 - 3 = 3x + 6 - 3$
- $y = 3x + 3$

The equation of a line whose graph has a slope of 3 and a point (−2, −3) is $y = 3x + 3$ or $-3x + y = 3$ in standard form. Since we are translating the slope - intercept form into standard form, Ax + By = C, "A" should be positive. Multiply both sides by -1 to make the equation positive.

Thus, we have the standard form of $3x - y = -3$.

Finding the Equation of a line Using Slope and y-intercept

Slope and y-intercept: m *and* b



Example:
Find the equation of a line whose graph has a slope of 2 and an intercept of 4.

Solution:

If the **slope** of a line and a **y-intercept** are known, then we will use the

Slope-intercept Form defined as,

$$y = mx + b$$

Step 1. Identify the slope or m and $y-intercept$ or b.

- $m = 2$ and $b = 4$

Step 2. Substitute the given values on the formula: $y = mx + b$.

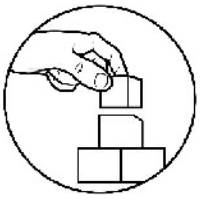
- $y = 2(x) + (4)$
- $y = 2x + 4$

Thus, the equation of a line whose graph has a slope of 2 and an intercept of 4 is $y = 2x + 4$ or $2x - y = -4$ in standard form.

Quick Notes

To determine the equation of the line:

- If the graph of a linear equation has a slope m and $y-intercept$ b, then use the equation $y = mx + b$. This form is called the slope-intercept form.
- If the graph of a linear equation has a slope m and passes through the point (x_1, y_1), then use the equation $y - y_1 = m(x - x_1)$. This form is called the point-slope form.
- If the graph of a linear equation passes through the points (x_1, y_1) and (x_2, y_2), then use the equation $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$
  This form is called the two-point form.
- Standard form is $Ax + By = C$, where A, B, and C are real numbers.



Explore

Activity 2: Fill me in

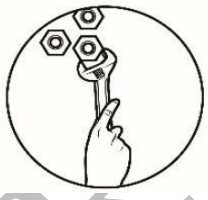
Directions: Fill in the blanks table with the correct value required.

Linear Equation	Slope **m**	y- intercept **b**
$-5x + y = 4$	(1.)_____	(2.) _____
(3.)_____$x - 6y = 7$	$\frac{3}{2}$	(4.) $-\frac{}{6}$
$3x + 5y = 10$	(5.)_____	(6)_____

Activity 3: Make me anew

Directions: Write an equation of the line in slope- intercept form given the following:

1. The line passes through the points (-1,3) and (2, 0).
2. The line has a slope -3 and passes through the point (2,1).
3. The line passing through the y -axis at -5 with a slope of -2.



Deepen

Activity 4: Transformation in action

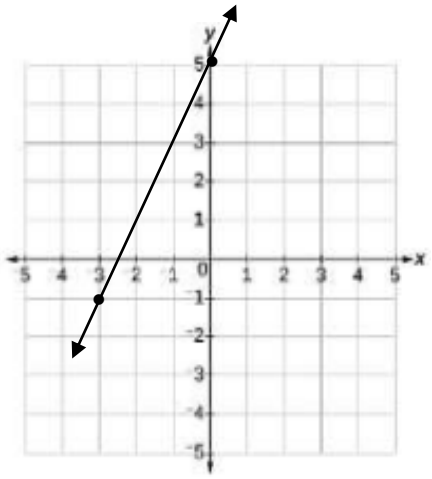
Directions: Transform the given set of data below into a linear equation.

1. The line passes the points (-6, 2) and (3 ,-5).
2. The line passes the point (3,-4) with a slope of 3.
3. A line that has a slope of 2 and a $y - intercept$ of $\frac{3}{2}$.
4. A line passing through (3, 0) and (0, -2)
5. The line with a slope of $\frac{1}{2}$. passes the point (3,1)

Gauge

Directions. Choose the letter of the correct answer and write the letter on a separate sheet of paper.

1. What is the standard form of the equation $y = -2x + 1$?
   A. $2x - y = 1$ B. $2x + y = 1$ C. $-2x + y = 1$ D. $-2x - y = 1$
2. What is the slope of the equation of a line $\frac{2}{3}x + 4y = 8$?
   A. $-\frac{1}{6}$ B. $\frac{2}{3}$ C. 4 D. 8
3. If the graph of a linear equation passes through a point (1, −2) and a slope of 3, what form is being illustrated?
   A. point-slope C. slope-intercept B. standard D. two-point
4. In the equation $3x - y = 1$, what is the y-intercept?
   A. −3 B. -1 C. 1 D. 3
5. What is the y-intercept of the line $3x + 2y = 6$?
   A. $-\frac{2}{3}$ B. $-\frac{3}{2}$ C. 3 D. 6
6. Which of the following pair of points have a slope of −3?
   A. (3,4) *and* (5, −2) B. (4,2) *and* (−2,5)
   C. (2,5) *and* (4, −2) D. (−2,2) *and* (4,5)
7. The equation of the line $y = 2x + 5$ passes through which point?
   A. (−4, −8) B. (−4, 3) C. (1, 7) D. (2, 7)
8. Which of the following equations is represented by the given graph on the right?
   A. $y = 5x - 2$ B. $y = 5x + 2$
   C. $y = 2x - 5$ D. $y = 2x + 5$



9. Determine the slope and the $y-intercept$ of the equation $y = 2x - \frac{1}{3}$?
   A. $m = 2$ *and* $b = -\frac{1}{3}$ B. $m = \frac{1}{3}$ *and* $b = 2$
   C. $m = 2$ *and* $b = -3$ D. $m = -1$ *and* $b = 2$
10. What is the slope of a line if it contains the points (1, −2) *and* (3, −4)?
    A. − 3 B.−1 C. 1 D. 3
11. Find the equation of a line passing through the points (−2,5) *and* (4, −3).
    A. $y = -4x + \frac{7}{3}$ B. $y = -\frac{4}{3}x + \frac{7}{3}$ C. $y = -x + \frac{4}{7}$ D. $y = \frac{4}{7}x + 1$
12. What is the equation of a line that passes through the points (1, 3) *and* (−2, 5)?
    A. $-2x + 3y = 11$ B. $2x + 3y = 11$ C. $2x - 3y = 11$ D. $3x + 2y = 11$
13. What is the equation of a line which contains the point (3,7) and has a slope $\frac{2}{3}$?
    A. $y = -\frac{3}{2}x + 5$ B. $y = -\frac{2}{3}x + 5$ C. $y = \frac{2}{3}x + 5$ D. $y = \frac{3}{2}x + 5$
14. The line passes through the point (0,3) and has a slope of 2. What is the equation of a line in slope-intercept form?
    A. $y = \frac{1}{2}x$ B. $y = 3$ C. $y = 2x + 3$ D. $y = 3x + 2$
15. Find the equation of the line passing through the x-axis at 3 and y -axis at 6.
    A. $y = -2x + y = 6$ B. $3x - y = 6$ C. $2x + y = 6$ D. $3x + y =$

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