8

DepED
DEPARTMENT OF EDUCATION

Mathematics

Quarter 1 – Module 5:
Rectangular Coordinate System, Linear Equations in Two Variables, Slope of the Line

ALTERNATIVE DELIVERY MODE
ADM

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 5: Rectangular Coordinate System; Linear Equations in Two Variables; and Slope of the Line
First Edition, 2020

Published by the Department of Education – Schools Division Office of Quezon City
Local Government of Quezon City
Schools Division Superintendent Dr. Jenilyn Rose B. Corpuz
City Mayor Hon. Ma. Josefina Belmonte Alimurung

Development Team of the Module

Writer: Evelyn C. Torrefranca

Editors: Ferdinand A. Noble, Efren Reyes, Rex Arcadio R. San Diego II (H.C.)

Reviewers: Ansiluz H. Betco, Joel P. Feliciano, Ma. Nimfa R. Gabertan

Illustrator: Name

Layout Artist: Heidee F. Ferrer, Brian Spencer B. Reyes

Management Team: JENILYN ROSE B. CORPUZ, CESO VI, SDS
FREDIE V. AVENDAÑO, ASDS
JUAN C. OBIERNA, Chief, CID
HEIDEE F. FERRER, EPS – LRMS
JOEL FELICIANO, EPS – Mathematics

Printed in the Philippines by the Schools Division Office of Quezon City
Department of Education – National Capital Region
Office Address: Nueva Ecija St., Bago Bantay, Quezon City
Telefax: 3456 - 0343
E-mail Address: sdoqcactioncenter@gmail.com

8

Mathematics

Quarter 1 – Module 5: Week 5

Lesson 1: Rectangular Coordinate System
Lesson 2: Linear Equations in Two Variables
Lesson 3: Slope of the Line

Introductory Message

For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Rectangular Coordinate System, Linear Equations in Two Variables, and Slope of the Line!

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:

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 learners as they do the tasks included in the module.

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Rectangular Coordinate System, Linear Equations in Two Variables, and Slope of the Line!

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 lesson learned. This also aids in the retention of learned concepts.
 ***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 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 the Rectangular Coordinate System, Linear Equations in Two Variables, and the Slope of a Line. 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 five lessons, namely:

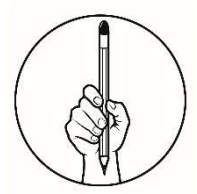
- Lesson 1 – Rectangular Coordinate System
- Lesson 2 – Linear Equations in Two Variables
- Lesson 3 – Slope of the Line

After going through this module, you are expected to:

1. illustrate the rectangular coordinate system and its uses;
2. illustrate linear equations in two variables; and
3. illustrate and find the slope of a line given two points, equation, and graph.

Lesson 1 The Rectangular Coordinate System

Where can we apply rectangular coordinate systems in real-life situations? When we look for exact locations, we use either conventional maps or even Google maps. This is the basic idea of using coordinates, which practically means location.



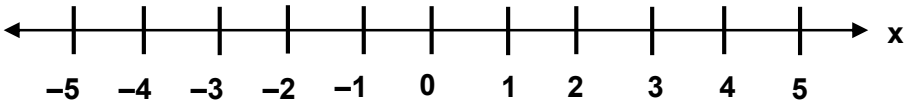
What I Know

Multiple Choice. Choose the letter of the best answer, and write it on a separate sheet of paper.

1. Who is the mathematician to whom the rectangular coordinate plane was named after?
   A. John Bernoulli
   B. Rene Descartes
   C. Leonhard Euler
   D. Carl Gauss
2. What are the coordinates of a point that is three units to the right of y-axis and two units below the x-axis?
   A. (–3,–2)
   B. (–3,2)
   C. (3,–2)
   D. (3,2)
3. What is the intersection of the x-axis and the y-axis in the coordinate plane?
   A. abscissa
   B. intercept
   C. ordinate
   D. origin
4. What quadrant contains four units to the right of y-axis and one unit below the x-axis?
   A. QI
   B. QII
   C. QIII
   D. QIV
5. What is the abscissa of the point (13, –12)?
   A. –12
   B. 1
   C. 13
   D. (13, –12)

What's In

Are you familiar with the number line?



We determine the location of a point using a single number. This number line is called a **one-dimensional coordinate system** since we can only move either to the right or to the left on the line but not up or down. The word 'coordinate' basically means location.

How can we describe locations on a plane which require two coordinates?

What's New

Finding the Best Movie Seats

Lee Min Ho and Kim Go Eun plan to go on a date. Lee Min Ho reserved two tickets in SM - 3D - IMAX Theater for a movie. Their reserved tickets show F-15 and F-16. Lee Min Ho wants the best seat for Kim Go Eun.

Did Lee Min Ho choose the right seats for them to be able to best view the movie?

Where are their seats?

Is his location F-15, the best seat in the theater?

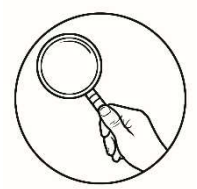
How about the location of F-16?

The arrangement of seats in the theater is shown below.

IMAX 2D SEATING PLAN

SCREEN

A							17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01											
B	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
C	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
D	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
E	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
F	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
G	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
H	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
I	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01				
J	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13			12	11	10	09	08	07	06	05	04	03	02	01		



What is It

In the given activity, the location of a seat in a theater is usually indicated by two coordinates. such as F-15. The letter F indicates the row. and 15 indicates the position on the row. Thus, Lee Min Ho and Kim Go Eun's seats are the 15th and 16th seats from the right of Row F. The same idea applies to naming of points. One coordinate indicates right or left, the other indicates up or down.

The **Rectangular Coordinate System**, or the **Cartesian Coordinate System** named after Rene Descartes, is a system for graphing number pairs.

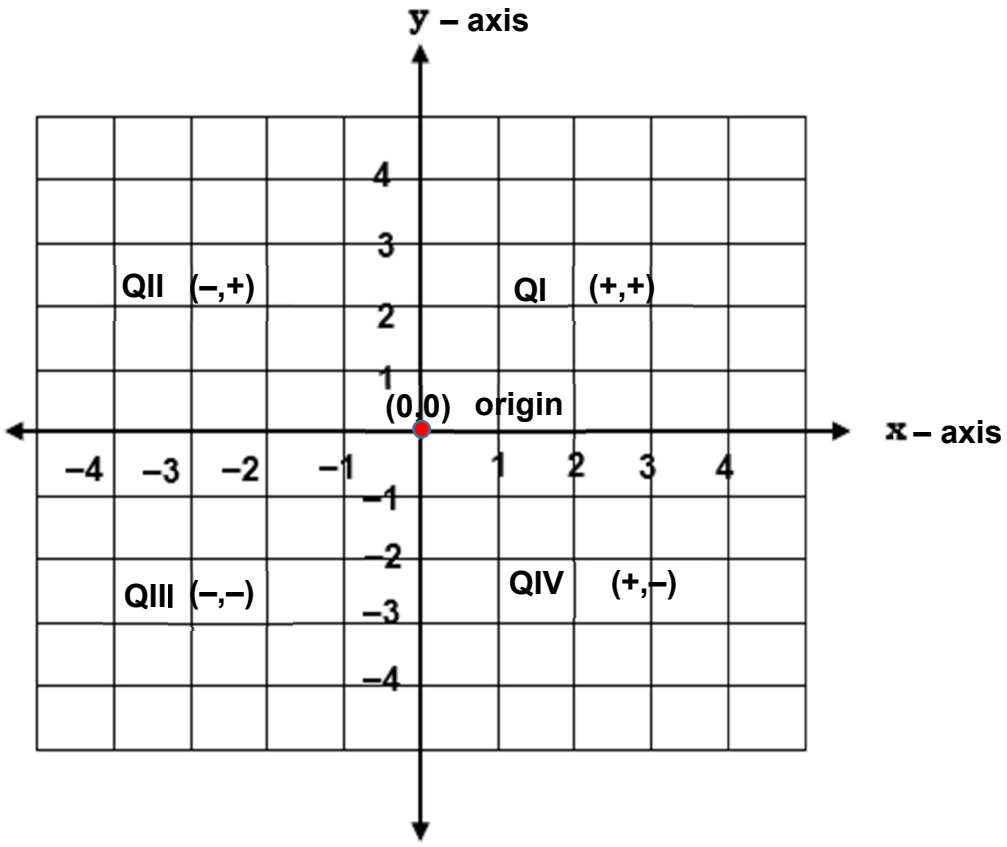
Did you know that *Rene Descartes (1596-1650) is a French mathematician, philosopher, and theologian? He was the father of Modern Philosophy. In his childhood, he was brilliant but sickly, but his teachers were very supportive and allowed him to take a rest and do reflections. This is where he came up with many mathematical ideas.*

☞ To plot points in this rectangular coordinate system, begin with a number line and then draw another number line perpendicular to the first, so that their 0 points coincide. These two lines intersect to form right angles at a point.

☞ We call the horizontal line as the **x-axis** while the vertical line is called the **y-axis**. Both are called **coordinate axes**. The point of intersection of the coordinate axes, located at coordinates (0,0), is called the **origin.**

☞ Take note that the positive values on the y-axis are located above the origin while the negative values are located below the origin. On the other hand, all positive values on the x-axis are to the right of the origin while all the negative values are to the left.

☞ The axes divide the coordinate plane into **four quadrants**, each labeled QI, QII, QIII, and QIV, and positioned counterclockwise.



(x,y)

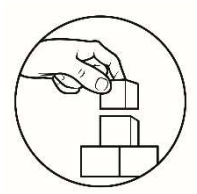
x-coordinate or abscissa

y-coordinate or ordinate

☞ Every point in the Cartesian Plane can be described using an ordered pair (x, y) of values. This ordered pair, called **coordinates** of that point, represents a point.

☞ The first number of the ordered pair is the **x-coordinate** or **abscissa,** which identifies the distance of the point from the origin measured along the **x-axis**.

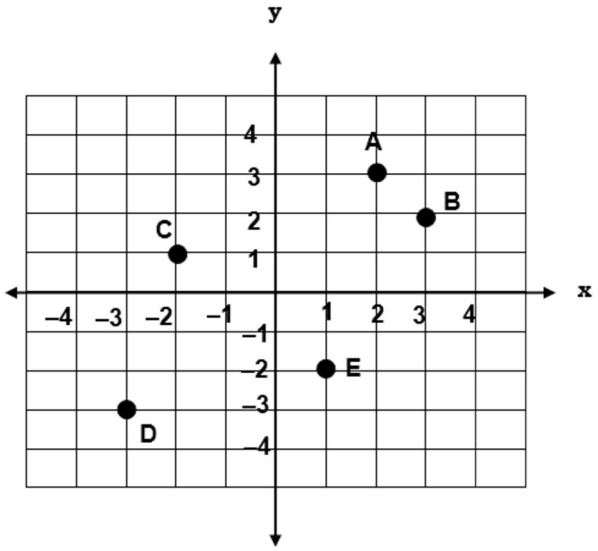
☞ The second number in the ordered pair is the **y-coordinate** or **ordinate, which** shows the distance of the point from the origin measured along the **y-axis**.



What's More

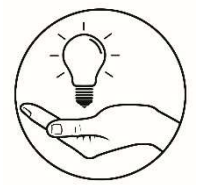
Activity 1.1: Determining the Coordinates

Look at the Cartesian coordinate plane below and find Point A. How will you find the coordinates of point A? How about the coordinates of the other points on the given coordinate plane?



After determining the coordinates of each point, find the abscissa and the ordinate.

Are the coordinates (2, 3) and (3, 2) the same? Why or why not?

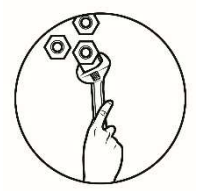


What I Have Learned

☞ Given the coordinates (x,y), the table below shows the quadrant or axis where the points lie. Fill in all the missing blanks.

Quadrant where the point is located	Signs of the Coordinates (x,y)
Quadrant I	**(1)**
Quadrant **(2)**	(+,–)
Quadrant III	**(3)**
Quadrant **(4)**	(–,+)

The point is located along:	if the coordinates are:
x- axis, right of the **(5)**	(+,0)
x- axis, **(6)** of the origin	(–,0)
y – axis, above the origin	**(7)**
y – axis **(8)** the origin	(0,–)

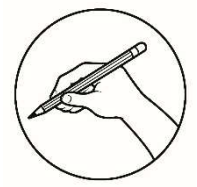


What I Can Do

Activity 1.2: Plotting of Points

Using a sheet of graphing paper, plot the following points on one Cartesian Coordinate Plane, and then connect the points in order. What figure is formed?

A (2, 0) → B (6, –3) → C (10, –5) → D (11, –4) →
→ E (10, –1) → F (10, 0) → G (8, 3) → H (5, 6) →
→ I (1, 8) → J (–2, 10) → K (–4, 10) → L (–3, 9) →
→ M (–3, 8) → N (–5, 7) → O (–8, 3) → P (–10, –5) →
→ Q (–12, –7) → R (–13, –9) → S (–10, –8) → T (–7, –8) →
→ U(–5, –9) → V(–6, –7) → W(–8, –5) → X (–5, 1) →
→ Y(–2, 1) → A (2, 0)



Assessment

Multiple Choice: Choose the letter of the best answer, and write it on a separate sheet of paper.

1. What is the abscissa of the point (–10, –2)?
   A. –12 B. –10 C. – 2 D. (–10, –2)

2. What is the ordinate of the point (1, –2)?
   A. –2 B. 0 C. 1 D. (1, –2)

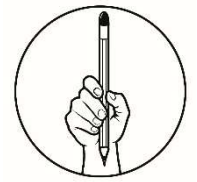
3. Which quadrant contains six units to the right of y-axis and three units below the x-axis?
   A. QI B. QII C. QIII D. QIV

4. Which quadrant contains two units to the left of y-axis and seven units below the x-axis?
   A. QI B. QII C. QIII D. QIV

5. What are the coordinates of a point that is five units to the left of y-axis and one unit above the x-axis?
   A. (–5,–1) B. (–5, 1) C. (–1,–5) D. (1, –5)

Lesson 2 Linear Equations in Two Variables

There are real-life situations that show relationships between two or more quantities. These situations can be represented by a linear equation.



What I Know

Multiple Choice: Choose the letter of the best answer, and write it on a separate sheet of paper.

1. Which equation is linear in two variables?
   A. $y = 2x - 1$
   B. $y = 2x^2 - 1$
   C. $y^2 = 2x - 1$
   D. $y^2 = 2x^2 - 1$

2. The following equations are linear in two variables EXCEPT _____.
   A. $y = 5x$
   B. $y = \frac{1}{3}x + 2$
   C. $y = x^2 - 1$
   D. $2x + 3y = 6$

3. Which point is the solution to the given equation $y = 3x + 2$?
   A. (0, 1)
   B. (1, 3)
   C. (2, 8)
   D. (3, 9)

4. Which point is the solution to the given equation $x + y = -3$?
   A. (–1, –2)
   B. (1, –3)
   C. (1, 2)
   D. (2, 1)

5. The following coordinates are solutions to the given equation $y = 2x - 4$ EXCEPT:

A. (–1, –6)
B. (0, –4)
C. (1, –2)
D. (2, –1)

What's In

Do you still remember how to solve linear equations in one variable?

The solution or root of an equation in one single variable is a replacement of the variable by a constant that will satisfy the equation.

It is important to develop a systematic method in solving equations free from trial and error methods.

How about solving linear equations in two variables?

What's New

Help me please...

During this pandemic, our local government assisted us in our basic needs by distributing relief goods to all families in different barangays.

Rice is one of our basic foods. Suppose the barangay gives 3 kilos of rice for the first week; 4 kilos for the second week; 5 kilos for the third week; and another 7 kilos of rice before the Enhanced Community Quarantine (ECQ) ends. If a kilo of rice costs 40 pesos, how much did each recipient family save from its expenses?

The values can be placed in a table.

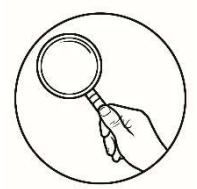
Weight of Rice (kg)	3	4	5	7
Cost (Php)	120	160	200	280

How do we find the cost?

☞ We simply multiply the weight of the rice by Php 40.

How about the total amount saved by each family recipient?

☞ We just add all the total costs in all weeks.



What is It

In the given activity, if we let x = weight of rice in kilograms and y = cost of rice, what is the relationship between the weight of rice and its corresponding cost?

We can write an equation using the given variables that will satisfy the relationship. This can be written as

$$y = 40x$$

The equation y = 40x contains the variables x and y. This type of equation is an example of a linear equation in two variables.

☞ A **linear equation** in two variables is an equation that can be written in the form: Ax + By = C.

where A, B, and C are real numbers, but A and B cannot both be zero.

☞ The **solution** of a linear equation in two variables is an ordered pair that makes the equation true.

How can we write y = 40x in the form of Ax + By = C?

All you need to do is apply the Addition Property of Equality (APE) by adding (–40x) to both sides of the equation.

$$-40x + y = 40x + (-40x)$$

$$-40x + y = 0$$

Thus, y = 40x is equivalent to –40x + y = 0.

How can we find the solutions to y = 40x?

It is easier to solve for y first and substitute for x and compute.

Now, substitute values for x and find the corresponding values for y.

We choose any value for x, the easiest is 0.

y = 40x ➡ y = 40(0) ➡ y = 0 The ordered pair (0, 0) is a solution.

Let's choose another number for x. Let us try x = 1.

y = 40x ➡ y = 40(1) ➡ y = 40

The ordered pair (1, 40) is another solution.

How about choosing a negative number for x. Let us try x = –1.

y = 40x ➡ y = 40(–1) ➡ y = –40

The ordered pair (0, –40) is another solution.

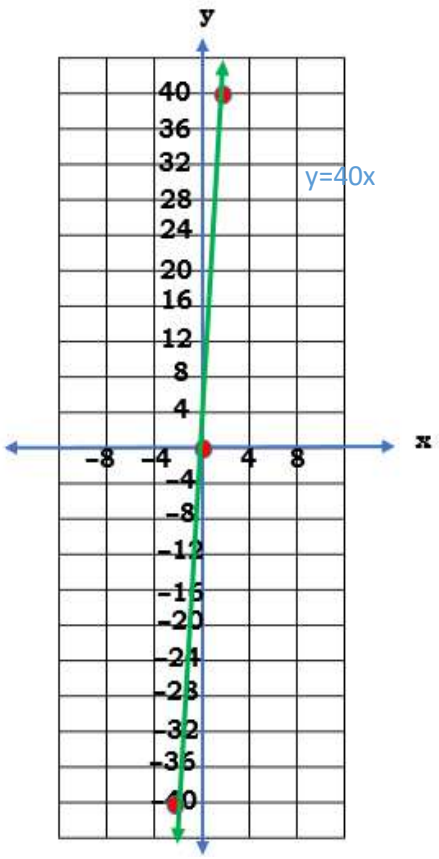
We can record the ordered pairs in a table to show the solutions to the given linear equation.

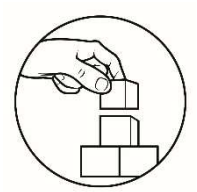
x	–1	0	1
y	–40	0	40

How can we plot the solutions of y = 40x on a coordinate plane?

The solutions of a linear equation in two variables are ordered pairs of numbers, which can be plotted on a Rectangular Coordinate System. A graph of a linear equation in two variables is a drawing that represents its solutions.

Let us consider the table of values of y = 40x, where we can write it as ordered pairs. Thus, we have the set $\{(-1,-40),(0,0),(1,40)\}$. Now, let us plot the points on one Cartesian Plane or Rectangular Coordinate System. Then, connect the points to form a straight line.





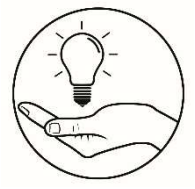
What's More

Activity 2.1: Linear Equations in Two Variables or NOT

Determine whether each equation is linear in two variables or not.

Write YES or NO.

1. $2x = 4 + y$	3. $2x–1 = y$	5. $xy = 2$	7. $x = y^2$	9. $y = \frac{6}{x}$
2. $y = 5x$	4. $\frac{1}{4}x = y$	6. $x^2 + y^2 = 1$	8. $y = \frac{x}{2}$	10. $2x + y = 8$

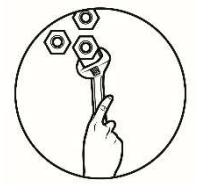


What I Have Learned

Fill in the blanks to complete the statements below.

☞ An equation is said to be _____ if the variables are raised to the first power only, there are no products of variables, and no variable appears in a denominator.

☞ The graphs of linear equations are _____ lines.



What I Can Do

Activity 2.2: Complete me...

How should each table be completed? Complete the ordered pairs below to make the solutions to the given linear equation true.

1. $y = x + 1$

If x =	then y =
–1	
0	
1	

2. $x + y = 2$

If x =	then y =
–2	
2	
4	

Assessment

Multiple Choice: Choose the letter of the best answer, and write it on a separate sheet of paper.

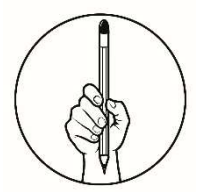
1. Which equation is linear in two variables?
   A. $y = x + 5$
   B. $y = x^2 + 5$
   C. $y^2 = x + 5$
   D. $y^2 = x^2 + 5$
2. The following equations are linear in two variables EXCEPT _____
   A. $y = -x + 1$
   B. $x + y = 1$
   C. $xy = 1$
   D. $\frac{x}{y} = 1$
3. Which point is the solution to the given equation $y = 2x - 1$?
   A. (1, –1)
   B. (1, 0)
   C. (1, 1)
   D. (1, 2)

4. Which point is the solution to the given equation $x - y = 3$?
   A. (–1, –2)
   B. (0, –3)
   C. (1, 4)
   D. (2, 1)
5. The following coordinates are the solutions to the given equation $y = 3x - 5$ EXCEPT _____.
   A. (–1, –8)
   B. (0, –5)
   C. (1, –2)
   D. (2, –1)

Lesson 3

Slope of the Line

Life is a series of natural and spontaneous changes. Don't resist them—that only creates sorrow. Let reality be reality. Let things flow naturally forward in whatever way they like. –Lao Tzu



What I Know

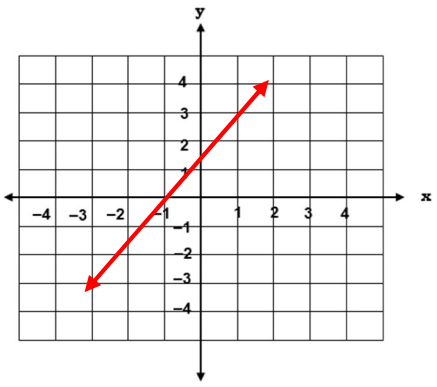
Multiple Choice: Choose the letter of the best answer, and write it on a separate sheet of paper.

1. What is the slope of the line that passes through points (2, 5) and (4,4)?
   A. -2
   B. $-\frac{1}{2}$
   C. $\frac{1}{2}$
   D. 2

2. What is the slope of a line that passes through (–1, 1) and (2, 4)?
   A. –2 B. –1 C. 0 D. 1

3. What is the slope of a line whose equation is y = – 5x – 10?
   A. –10 B. – 5 C. 5 D. 1

4. What is the slope of the given line in the graph below?
   A. $-\frac{3}{2}$
   B. $-\frac{2}{3}$
   C. $\frac{2}{3}$
   D. $\frac{3}{2}$



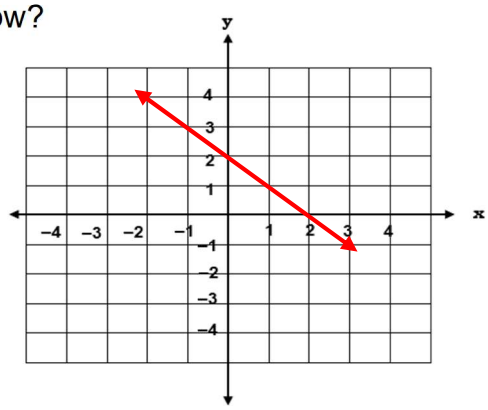
5. What is the slope of the line in the graph given below?

A. -2

B. -1

C. $\frac{1}{2}$

D. 1



What's In

Now that we have learned linear equations in two variables, which graphs are straight lines. One important property of straight lines is its slope.

Can you give similar or synonymous words for the word "slope"?

We may include the words like rise, incline, tilt, descent, slant, ramp, gradient, steep, pitch in our list.

Slope shows both steepness and direction.

Notes to the Teacher

What's New

Snap shots....

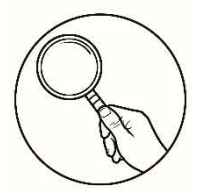
Where can we encounter these slopes in everyday life? Take a look at the pictures below.

Aerial view of rice terraces | Pikrepo
pikrepo.com

File:DoloresGrottoBambanjf7783 10.JPG ...
commons.wikimedia.org

Disability Ramp High Resolution Stock ...
alamy.com

We can describe the slope of the rice terraces, stairs, and ramp of the above pictures by considering their horizontal and vertical movement – and they may be steep or gradual. Along a steep slope, vertical movement is greater while in a gradual slope, most movement is horizontal. In constructing building/house stairs and ramps, one must need to consider its slope for which it is not too steep to walk on.



What is It

Do you still remember our previous lesson about the relief goods distributed to families in need? Again, if we let x = weight of rice in kilograms, and y = cost of rice, the relationship between the weight of rice and its corresponding cost can be written as

$$y = 40x$$

Let us make table of a values out of the given equation.

x	1	2	3	4
y	40	80	120	160

Thus, we can list the set of coordinates: $\{(1,40),(2,80),(3,120),(4,160)\}$

The coordinates of a pair of points on a line can be used to calculate the slope of a line. The **slope of the line denoted by *m*** is the ratio of change in the vertical distance, $y_2 - y_1$ to the change in the horizontal distance, $x_2 - x_1$ between any points on the line.

Hence, (a) $\text{slope} = \dfrac{\text{rise}}{\text{run}} = \dfrac{\text{vertical change}}{\text{horizontal change}}$

(b) $\text{slope} = \dfrac{\text{difference between y} - \text{coordinates}}{\text{difference between x} - \text{coordinates}}$

(c) $\text{slope (m)} = \dfrac{y_2 - y_1}{x_2 - x_1}$ where $x_2 \neq x_1$

There are different ways on how to find the slope of the line. Let us consider the following cases:

Case 1: How can we find the slope of a line given two points on the line?

From the previous example, you may select any two coordinates or ordered pairs from the given table of values or set of coordinates. For instance, we choose (1, 40) and (2, 80).

What is now the slope of the line that passes through (1, 40) and (2, 80)?

Let us solve using the steps below.

Step 1:	Let (1, 40) be (x_1, x_2) and (2, 80) be (y_1, y_2).
Step 2:	Substitute to the given formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$. $m = \frac{80 - 40}{2 - 1}$
Step 3:	Evaluate. $m = \frac{40}{1}$
Step 4:	Simplify. $m = 40$

Hence, the slope of the line passing through (1, 40) and (2, 80) is 40.

What happens when we let (2, 80) be (x_1, x_2) and (1, 40) be (y_1, y_2)?

☞ When we substitute it to the given formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$.

$$m = \frac{40 - 80}{1 - 2}$$

$$m = \frac{-40}{-1}$$

$$m = 40$$

☞ Notice that even if we reverse the order of terms in the numerator, as long as we also reverse the order of terms in the denominator, the result remains the same.

☞ Take note that we make sure to subtract the y-coordinates and the x-coordinates in the same order.

Let's have another example.

Find the slope of the line passing through the points (–1, 3) and (2, 3).

Let us solve the equation by using the steps below.

Step 1:	Let (–1, 3) be (x_1, x_2) and (2, 3) be (y_1, y_2).
Step 2:	Substitute to the given formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$. $m = \frac{3 - 3}{2 - (-1)}$
Step 3:	Evaluate. $m = \frac{0}{2 + 1}$

	$m = \frac{0}{3}$
Step 4:	Simplify. $m = 0$

Hence, the slope of the line passing through (–1, 3) and (2, 3) is 0.

Case 2: How can we find the slope of a line given the equation?

Do you still remember this linear equation y = 40x?

If the equation is in this y-form, the numerical coefficient of x is always the slope of the line. Thus, in y = 40x, the numerical coefficient of x is 40. That is now the slope of the line which is equal to the slope we have computed using its two coordinates.

Let us have more examples.

Find the slope of the line given the equations below.

1.) y = 3x

2.) y = –5x

3.) y = 4x +1

4.) y = –4x –2

5.) 2x + y = 4

☞ You may check your answers.

1) m = 3

2.) m = –5

3.) m = 4

4.) m = –4

5.) 2x + y = 4

y = –2x + 4

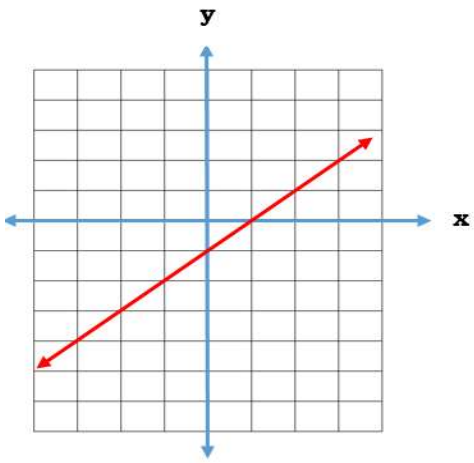
m = –2

Case 3: How can we find the slope of a line given the graph?

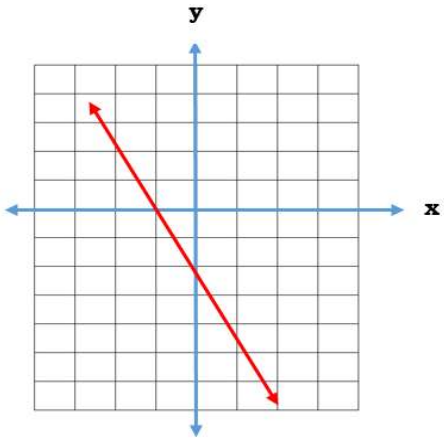
Let's recall that a $\text{slope} = \frac{\text{rise}}{\text{run}}$.

Determine the slope of the line from its graph.

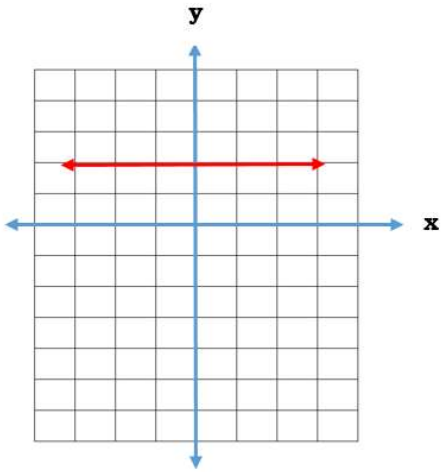
1.)



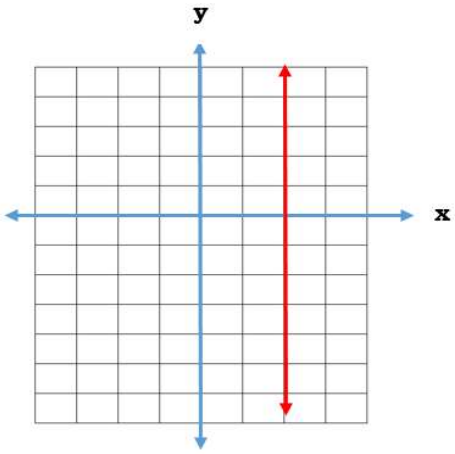
2)



3.)



4.)



Let's discuss each item. How can we find the slope of each line given its graph?

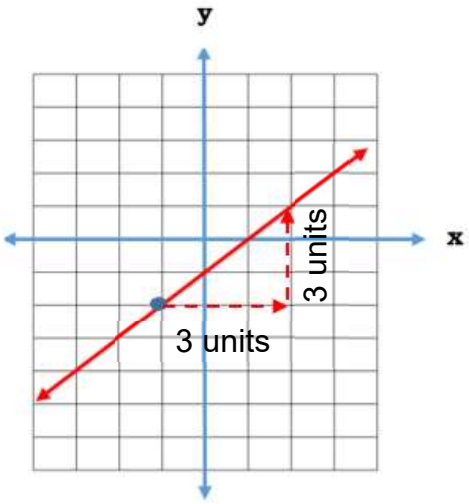
There are two methods on how to determine the slope.

Method 1: Finding the Slope of a Line Directly from the Graph

Steps:

1) Select a point and count convenient units to the right. We will label this as the horizontal change.
2) Count the number of units vertically up until it meets the line at the second point. Prefix this numerical measure for the vertical change with a positive sign.
3) Count the number of units vertically down until it meets the line at the second point. Prefix this numerical measure for the vertical change with a negative sign.

Answer to Item 1:



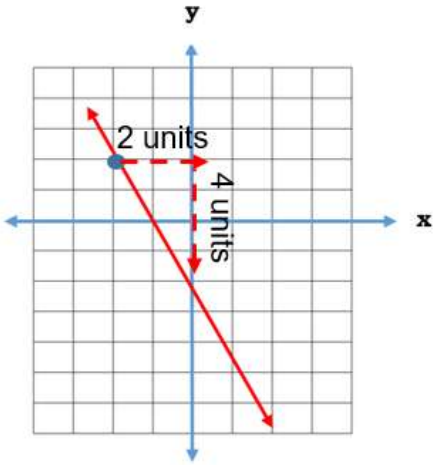
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{3}{3}$$

$$m = 1$$

Hence, the slope of the line is 1.

Answer to Item 2:



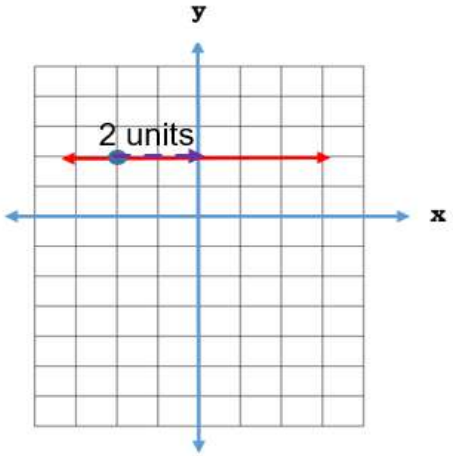
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{-4}{2}$$

$$m = -2$$

Hence, the slope of the line is –2.

Answer to Item 3:



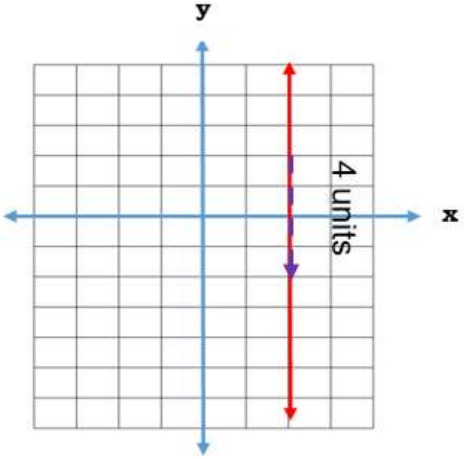
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{0}{2}$$

$$m = 0$$

Hence, the slope of the line is 0.

Answer to Item 4:



$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{4}{0}$$

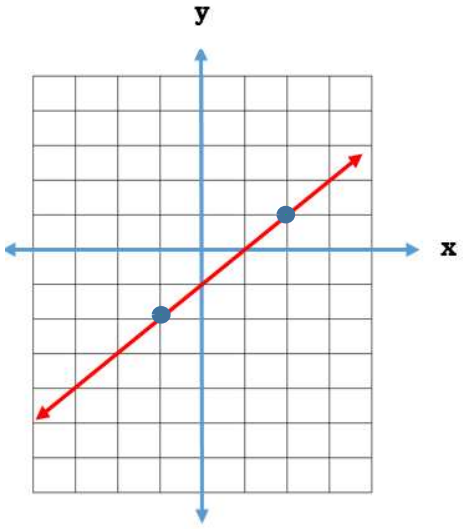
$$m = \infty \text{ (undefined)}$$

Method 2: Finding the Slope of a Line Using Two Points on its Graph

Steps:

1) Pick two points on the line and determine their coordinates.
2) Determine the difference in y-coordinates of these two points (*rise*).
3) Determine the difference in x-coordinates for these two points (*run*).
4) Divide the difference in y-coordinates by the difference in x-coordinates (rise/run or slope).

Let us try item number 1 to find the slope of the given graphs using Method 2. Now, it's your turn to try items 2-4.



The selected coordinates are (2,1) and (–1,–2).

Then, substitute it to the slope formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

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

$$m = \frac{-3}{-3} = 1$$

What's More

Activity 3.1: Solve for Slope...

1. Find the slope of the line that passes through the given pair of points.

   a) (1, 2) and (3, 4)

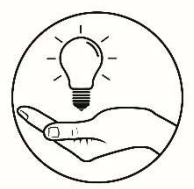
   b) (–3, 3) and (–1, –5)

2. Determine the slope of the line given its equation.

   a) x = 6 + y

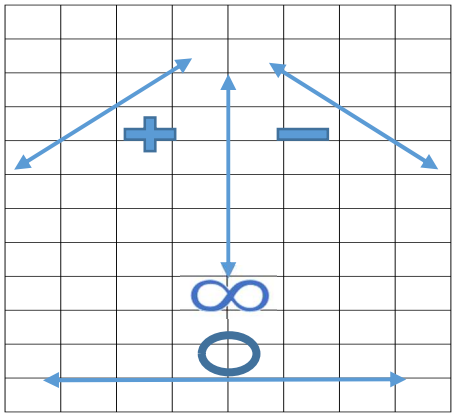
   b) y = x – 2

   c) 3x + 2y = 6



What I Have Learned

Just don't forget this.



- ☞ The slope of a line is constant throughout any segment on the line.
- ☞ If the line slants upward to the right, the slope is positive.
- ☞ If the line slants downward to the right, the slope is negative.
- ☞ If the line is parallel to the x-axis (horizontal line), the slope is zero.
- ☞ If the line is parallel to the y-axis (vertical line), there is no slope. Vertical lines have undefined slope.

What I Can Do

Activity 3.2: Same line? Or Not?

Determine whether the set of points $\{(0,-3),(1,-2),(2,-1),(3,0),(4,1)\}$ lie on the same line. If they do, find the slope of the line.

Assessment

Multiple Choice: Choose the letter of the best answer, and write it on a separate sheet of paper.

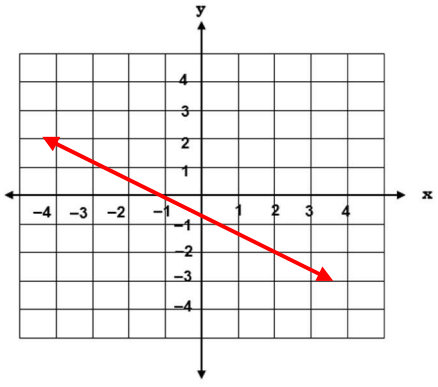
1. What is the slope of the line that passes through points (–2, 7) and (1,4)?
   A. – 3
   B. –1
   C. 0
   D. 1
2. What is the slope of a line through (0, –8) and (–1, –3)?
   A. –11
   B. – 5
   C. 5
   D. 11
3. What is the slope of the line of y = 6x + 4?
   A. –6
   B. 0
   C. 4
   D. 6
4. What is the slope of a line which equation is x + y = – 3?
   A. –3
   B. –1
   C. 1
   D. 3
5. What is the slope of the line given in the graph below?

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

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

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

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



Answer Key

Lesson 1:

What I Know

1.) C

2.) C

3.) D

4.) D

5.) C

What's More
Activity 1.1

The coordinates of the given points are:

A(2,3)

B(3,2)

C(–2,1)

D(–3,–3)

E(1,–2)

The coordinates A(2,3) and B(3,2) are not the same. The coordinates of a point that is two units to the right of y-axis and three units above the x-axis is at point A(2,3), while the coordinates of a point that is three units to the right of y-axis and two units above the x-axis

Lesson 1:

What I Have Learned

1.) (+,+)

2.) IV

3.) (–,–)

4.) II

5.) origin

6) left

7.) (0,+)

8) below

What I Can Do

Activity 1.2

Dolphin

Assessment

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

Lesson 2:

What I Know

1.) A

2.) C

3.) C

4.) A

5.) D

What's More
Activity 2.1

1.) Yes

2.) Yes

3.) Yes

4.) Yes

5.) No

6.) No

7.) No

8.) Yes

9.) No

10.) Yes

What I Have Learned

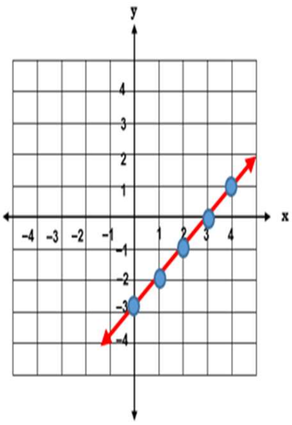
linear

straight

Lesson 3:

What I Can Do

Activity 3.2



Using the coordinates (0, –3) and (1, –2), the slope is:

$m = \frac{y_2 - y_1}{x_2 - x_1}$;

$m = \frac{-2-(-3)}{1-0}$;

$m = \frac{-2+3}{1}$

$m = \frac{1}{1}$; Thus, $m = 1$.

Lesson 3:

What I Know

1.) B

2.) D

3.) B

4.) D

5.) B

What's More
Activity 3.1

1. a.) m = 1
   b.) m = –4

2. a.) m = 1

   b.) m = 1

   c.) $m = -\frac{3}{2}$

Assessment

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

Lesson 2:

What I Can Do

Activity 2.2

1. y = x + 1

If x =	then y =
–1	0
0	1
1	2

2. x + y = 2

If x =	then y =
–2	4
2	0
4	–2

Assessment

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

References

Lucy O. Sia, et. al. 1999. *21st Century Mathematics.* Quezon City: Phoenix Publishing House, Inc.

Margarita T. Pavia. 1999. *Math Challenges Enhancement Exercises for High School Math.* Makati: Belgosa Media Systems, Inc.

Orlando A. Oronce, et. al. 2013. *e-math Intermediate Algebra.* Manila: Rex Publishing Company, Inc.

Gladys C. Nivera. 2014. *Grade 8 Mathematics Patterns and Practicalities.* Makati: Salesiana Books by Don Bosco Press, Inc.

For inquiries or feedback, please write or call:

Department of Education – Schools Division Office of Quezon City

Nueva Ecija St., Bago, Bantay, Quezon City

Telephone: 8352 – 6806/ 8352 - 6809

Email Address: sqoqcactioncenter@gmail.com