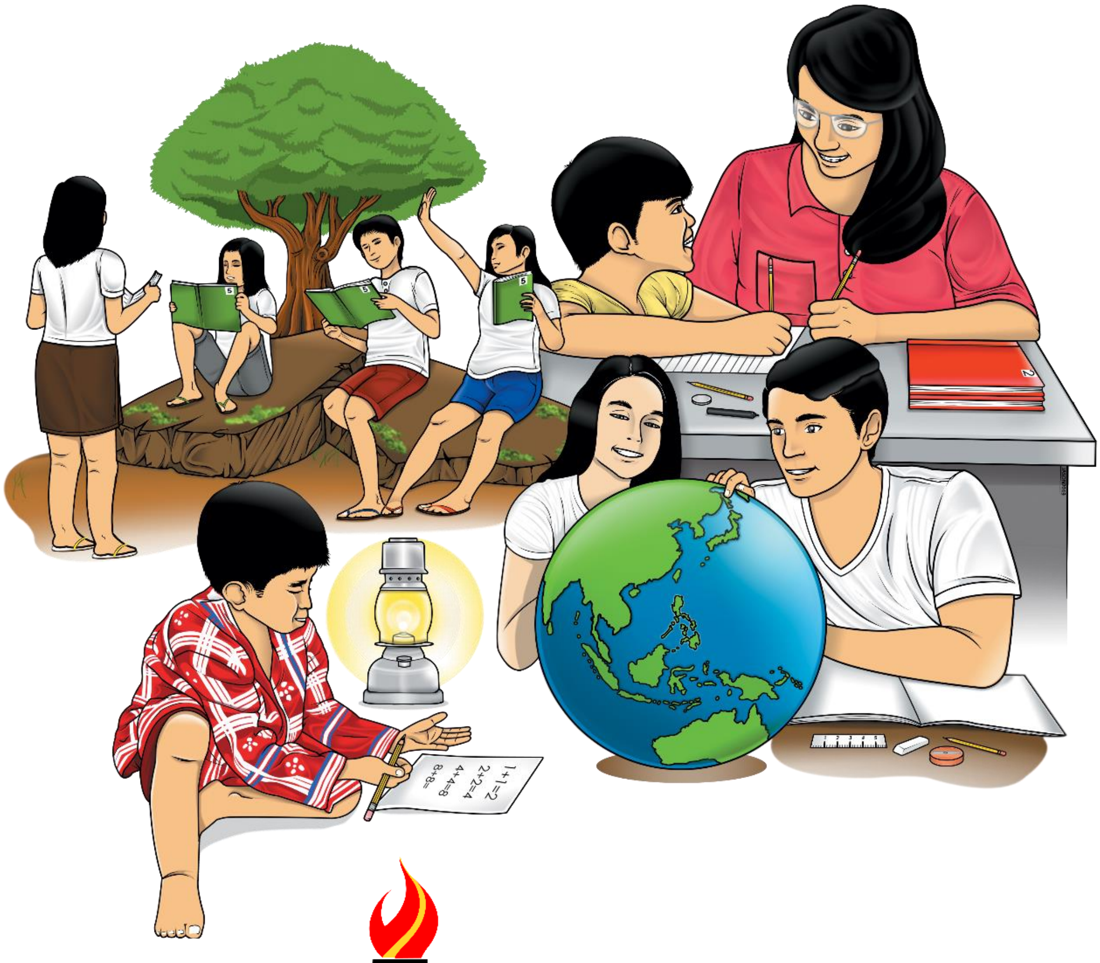
Mathematics

Quarter 1 – Module 14
Illustrating Systems of Linear Equations in Two Variables



ALTERNATIVE DELIVERY MODE

Mathematics – Grade 8
Alternative Delivery Mode
Quarter 1 – Module 14: Illustrating Systems of Linear Equations in Two Variables
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Mathematics

Quarter 1 – Module 14
Illustrating Systems of Linear Equations in Two Variables

DEPARTMENT OF EDUCATION

Introductory Message

For the facilitator:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Illustrating Systems of Linear Equations in Two Variables!

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

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

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

Notes to the Teacher

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

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

For the learner:

Welcome to the Mathematics 8 Alternative Delivery Mode (ADM) Module on Illustrating Systems of Linear Equations in Two Variables!

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

This module has the following parts and corresponding icons:

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

At the end of this module you will also find:

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

The following are some reminders in using this module:

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

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

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

What I Need to Know

This module covers key concepts of linear equations in two variables. It focuses on the illustrating systems of linear equations in two variables. In this module, the students will describe mathematical expressions and mathematical equations. The lesson is arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module contains:

Lesson 1- Illustrating Systems of Linear Equations in Two Variables.

Objectives: After going through this module, you are expected to:

1. define a system of linear equations in two variables;
2. identify the three type of systems of linear equations in two variables: consistent and independent, consistent and dependent, and inconsistent;
3. determine whether an ordered pair satisfies a given pair of linear equations in two variables; and
4. represent real-life situations using systems of linear equations in two variables.

What I Know

Pre- Assessment

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

1. Which of the following is true about the system of linear equations in two variables?

   I. Any set of linear equations.
   II. A set of two or more linear equations in two variables.
   III. A system of linear equations may have only one solution, infinitely many solutions, or no solution at all.
   IV. A system of linear equations in two variables can be solved algebraically or graphically.

   A. I and II
   B. II and III
   C. I, II, and III
   D. II, III, and IV

2. Which of the following equations could NOT be considered as system of linear equation in two variables?

   A. $\begin{cases} 7x - y = 8 \\ 2x + 4y = 8 \end{cases}$

   B. $\begin{cases} y = x - 8 \\ \frac{5}{2}x + 4y = 8 \end{cases}$

   C. $\begin{cases} -x + 6y = 2 \\ 7x = y - 12 \end{cases}$

   D. $\begin{cases} 4x^2 - 3x - 4 = 0 \\ xy^2 = -9 \end{cases}$

3. What system of linear equations in two variables is equivalent to $\begin{cases} y = 4x - 2 \\ \frac{1}{2}x - 5 = y \end{cases}$?

   A. $\begin{cases} 4x - y = 2 \\ x + 2y = 5 \end{cases}$

   B. $\begin{cases} 4x - y = -2 \\ x + 2y = 10 \end{cases}$

   C. $\begin{cases} 4x - y = 2 \\ x - 2y = 10 \end{cases}$

   D. $\begin{cases} 4x + y = -2 \\ x - 2y = 5 \end{cases}$

4. What system of linear equations in two variables is the same as $\begin{cases} \frac{3}{2}x - 4y = 1 \\ 5x - \frac{1}{2}y = 10 \end{cases}$?

   A. $\begin{cases} 3x - 8y = 2 \\ 10x - y = 20 \end{cases}$

   B. $\begin{cases} 3x + 8y = 2 \\ 10x + 4y = 5 \end{cases}$

   C. $\begin{cases} 8x - 3y = 2 \\ x - 10y = 5 \end{cases}$

   D. $\begin{cases} 3x + 2y = -8 \\ 4x - y = 20 \end{cases}$

5. Which of the following is a system of linear equations in two variables?

A. $\begin{cases} -y = 4 \\ x - 3y = 4 \end{cases}$

C. $\begin{cases} 5 - 2y = 4 \\ -3x + y = -2 \end{cases}$

B. $\begin{cases} 2x - y = 4 \\ 2x = -2 \end{cases}$

D. $\begin{cases} x + 3 = y \\ 2x + 2y = 6 \end{cases}$

6. Which of the following system of equations is consistent and independent?

A. $\begin{cases} 3x - 2y = 1 \\ x + 2y = 5 \end{cases}$

C. $\begin{cases} x + 3y = 5 \\ 3x + 9y = 15 \end{cases}$

B. $\begin{cases} x - 2y = 1 \\ x - 2y = 5 \end{cases}$

D. $\begin{cases} x - y = 1 \\ x - y = -5 \end{cases}$

7. Which of the following systems of equations is consistent and dependent?

A. $\begin{cases} x + 2y = 5 \\ x + 2y = -3 \end{cases}$

C. $\begin{cases} x + 3y = -5 \\ 3x + 9y = 15 \end{cases}$

B. $\begin{cases} 3x - 2y = 6 \\ 15x - 10y = 30 \end{cases}$

D. $\begin{cases} x - y = 1 \\ x + y = 4 \end{cases}$

8. Which of the following systems of equations is inconsistent?

A. $\begin{cases} 5x + 2y = 10 \\ 2x + 5y = 10 \end{cases}$

C. $\begin{cases} 2x + y = 4 \\ 2x + 3y = 2 \end{cases}$

B. $\begin{cases} 4x - 3y = 12 \\ 12x - 9y = -36 \end{cases}$

D. $\begin{cases} 5x + y = -3 \\ 15x + 3y = -9 \end{cases}$

9. Which of the following equations can be paired with $x + 2y = 8$ to make a consistent and independent system of equations?

A. $-3x - 6y = -24$

C. $3x - 2y = 4$

B. $7x + 14y = -16$

D. $2x + 4y = 16$

10. Which of the following equations can be paired with $3x - 2y = 5$ to make a consistent and dependent system of equations?

A. $-15\text{x} + 10\text{y} = -25$

C. $\text{x} + 2\text{y} = 1$

B. $6\text{x} - 4\text{y} = -10$

D. $12\text{x} + 8\text{y} = 20$

11. Which of the following ordered pair satisfies the given system $\begin{cases} x - 3y = 5 \\ 3x - 4y = -5 \end{cases}$?

A. $(7,4)$

C. $(7,-4)$

B. $(-7,-4)$

D. $(-7,4)$

12. What is the value of k in the system $\begin{cases} 5x + ky = -13 \\ 4x + ky = -5 \end{cases}$ if $(-2,-1)$ satisfies both equations in the system?

A. -1 and 1

C. -3 and 3

B. -2 and 2

D. -4 and 4

13. Mario invested a total of P 25,000 in his two funds paying 6 % and 8%, respectively in annual interest. The combined annual interest is P 1,800. What system of linear equations in two variables will best represent the situation?

A. $\begin{cases} x + y = 25{,}000 \\ 0.06x + 0.08y = 1{,}800 \end{cases}$

C. $\begin{cases} x - y = 25{,}000 \\ 0.08x + 0.06y = 1{,}800 \end{cases}$

B. $\begin{cases} x + y = 1{,}800 \\ 0.06x + 0.08y = 2{,}500 \end{cases}$

D. $\begin{cases} x + y = 1{,}800 \\ 0.06x - 0.08y = 25{,}000 \end{cases}$

14. Is $x + y^2 = 5$ and $x + 4y = 6$ a system of linear equation in two variables?

A. Yes, because it has two variables, x and y.

B. Yes, because it is written in standard form and in general form.

C. No, because the constants A, B, and C are all real numbers but A and B are not both zero.

D. No, because the degree one of the equations is not 1.

15. Jayda was tasked by her teacher to verify if the ordered pair $(-1, 2)$ will satisfy to the system $\begin{cases} 4x + 3y = 2 \\ 5x - y = -7 \end{cases}$. Her solution is shown below.

Equation 1: $4x + 3y = 2$

$$4(-1) + 3(2) = 2$$
$$-4 + 6 = 2$$
$$2 = 2$$

Equation 2: $5x - y = -7$

$$5(-1) - (2) = -7$$
$$-5 - 2 = -7$$
$$-7 = -7$$

Is her solution correct?

A. Yes, because she substituted the values of the variable x = 1and y = -2.

B. Yes, because she followed the process of evaluating the system of linear equations.

C. No, because the point (-1, 2) is not a common point of the given system of linear equations in two variables.

D. No, because she is supposed to make two false statements that makes a solution of the system of linear equations.

Lesson 1 Illustrating Systems of Linear Equations in Two Variables

In today's "new normal" setting, almost everyone relies on digital communications to reach out to friends and family, deliver work/services from home, and even purchase basic necessities such as food, clothing, medicine, etc. Hence, there is an increasing number of subscribers in the mobile telecommunications industry.

In most cases, these telecommunication companies sold services on similar basis. For instance, these companies charge a fixed cost for a given number of gigabytes (GB) of mobile data subscription, unlimited calls to the same network, and a certain number of minutes of call and text messages sent to other networks plus an additional cost per kilobytes of mobile data used, number of minutes of call and text messages to other networks above that limit.

How would one know which plan is best to choose and which network services to avail? To answer these and similar questions, we need to recognize that there is more than one variable involved and situation such as this can be modelled using linear equations in two variables.

Let us begin this module by reactivating your basic knowledge involving linear equations in two variables.

What's In

Connect Me

Directions: Connect the linear equation to its solution or to its ordered pair.

Linear Equations	Ordered Pairs
1. $y = 3x - 12$	• $(-10, 2)$
2. $2x - y = 7$	• $(-1, 3)$
3. $12y + 6x = 24$	• $(6, -1)$
4. $x + y = -8$	• $(0, -3)$
5. $2y = 8x + 14$	• $(8, 9)$
	• $(5, 3)$

Questions:

1. How did you determine the corresponding solution of each linear equation?
2. What difficulties did you encounter in finding the solution?
3. How will you address the difficulties experienced in finding the solution?

What's New

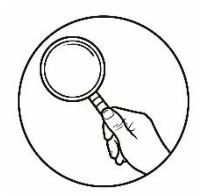
Transform Me!

Directions: Transform each pair of equations into the slope-intercept form ($y = mx + b$) and identify the slope (m) and y-intercept (b). Write your answers on a separate sheet of paper.

Given	Slope-intercept Form ($y = mx + b$)	Slope (m)	y-intercept (b)
1. $x + y = 5$ and $x - y = 1$			
2. $3x + 2y = 6$ and $6x + 4y = 12$			
3. $2x - y = 5$ and $2x - y = 3$			

Questions:

1. Were you able to transform each equation into its slope-intercept form correctly?
2. What have you observed with the slope(m) and y-intercept (b) of the pair of equations in item 1? item 2? item 3?
3. If you are to find ordered pairs that will satisfy both equations in each item, how would you do it?
4. What ordered pair/s, if there's any, that would satisfy both equations in item 1? item 2? item 3?



What is It

In order to investigate situation such as that of the best network services and plan to avail, we need to recognize that we are dealing with more than one variable and probably more than one equation.

Recall that the standard form of a linear equation in two variables is written in the order $\boldsymbol{Ax + By = C}$, where A, B, and C are real numbers and both A and B are not equal to zero. If we are to consider two or more linear equations simultaneously (at the same time) and are to find pair of numbers or ordered pairs that will satisfy the equations, then we are dealing with **systems of linear equations**.

Suppose we take the pair of equations $x + y = 5$ and $x - y = 1$. Note that there are infinitely many pair of numbers whose sum is 5, hence, we can say that there are infinitely many ordered pairs (x, y) that will satisfy the equation and some of these are shown in Table 1 below. Similarly, if we consider the equation $x - y = 1$, we can also say that there are infinitely many pair of numbers whose difference is 1, hence, we can also say that there are infinitely many ordered pair (x, y) that will satisfy $x - y = 1$ and some of these are shown in Table 2 below.

$x + y = 5$		
x	y	(x, y)
0	5	$(0,5)$
1	4	$(1,4)$
2	3	$(2,3)$
$\mathbf{4}$	$\mathbf{1}$	$(\mathbf{4},\mathbf{1})$
5	0	$(5,0)$

Table 1

$x - y = 1$		
x	y	(x, y)
0	-1	$(0,-1)$
1	0	$(1,0)$
2	1	$(2,1)$
3	2	$(3,2)$
$\mathbf{4}$	$\mathbf{1}$	$(\mathbf{4},\mathbf{1})$

Table 2

From Tables 1 and 2, we see that the ordered pair $(4,1)$ satisfies both $x + y = 5$ and $x - y = 1$. If we are to consider the equations simultaneously, then we can write this as:

$$\begin{cases} x + y = 5 \\ x - y = 1 \end{cases}$$

This can be read as " the system of equations $x + y = 5$ and $x - y = 1$".

Since the ordered pair $(4,1)$ satisfies both equations, then we say that it is called a **solution** to the system of equations. A **solution** of a system of linear equations is an ordered pair (x, y) that satisfies both equations.

Generally, there are three kinds of systems of linear equations in two variables according to the number of solutions. Note that finding the solutions to a system of linear equations can be done both graphically and algebraically (substitution and elimination), but these methods will be discussed in the succeeding modules.

Recall that in the previous activity, you were asked to transform the pair of equations into the slope-intercept form and identify the slope and y-intercept of each equation. Now let us discuss the three kinds of systems of linear equations using the information from that activity.

1. A system of linear equations can be **consistent and independent**. This is a system of linear equations having exactly **one solution**. The slopes of the lines defined by the equations are not equal, their y-intercepts could be equal or unequal.

   Example 1. $\begin{cases} x + y = 5 \\ x - y = 1 \end{cases}$

   We already know from the discussion above that the ordered pair $(4,1)$ is a solution to the given system of equations. We only need to check on the slope and the y-intercept of the pair of equations. Transforming each equation into the slope-intercept form, we get:

   Equation 1:

   $$\begin{aligned} x + y &= 5 \\ x - x + y &= 5 - x \\ y &= -x + 5 \end{aligned}$$

   $\boldsymbol{m = -1}$; $\boldsymbol{b = 1}$

   Equation 2:

   $$\begin{aligned} x - y &= 1 \\ x - x - y &= 1 - x \\ -y &= -x + 1 \\ (-1)(-y) &= (-1)(-x + 1) \\ y &= x - 1 \end{aligned}$$

   $\boldsymbol{m = 1}$; $\boldsymbol{b = -1}$

   Observe that the slope of equation 1 is not equal to the slope of equation 2. Hence, we say that $m_1 \neq m_2$.

   In your next lesson, you can verify that by graphical method, the graphs of these equations intersect at exactly one point and that point of intersection is at $(4,1)$.

2. A system of linear equations can be **consistent and independent**. This is a system of linear equations having **infinitely many solutions**. The slopes of the lines defined by the equations are equal and their y-intercepts are also equal.

   Example 2. $\begin{cases} 3x + 2y = 6 \\ 6x + 4y = 12 \end{cases}$

   Transforming each equation into the slope-intercept form, we get:

Equation 1:

$$\begin{aligned}
3x + 2y &= 6\\
3x - 3x + 2y &= 6 - 3x\\
2y &= -3x + 6\\
\frac{1}{2}(2y) &= \frac{1}{2}(-3x + 6)\\
y &= \frac{-3}{2}x + 3
\end{aligned}$$

$$\boldsymbol{m} = \frac{-3}{2} \quad ; \quad \boldsymbol{b} = \mathbf{3}$$

Equation 2:

$$\begin{aligned}
6x + 4y &= 12\\
6x - 6x + 4y &= 12 - 6x\\
4y &= -6x + 12\\
\frac{1}{4}(4y) &= \frac{1}{4}(-6x + 12)\\
y &= \frac{-3}{2}x + 3
\end{aligned}$$

$$\boldsymbol{m} = \frac{-3}{2} \quad ; \quad \boldsymbol{b} = \mathbf{3}$$

Observe that the slope of both equations are equal and the y-intercept of both equations are also equal, hence, we say that $m_1 = m_2$ and $b_1 = b_2$.

What are some of the ordered pairs that will satisfy both equations? Let us try some points and determine whether these ordered when substituted to both equations will yield a true statement.

a. the y-intercept: $(0,3)$

Equation 1: $x = 0;\ y = 3$

$$\begin{aligned}
3x + 2y &= 6\\
3(0) + 2(3) &= 6\\
6 &= 6 \ \checkmark
\end{aligned}$$

Equation 2: $x = 0;\ y = 3$

$$\begin{aligned}
6x + 4y &= 12\\
6(0) + 4(3) &= 12\\
12 &= 12 \ \checkmark
\end{aligned}$$

b. the x-intercept: $(2,0)$

Equation 1: $x = 2;\ y = 0$

$$\begin{aligned}
3x + 2y &= 6\\
3(2) + 2(0) &= 6\\
6 &= 6 \ \checkmark
\end{aligned}$$

Equation 2: $x = 2;\ y = 0$

$$\begin{aligned}
6x + 4y &= 12\\
6(2) + 4(0) &= 12\\
12 &= 12 \ \checkmark
\end{aligned}$$

c. Another point $(6,-6)$

Equation 1: $x = 6;\ y = -6$

$$\begin{aligned}
3x + 2y &= 6\\
3(6) + 2(-6) &= 6\\
18 - 12 &= 6\\
6 &= 6 \ \checkmark
\end{aligned}$$

Equation 2: $x = 6;\ y = -6$

$$\begin{aligned}
6x + 4y &= 12\\
6(6) + 4(-6) &= 12\\
36 - 24 &= 12\\
12 &= 12 \ \checkmark
\end{aligned}$$

And we can go on testing infinitely many ordered pairs to show that indeed the system $\begin{cases} 3x + 2y = 6 \\ 6x + 4y = 12 \end{cases}$ has infinitely many solutions. Another thing that we can do to is to show that one equation is equivalent to the other. That is, in the example above, equation 2 can be obtained by multiplying each term of equation 1 by 2. Conversely, equation 1 can be obtained by dividing each term of equation 2 by 2. Hence, we say that the two equations are equivalent. In your next lesson, you can verify that by graphical method, the graphs of these two equations coincide. That is, the points in the graph of $3x + 2y = 6$ are exactly the same pints in the graph of $6x + 4y = 12$.

3. A system of linear equations can be **inconsistent**. This is a system of linear equations having **no solution**. The slopes of the lines defined by the equations are equal but their y-intercepts are not equal.

   Example 3. $\begin{cases} 2x - y = 5 \\ 2x - y = 3 \end{cases}$

   Transforming these equations into the slope-intercept form, we get:

   Equation 1:

$$\begin{aligned} 2x - y &= 5 \\ 2x - 2x - y &= 5 - 2x \\ -y &= -2x + 5 \\ (-1)(-y) &= (-1)(-2x + 5) \\ y &= 2x - 5 \\ \boldsymbol{m = 2} \quad &; \quad \boldsymbol{b = -5} \end{aligned}$$

   Equation 2:

$$\begin{aligned} 2x - y &= 3 \\ 2x - 2x - y &= 3 - 2x \\ -y &= -2x + 3 \\ (-1)(-y) &= (-1)(-2x + 3) \\ y &= 2x - 3 \\ \boldsymbol{m = 2} \quad &; \quad \boldsymbol{b = -3} \end{aligned}$$

   Observe that the slope of equation 1 is equal to the slope of equation 2 but the y-intercept of equation 1 is not equal to the y-intercept of equation 2. Hence, we say that $m_1 = m_2$ and $b_1 \neq b_2$. Again, in your next lesson you can verify that by graphical method, the graphs of these two equations do not intersect any point, hence, they are parallel.

Recall that at the beginning of this lesson, it has been mentioned that real-life situations can be modelled using system of linear equations in two variables. Now let us explore some of these using the examples below.

Example 1. A mobile network provider offers a postpaid sim-only plan that costs Php999 per month plus Php2.50 per text message sent to other networks. Another mobile network sim-only plan costs Php1299 per month but offers Php1 only for every text message sent to other networks. What are the two equations that can be used to represent the total monthly cost (y) of the number of text messages (x) sent to other networks?

Answer:

Ley x be the total number of text messages sent to other networks
y be the total monthly cost of x text messages sent to other networks

Hence, we have the two equations:

$$y = 2.5x + 999 \text{ and } y = x + 1299$$

We can write these equations as a system: $\begin{cases} y = 2.5x + 999 \\ y = x + 1299 \end{cases}$.

Example 2. Matthew and Minard are selling fruit for a school fundraiser. Customers can buy small and large boxes of oranges. Matthew sells 3 small boxes and 14 large boxes of oranges for a total of $Php203.00$. Minard sells 11 small boxes of oranges and 11 large boxes of oranges for a total of $Php\ 220.00$. Write linear equations to represent the cost of a small box and large box of oranges.

Answer:

Ley x be the number of boxes of oranges

y be the number of large boxes of oranges

Hence, we have the two equations:

$$3x + 14y = 203 \text{ and } 11x + 11y = 220$$

We can write these equations as a system: $\begin{cases} 3x + 14y = 203 \\ 11x + 11y = 220 \end{cases}$.

What's More

Activity 1: Pick Me!

Determine which of the following ordered pairs would satisfy the given system of linear equations in two variables. Write your answers on a separate sheet of paper.

1. $\begin{cases} \mathbf{x + 2y = 5} \\ \mathbf{3x + y = 5} \end{cases}$	$(\mathbf{1, 2})$	$(\mathbf{0, 2})$	$(\mathbf{-1, 3})$	$(\mathbf{3, 1})$
2. $\begin{cases} \mathbf{y = x + 2} \\ \mathbf{2x - 3y = -7} \end{cases}$	$(0,2)$	$(1,3)$	$(2,5)$	$(-2,0)$
3. $\begin{cases} \mathbf{3x - 2y = 8} \\ \mathbf{x + y = 6} \end{cases}$	$(0,-4)$	$(1,3)$	$(2,-1)$	$(4,2)$
4. $\begin{cases} \mathbf{4x - y = -1} \\ \mathbf{x + 7y = 7} \end{cases}$	$(1,-3)$	$(0,1)$	$(-1,6)$	$(2,-7)$
5. $\begin{cases} \mathbf{2x - 3y = 14} \\ \mathbf{5x + 2y = -3} \end{cases}$	$(-3,-5)$	$(-2,1)$	$(4,3)$	$(1,-4)$

Questions:

1. How did you determine if an ordered pair is a solution to the given system of linear equations in two variables?
2. If you are to transform each equation in the system into the slope-intercept form, what conclusion can you draw about their slopes? y-intercepts?
3. What kind of system of linear equations are given above?

Activity 2. What Am I?

Directions: Using the slope and y-intercept, tell whether the system of equations are consistent and independent, consistent and dependent, or inconsistent. Write your answer on a separate sheet of paper.

_________1. $\begin{cases} 2x - 3y = -7 \\ 2x - 3y = 8 \end{cases}$

_________2. $\begin{cases} x - y = -5 \\ x + y = 1 \end{cases}$

_________3. $\begin{cases} x + y = 1 \\ 3x + 3y = 3 \end{cases}$

Questions:

1. Which of the system of equations above is consistent and independent? consistent and dependent? inconsistent?
2. For consistent and independent system of equations, what have you observed about the slope of the equations?
3. For consistent and dependent system of equations, what have you observed about the slope and y-intercepts of the equations?
4. For inconsistent system of equations, what have you observed about the slope and y-intercept of the equations?
5. What does the slope and y-intercept of the equations in the system tell you about its number of solution/s?

Activity 3: Correct Me If I'm Wrong.

Determine whether each pair of equations in the system is **equivalent** or **not**. Put a ✓ mark if the equations are equivalent or ***x*** mark if not. Write your answer on the space provided before the number.

_________1. $\begin{cases} 2x - y = 7 \\ 3x - y = 5 \end{cases}$

_________2. $\begin{cases} x + y = 8 \\ 2x + 2y = 16 \end{cases}$

_________3. $\begin{cases} 6x - 2y = 8 \\ y = 3x - 3 \end{cases}$

_________4. $\begin{cases} x + y = 8 \\ x + y = -3 \end{cases}$

_________5. $\begin{cases} 8x + 2y = 10 \\ 4x = -y + 5 \end{cases}$

Activity 4: Let's Sell!

Directions: Read the situation below and answer the questions that follow. Use a separate sheet of paper.

Situation: *A store will sell 3 large and 4 small flower pots for Php205. They will also sell 2 large and 3 small flower pots for Php145. Let* x *represents large pot, and* y *represents small pot.*

Questions:

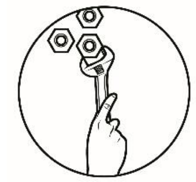
1. What are the two equations that can be used to determine the price of each flower pot?
2. How did you identify the equations? Is it a system of linear equation or is it a simple linear equation?
3. Find an ordered pair that will satisfy the equations obtained in question no. 1. Show your solutions.

What I Have Learned

Complete Me!

Supply the correct term to complete the statement.

1. The solution to a system of linear equations in two variables is an ordered pair that makes both equations _______________.
2. A _______________ refers to two or more linear equations involving two unknowns, for which, values are sought that are common solutions of the equations involved.
3. In the given system $\boldsymbol{x - y = -1}$ and $\boldsymbol{2x + y = 4}$, the solution is _______________ because the values satisfy the given equations.
4. The solution to a system of linear equations in two variables is an _______________ that makes both equations true.
5. The system of equations is called ___________________ if the slopes of the lines defined by the equations are not equal and their y-intercepts could be equal or unequal.
6. The system of equations is called ___________________ if the slopes of the lines defined by the equations are equal and their y-intercepts are also equal.
7. The system of equations is called ___________________ if slopes of the lines defined by the equations are equal but their y-intercepts are not equal.



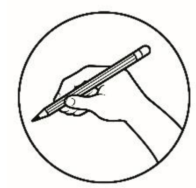
What I Can Do

The Story of my Life

Write a situation in your life which can be represented by systems of linear equations in two variables.

Your output will be rated using the following rubrics:

4	3	2	1
The situation is clear, realistic and the use of the system of linear equations in two variables is properly illustrated.	The situation is clear and the use of the system of linear equations in two variables is not illustrated.	The situation is not clear and the use of the system of linear equations in two variables is not illustrated.	The situation is not clear and the use of the system of linear equations in two variables is not illustrated.



Assessment

Post- Assessment

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

1. Which of the following is NOT a system of linear equations in two variables?

A. $\begin{cases} x - y + 5 \\ -3x^2 = 0 \end{cases}$

B. $\begin{cases} 3x - y = 5 \\ x - 11y = -1 \end{cases}$

C. $\begin{cases} 4x - 8y = 12 \\ 2x - \frac{1}{3}y = -12 \end{cases}$

D. $\begin{cases} x - 4y = 5 \\ \frac{3}{5}x - 4y = 7 \end{cases}$

2. What system of linear equations in two variables is equivalent to $\begin{cases} y = \frac{1}{2}x - 4 \\ y = 4x - 5 \end{cases}$?

A. $\begin{cases} \mathrm{x} - 2\mathrm{y} = 8 \\ 4\mathrm{x} - \mathrm{y} = 5 \end{cases}$

B. $\begin{cases} 4\mathrm{x} - \mathrm{y} = -2 \\ \mathrm{x} + 2\mathrm{y} = -5 \end{cases}$

C. $\begin{cases} \mathrm{x} - \mathrm{y} = 8 \\ 4\mathrm{x} - 2\mathrm{y} = 5 \end{cases}$

D. $\begin{cases} \mathrm{x} + 2\mathrm{y} = -8 \\ \mathrm{x} - 4\mathrm{y} = -5 \end{cases}$

3. What system of linear equations in two variables is the same as $\begin{cases} \frac{4}{5}x - y = -3 \\ y = \frac{2}{3}x - 5 \end{cases}$?

A. $\begin{cases} 4\mathrm{x} + 10\mathrm{y} = 5 \\ 2\mathrm{x} - 3\mathrm{y} = 15 \end{cases}$

C. $\begin{cases} 4\mathrm{x} - 5\mathrm{y} = -15 \\ 2\mathrm{x} - 3\mathrm{y} = 15 \end{cases}$

B. $\begin{cases} 4x - 10y = 15 \\ 2x - 3y = 15 \end{cases}$

D. $\begin{cases} 4x + 10y = -5 \\ 3x - 2y = -15 \end{cases}$

4. Which of the following ordered pairs satisfies the system $\begin{cases} x + 4y = -1 \\ x + 2y = 1 \end{cases}$?

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

5. What is the value of y if $x = -5$ in the system $\begin{cases} 3x + 5y = -5 \\ x - 2y = -9 \end{cases}$?

A. 0
B. 1
C. 2
D. 3

6. What equation is best paired to $2x + y = 3$ to make an inconsistent system of linear equations in two variables?

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

7. Which of the following equations can be paired with $6x - 3y = 24$ to make a consistent and dependent system?

A. $y = 2x - 8$
B. $y = 2x + 8$
C. $y = 6x + 24$
D. $y = 6x - 24$

8. What system of linear equations in two variables is the same as $\begin{cases} \frac{1}{2}x - 4y = 4 \\ x - \frac{1}{3}y = 6 \end{cases}$?

A. $\begin{cases} x - 8y = 8 \\ 3x - y = 18 \end{cases}$

C. $\begin{cases} 8x - y = 8 \\ x - 3y = 18 \end{cases}$

B. $\begin{cases} x + 8y = 8 \\ 3x + y = 18 \end{cases}$

D. $\begin{cases} 8x + y = -8 \\ x + 3y = -18 \end{cases}$

9. Which of the following is a system of linear equations in two variables?

A. $\begin{cases} -x = 5 \\ y - 4y = 4 \end{cases}$

C. $\begin{cases} 3 - y = 8 \\ -6x + y = 6 \end{cases}$

B. $\begin{cases} 3x - 2y = 4 \\ 4x = -3 \end{cases}$

D. $\begin{cases} x + 4 = y \\ 2x - 2y = -8 \end{cases}$

10. All of the following ordered pairs satisfy the system $\begin{cases} 2x - y = 4 \\ 4x - 2y = 8 \end{cases}$, EXCEPT:

A. $(0, -4)$ C. $(4, 4)$
B. $(2, 0)$ D. $(0,2)$

11. Which of the following statements is true about the system $\begin{cases} 2x + y = 4 \\ x - y = 2 \end{cases}$?

A. There is an ordered pair (2,0) that satisfies both equation.
B. There are infinitely many ordered pair that satisfy both equations.
C. The slope of the first equation is equal to the slope of the second equation.
D. The slope and the y-intercept of the first equation and second equation are equal.

12. Which statement is true about the system $\begin{cases} x + y = 15 \\ 3x + 3y = -10 \end{cases}$?

A. There is one ordered pair that will both equations.
B. There is no ordered pair that will satisfy both equations.
C. There is infinitely many ordered pairs that will satisfy both equations.
D. Equation 2 is obtained by multiplying each term in equation 1 by 3.

13. What is the value of k in the system $\begin{cases} kx + 5y = -3 \\ 3x + ky = -5 \end{cases}$ if the ordered pair $(-2, 1)$ makes the two equations true?

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

14. Neria is buying $Php1500$ worth of flowering plants. A pot of rose costs $Php150$ and a pot of gumamela costs $Php75$. While Zasha is buying $Php1400$ worth of flowering plants. A pot of bromeliad costs $Php200$ and a pot of santan costs $Php50$. Which of the following system of equations best represent the situation?

A. $\begin{cases} 150x + 75y = 1500 \\ 200x + 50y = 1400 \end{cases}$ C. $\begin{cases} 75x + 150y = 1500 \\ 50x - 200y = 1400 \end{cases}$

$B.$ $\begin{cases} 150x - 75y = 1500 \\ 200x - 50y = 1400 \end{cases}$ D. $\begin{cases} 150x - 75y = 1500 \\ 200x - 50y = 1400 \end{cases}$

15. Dustin Zayd was tasked by his teacher to find an ordered pair that satisfies the given system $\begin{cases} 6x - 5y = -2 \\ x + 2y = -11 \end{cases}$. His answer is point (3, 4) .Is he correct?

A. Yes, because he substituted the variable of $x = 3$ and $y = 4$ to the system of linear equations.
B. Yes, because he yielded two true statements that makes a solution of the system of linear equations.
C. No, because he did not follow the steps in evaluating system of linear equations in two variables.
D. No, because the point (3, 4) does not satisfy the given system of linear equations in two variables.

Additional Activities

Mathematics and art are related in a variety of ways. Mathematics can be discerned in arts such as music, dance, and in many forms of visual arts. Hence, your task is to compose a jingle, dance video, painting or collage, or any other art forms to share your learning in illustrating a system of linear equations in two variables, particularly its relevance to your life.

Your output will be rated using the following rubric.

Criteria	**Performance Level**				
	Beginning (6 points)	**Developing (7 points)**	**Approaching Proficiency (8 points)**	**Proficient (9 points)**	**Advanced (10 points)**
Output Requirements	Limited evidence of output requirements	Output meets some requirements, guidelines and objectives	Output meets most requirements, guidelines and objectives	Output meets all requirements, guidelines and objectives with the capacity to advance	Output exceeds requirements, guidelines ad objectives at an advanced level
Craftsmanship/ Technique	Limited developing knowledge of tools, and media techniques	Some developing knowledge of understanding the tools and media. Techniques were not used	Output is needing better attention to the use of tools and media. Recognizes necessary techniques	Proficient use of tools, media, and techniques. Most elements are skillful and complete with capacity to advance	Advanced use of tools, media, and techniques. All elements are skillful and complete
Productivity	Limited effort to develop ideas, produce work or use time well. Almost never accessed resources	Minimal effort to develop ideas, produce work or use time well. Rarely accessed resources	Adequate effort to develop ideas, produce work or use time well. Sometimes accessed resources	Proficient effort to develop ideas, produce work or use time well. Often accessed resources	Advanced effort to develop ideas, produce work or use time well. Accessed available resources when needed

Criteria	Performance Level				
	Beginning (6 points)	**Developing (7 points)**	**Approaching Proficiency (8 points)**	**Proficient (9 points)**	**Advanced (10 points)**
Critical Thinking	Limited attempt to accurately interpret process and content	Minimal attempt to accurately interpret process and content	Adequate attempt to accurately interpret process and content	Proficient attempt to accurately interpret process and content	Advanced attempt to accurately interpret process and content
Critical Response	Limited attempt to make connections to the artistic process	Recognizes some artistic vocabulary although unclear. Does not create comparisons to global issues or cultural context	Some use of artistic vocabulary. Does not create comparisons to global issues or cultural context	Proficient use of artistic vocabulary. Creates some comparisons to global issues or cultural context with the capacity to advance	Advanced use of artistic vocabulary. Creates relevant comparisons to global issues or cultural contexts

Answer Key

What I Know

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

What's in

Connect Me

1. (5, 3)
2. (8, 9)
3. (6, -1)
4. (-10, 2)
5. (-1, 3)

What's New

1. $y = -x + 5; m = -1; b = 5$
   $y = x - 1; m = 1; b = 1$
2. $y = -\frac{3}{2}x + 3; m = -\frac{3}{2}; b = 3$
   $y = -\frac{3}{2}x + 3; m = -\frac{3}{2}; b = 3$
3. $y = 2x - 5; m = 2; b = -5$
   $y = 2x - 3; m = 2; b = -3$

What's More

Activity 1 "Pick Me "

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

Activity 2: What Am I?

1. inconsistent
2. consistent and independent
3. consistent and dependent

Questions:

1. (In order) item 2, item 3, item 1
2. slopes are unequal
3. slopes are equal and the y-intercepts are also equal
4. slopes are equal; y-intercepts are not equal
5. unequal slopes have one solution; equal slopes and equal y-intercepts have infinitely many solutions; equal slopes but different y-intercepts have no solution.

Activity 3: Correct Me If I'm Wrong

1. **X**
2. ✓
3. **X**
4. **X**
5. ✓

Activity 4 "Let's Sell"

1. $\begin{cases} 3x + 4y = 205 \\ 2x + 3y = 145 \end{cases}$
2. Let x represents the number of large flower pots; y represents the number of small flower pots; system of equations in two variables
3. $(35,25)$

What have I learned

1. True
2. System of linear equations in two variables
3. (1,2)
4. ordered pair
5. consistent and independent
6. consistent and dependent
7. inconsistent

What I can Do

Answers may vary.

Assessment

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

Additional Activities

Answers may vary.

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