TEACHING GUIDE

Module 4: Linear Inequalities in Two Variables

A. Learning Outcomes

Content Standard:
The learner demonstrates understanding of key concepts of linear inequalities in two variables.

Performance Standard:
The learner is able to formulate real-life problems involving linear inequalities in two variables and solve these with utmost accuracy using a variety of strategies.

UNPACKING THE STANDARDS FOR UNDERSTANDING

<table>
<tr><td rowspan="2">SUBJECT:
Grade 8 Mathematics
QUARTER
Second Quarter
STRAND:
Algebra
TOPIC:
Linear Inequalities in Two Variables
LESSONS:
1. Mathematical Expressions and Equations in Two Variables
2. Equations and Inequalities in Two Variables
3. Graphs of Linear Inequalities in Two Variables</td><td colspan="2">LEARNING COMPETENCIES
1. Differentiate between mathematical expressions and mathematical equations.
2. Differentiate between mathematical equations and inequalities.
3. Illustrate linear inequalities in two variables.
4. Graph linear inequalities in two variables on the coordinate plane.
5. Solve real-life problems involving linear inequalities in two variables.</td></tr>
<tr><td>ESSENTIAL UNDERSTANDING:
Students will understand that real-life problems where certain quantities are related and bounded by restraints, conditions and constraints can be solved using linear inequalities in two variables.</td><td>ESSENTIAL QUESTION:
How can problems involving two quantities bounded by conditions, restraints and constraints be solved?</td></tr>
<tr><td></td><td colspan="2">TRANSFER GOAL:
Students will be able to apply the key concepts of linear inequalities in two variables in formulating and solving real-life problems.</td></tr>
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B. Planning for Assessment

Product/Performance

The following are products and performances that students are expected to come up with in this module.

a. Linear inequalities drawn from real-life situations and the graph of each
b. Role-playing of real-life situations where linear inequalities in two variables are applied
c. Real-life problems involving linear inequalities in two variables formulated and solved
d. Budget proposal that demonstrates students' understanding of linear inequalities in two variables.

Assessment Map

TYPE	KNOWLEDGE	PROCESS/SKILLS	UNDERSTANDING	PERFORMANCE
Pre – assessment/ Diagnostic	**Pre-Test: Part I** Identifying and describing linear inequalities in two variables and their graphs	**Pre-Test: Part I** Graphing linear inequalities in two variables Finding the solution set of linear inequalities in two variables	**Pre-Test: Part I** Solving problems involving linear inequalities in two variables Representing situations using linear inequalities in two variables	**Pre-Test: Part I** Products and performances related to or involving linear inequalities in two variables

Formative	**Quiz: Lesson 1** Identifying linear inequalities in two variables and their graphs	**Quiz: Lesson 1** Graphing linear inequalities in two variables Determining whether an ordered pair is a solution to a given linear inequality in two variables Finding the solution set of linear inequalities in two variables	**Quiz: Lesson 1** Representing situations using linear inequalities in two variables Explaining how to graph linear inequalities in two variables Differentiating linear inequalities in two variables from linear equations in two variables Solving problems involving linear inequalities in two variables	

Summative	***Post-Test: Part I*** Identifying and describing linear inequalities in two variables and their graphs	***Post-Test: Part I*** Graphing linear inequalities in two variables Finding the solution set of linear inequalities in two variables	***Post-Test: Part I*** Solving problems involving linear inequalities in two variables Representing situations using linear inequalities in two variables	**Post-Test: Part I** Products and performances related to or involving linear inequalities in two variables
	Part II Identifying linear inequalities in two variables	**Part II** Solving linear inequalities in two variables graphically and algebraically	**Part II** Describing the solution set of linear inequalities in two variables	
			Part III: Solving problems involving linear inequalities in two variables	**Part IV:** **GRASPS Assessment**
Self - assessment	**Journal Writing:** Expressing understanding of linear inequalities in two variables Expressing understanding of finding solutions of linear inequalities in two variables graphically and algebraically			

Assessment Matrix (Summative Test)

Levels of Assessment	What will I assess?	How will I assess?	How Will I Score?
Knowledge 15%	The learner demonstrates understanding of key concepts of linear inequalities in two variables. Differentiate between mathematical expressions and mathematical equations. Differentiate between mathematical equations and inequalities. Illustrate linear inequalities in two variables. Graph linear inequalities in two variables on the coordinate plane. Solve real-life problems involving linear inequalities in two variables.	**Paper and Pencil Test** **Part I** items 2, 4 and 8 **Part II** item 1 **Part IV** item 1	1 point for every correct response
Process/Skills 25%		**Part I** items 1, 3, 6, 11, and 12 **Part II** item 3	1 point for every correct response Rubric on Problem Solving
Understanding 30%		**Part I** items 5, 7, 9, 13, 14, and 16 **Part II** items 2, 4 and 5 **Part III** Items 1 and 2	1 point for every correct response Rubric for explanation Criteria: Clear Coherent Justified Rubric for drawing Criteria: Neat and Clear Accurate Justified Appropriate Relevant Rubric on Problem Solving
Product 30%	The learner is able to formulate real-life problems involving linear inequalities in two variables and solve these with utmost accuracy using a variety of strategies.	**Part I** Items 10, 15, 17, 18, 19, and 20 **Part IV** **GRASPS Assessment** Make a simple budget proposal for raising broiler chickens. Apply your understanding of the key concepts of linear inequalities in two variables in preparing the budget proposal.	1 point for every correct response Rubric on Budget Proposal for Raising Broiler Chickens Criteria: The budget proposal should be clear, realistic, and make use of linear inequalities in two variables and other mathematical statements.

C. Planning for Teaching-Learning

Introduction:

This module covers key concepts of linear inequalities in two variables. It focuses on the three lessons namely: Mathematical Expressions and Equations in Two Variables, Equations and Inequalities in Two Variables, and Graphs of Linear Inequalities in Two Variables. In this module, the students will describe mathematical expressions, mathematical equations and inequalities. They will also illustrate and translate mathematical statements into inequalities. The students will also draw the graphs of linear inequalities in two variables using any graphing materials, tools, or computer software such as GeoGebra. It would be more convenient for students to graph the inequalities in two variables and find its solutions if the use of GeoGebra is encouraged.

In all lessons, students are given the opportunity to use their prior knowledge and skills in learning linear inequalities in two variables. They are also given varied activities to process the knowledge and skills learned and to deepen and transfer their understanding of the different lessons.

As an introduction to the main lesson, ask them the following questions:

Have you asked yourself how your parents budget their income for your family's needs? How engineers determine the needed materials in the construction of new houses, bridges, and other structures? How students like you spend your time studying, accomplishing school requirements, surfing the internet, or doing household chores?

Entice the students to find out the answers to these questions and to determine the vast applications of linear inequalities in two variables through this module.

Objectives:

After the learners have gone through the lessons contained in this module, they are expected to:

a. describe and differentiate mathematical expressions, equations, and inequalities.
b. illustrate linear inequalities in two variables using practical situations;
c. draw and describe the graphs of linear inequalities in two variables; and
d. formulate and solve problems involving linear inequalities in two variables.

Teacher's Note and Reminders

Pre-Assesment

Check students' prior knowledge, skills, and understanding of mathematics concepts related to Linear Inequalities in Two Variables. Assessing these will facilitate teaching and students' understanding of the lessons in this module.

Answer Key

Part I

1. B	6. A	11. C	16. C
2. D	7. B	12. B	17. C
3. B	8. B	13. C	18. C
4. D	9. C	14. B	19. B
5. C	10. D	15. D	20. B

Teacher's Note and Reminders

III. PRE - ASSESSMENT

Find out how much you already know about this module. Choose the letter that corresponds to your answer. Take note of the items that you were not able to answer correctly. Find the right answer as you go through this module.

1. Janel bought three apples and two oranges. The total amount she paid was at most Php 123. If x represents the number of apples and y the number of oranges, which of the following mathematical statements represents the given situation?

   a. $3x + 2y \geq 123$ c. $3x + 2y > 123$
   b. $3x + 2y \leq 123$ d. $3x + 2y < 123$

2. How many solutions does a linear inequality in two variables have?

   a. 0 b. 1 c. 2 d. Infinite

3. Adeth has some Php 10 and Php 5 coins. The total amount of these coins is at most Php 750. Suppose there are 50 Php 5-coins. Which of the following is true about the number of Php 10-coins?

   I. The number of Php 10-coins is less than the number of Php 5-coins.
   II. The number of Php 10-coins is more than the number of Php 5-coins.
   III. The number of Php 10-coins is equal to the number of Php 5-coins.

   a. I and II b. I and III c. II and III d. I, II, and III

4. Which of the following ordered pairs is a solution of the inequality $2x + 6y \leq 10$?

   a. (3, 1) b. (2, 2) c. (1, 2) d. (1, 0)

5. What is the graph of linear inequalities in two variables?

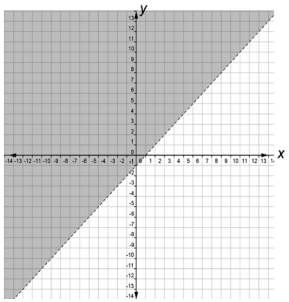
   a. Straight line c. Half-plane
   b. Parabola d. Half of a parabola

6. The difference between the scores of Connie and Minnie in the test is not more than six points. Suppose Connie's score is 32 points, what could be the score of Minnie?

   a. 26 to 38
   b. 38 and above
   c. 26 and below
   d. Between 26 and 38

Teacher's Note and Reminders

7. What linear inequality is represented by the graph at the right?



a. $x - y > 1$
b. $x - y < 1$
c. $-x + y > 1$
d. $-x + y < 1$

8. In the inequality $c - 4d \leq 10$, what could be the possible value of d if $c = 8$?

a. $d \leq -\frac{1}{2}$ b. $d \geq -\frac{1}{2}$ c. $d \leq \frac{1}{2}$ d. $d \geq \frac{1}{2}$

9. Mary and Rose ought to buy some chocolates and candies. Mary paid Php 198 for six bars of chocolates and 12 pieces of candies. Rose bought the same kinds of chocolates and candies but only paid less than Php 100. Suppose each piece of candy costs Php 4, how many bars of chocolates and pieces of candies could Rose have bought?

a. 4 bars of chocolates and 2 pieces of candies
b. 3 bars of chocolates and 8 pieces of candies
c. 3 bars of chocolates and 6 pieces of candies
d. 4 bars of chocolates and 4 pieces of candies

10. Which of the following is a linear inequality in two variables?

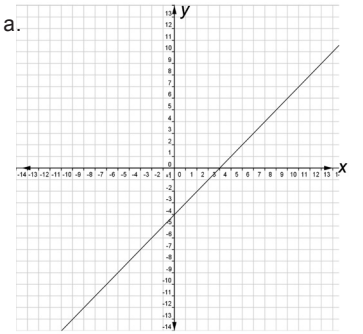
a. $4a - 3b = 5$
b. $7c + 4 < 12$
c. $3x \leq 16$
d. $11 + 2t \geq 3s$

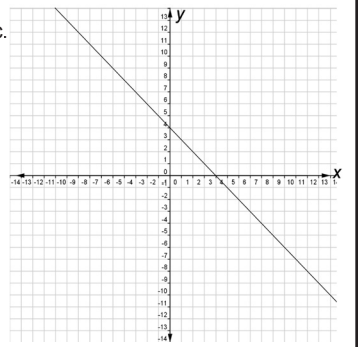
11. There are at most 25 large and small tables that are placed inside a function room for at least 100 guests. Suppose only 6 people can be seated around the large table and only four people for the small tables. How many tables are placed inside the function room?

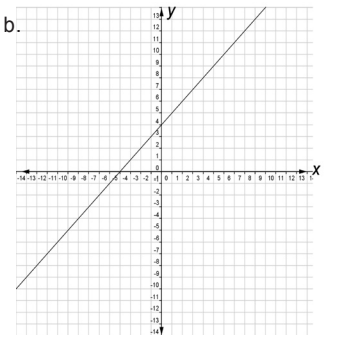
a. 10 large tables and 9 small tables
b. 8 large tables and 10 small tables
c. 10 large tables and 12 small tables
d. 6 large tables and 15 small tables

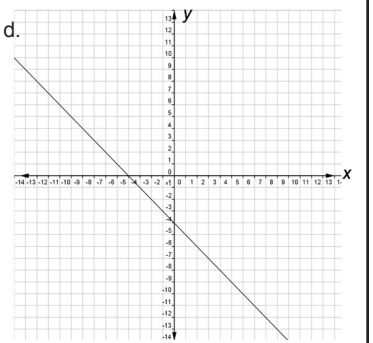
Teacher's Note and Reminders

12. Which of the following shows the plane divider of the graph of $y \geq x + 4$?

a.


c.


b.


d.


13. Cristina is using two mobile networks to make phone calls. One network charges her Php 5.50 for every minute of call to other networks. The other network charges her Php 6 for every minute of call to other networks. In a month, she spends at least Php 300 for these calls. Suppose she wants to model the total costs of her mobile calls to other networks using a mathematical statement. Which of the following mathematical statements could it be?

a. $5.50x + 6y = 300$
b. $5.50x + 6y > 300$
c. $5.50x + 6y \geq 300$
d. $5.50x + 6y \leq 300$

14. Mrs. Roxas gave the cashier Php 500-bill for three adult's tickets and five children's tickets that cost more than Php 400. Suppose an adult ticket costs Php 75. Which of the following could be the cost of a children's ticket?

a. Php 60 b. Php 45 c. Php 35 d. Php 30

Teacher's Note and Reminders

15. Mrs. Gregorio would like to minimize their monthly bills on electric and water consumption by observing some energy and water saving measures. Which of the following should she prepare to come up with these energy and water saving measures?

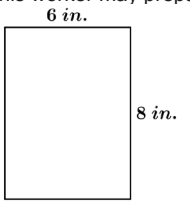
    I. Budget Plan
    II. Previous Electric and Water Bills
    III. Current Electric Power and Water Consumption Rates

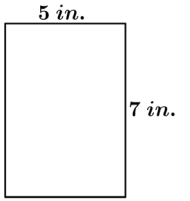
    a. I and II b. I and III c. II and III d. I, II, and III

16. The total amount Cora paid for two kilos of beef and three kilos of fish is less than Php 700. Suppose a kilo of beef costs Php 250. What could be the maximum cost of a kilo of fish to the nearest pesos?

    a. Php 60 b. Php 65 c. Php 66 d. Php 67

17. Mr. Cruz asked his worker to prepare a rectangular picture frame such that its perimeter is at most 26 in. Which of the following could be the sketch of a frame that his worker may prepare?

a.


c.


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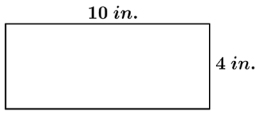

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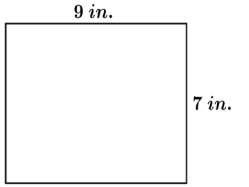
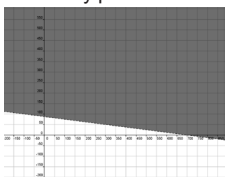
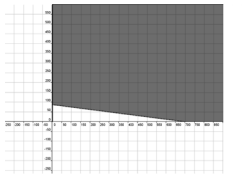
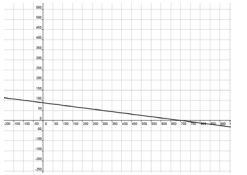


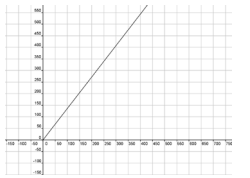
Teacher's Note and Reminders

18. The Mathematics Club of Masagana National High School is raising at least Php 12,000 for their future activities. Its members are selling pad papers and pens to their school mates. To determine the income that they generate, the treasurer of the club was asked to prepare an interactive graph which shows the costs of the pad papers and pens sold. Which of the following sketches of the interactive graph the treasurer may present?

a. 

c. 

b. 

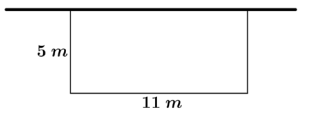
d. 

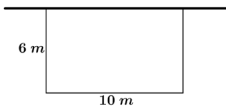
19. A restaurant owner would like to make a model which he can use as a guide in writing a linear inequality in two variables. He will use the inequality in determining the number of kilograms of pork and beef that he needs to purchase daily given a certain amount of money (C), the cost (A) of a kilo of pork, the cost (B) of a kilo of beef. Which of the following models should he make and follow?

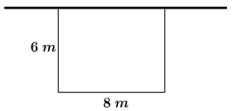
I. $Ax + By \leq C$ II. $Ax + By = C$ III. $Ax + By \geq C$

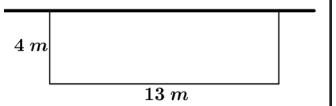
a. I and II b. I and III c. II and III d. I, II, and III

20. Mr. Silang would like to use one side of the concrete fence for the rectangular pig pen that he will be constructing. This is to minimize the construction materials to be used. To help him determine the amount of construction materials needed for the other three sides whose total length is at most 20 m, he drew a sketch of the pig pen. Which of the following could be the sketch of the pig pen that Mr. Silang had drawn?

a. 

c. 

b. 

d. 

LEARNING GOALS AND TARGETS:

Students are expected to demonstrate understanding of key concepts of linear inequalities in two variables, formulate real-life problems involving these concepts, and solve these with utmost accuracy using a variety of strategies.

Topic: Linear Inequalities in Two Variables

What to Know

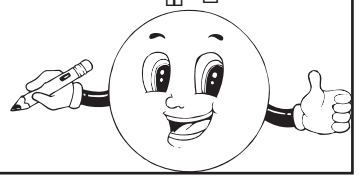
Provide the students opportunity to use some mathematical terms in other contexts by doing Activity 1. Let the students realize that in many real-life situations, mathematical terms are used to compare objects, quantities, and even attributes. Also in this activity, students will be able to recall and familiarize themselves with the terms related to linear inequalities in two variables.

Answer Key

Activity 1 (Some Possible Answers)

1. problems	6. action
2. investment	7. pest
3. wrinkles	8. rest
4. beautiful, simple	9. flood
5. crime	10. wants

Teacher's Note and Reminders



What to Know

Start the module by assessing your knowledge of the different mathematical concepts previously studied and your skills in performing mathematical operations. This may help you in understanding Linear Inequalities in Two Variables. As you go through this module, think of the following important question: *"How do linear inequalities in two variables help you solve problems in daily life?"* To find out the answer, perform each activity. If you find any difficulty in answering the exercises, seek the assistance of your teacher or peers or refer to the modules you have gone over earlier. To check your work, refer to the Answer Key provided at the end of this module.

Activity 1 WHEN DOES LESS BECOME MORE?

Directions: Supply each phrase with the most appropriate word. Explain your answer briefly.

1. Less money, more _____
2. More profit, less _____
3. More smile, less _____
4. Less make-up, more _____
5. More peaceful, less _____
6. Less talk, more _____
7. More harvest, less _____
8. Less work, more _____
9. Less trees, more _____
10. More savings, less _____

QUESTIONS ?

a. How did you come up with your answer?
b. How did you know that the words are appropriate for the given phrases?
c. When do we use the word "less"? How about "more"?
d. When does less really become more?
e. How do you differentiate the meaning of "less" and "less than"? How are these terms used in Mathematics?

Present a real-life situation where students could place themselves into it and formulate mathematical statements. Ask them to perform Activity 2. In this activity, the students will be able to see how linear inequalities in two variables are illustrated in real life. There are no specific answers to the questions in the activity. Students' responses may vary depending on their actual experiences.

Teacher's Note and Reminders

f. How do you differentiate the meaning of "more" and "more than"? How are these terms used in Mathematics?

g. Give at least two statements using "less", "less than", "more" and "more than".

h. What other terms are similar to the terms "less", "less than", "more" or "more than"? Give statements that make use of these terms.

i. In what real-life situations are the terms such as "less than" and "more than" used?

*How did you find the activity? Were you able to give real-life situations that make use of the terms **less than and more than**? In the next activity, you will see how inequalities are illustrated in real-life.*

Activity 2 BUDGET..., MATTERS!

Directions: Use the situation below to answer the questions that follow.

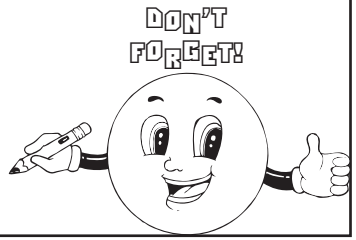
Amelia was given by her mother Php 320 to buy some food ingredients for "chicken adobo". She made sure that it is good for 5 people.

QUESTIONS ?

1. Suppose you were Amelia. Complete the following table with the needed data.

Ingredients	Quantity	Cost per unit or piece	Estimated Cost
chicken			
soy sauce			
vinegar			
garlic			
onion			
black pepper			
sugar			
tomato			
green pepper			
potato			

Teacher's Note and Reminders



Let the students describe some mathematical statements and ask them to differentiate mathematical expressions, equations, and inequalities. Tell them to perform Activity 3. Let the students distinguish the different symbols used and their meaning in the mathematical statements. Furthermore, emphasize to them that the members on either side of a mathematical statement are merely expressions. To further strengthen their understanding of mathematical expressions, equations, and inequalities, ask them to give and describe some examples of these.

2. How did you estimate the cost of each ingredient?
3. Was the money given to you enough to buy all the ingredients? Justify your answer.
4. Suppose you do not know yet the cost per piece or unit of each ingredient. How will you represent this algebraically?
5. Suppose there are two items that you still need to buy. What mathematical statement would represent the total cost of the two items?

From the activity done, have you seen how linear inequalities in two variables are illustrated in real life? In the next activity, you will see the differences between mathematical expressions, linear equations, and inequalities.

Activity 3 EXPRESS YOURSELF!

Directions: Shown below are two sets of mathematical statements. Use these to answer the questions that follow.

$y = 2x + 1$	$y > 2x + 1$
$3x + 4y = 15$	$3x + 4y < 15$
$10 - 5y = 7x$	$10 - 5y \geq 7x$
$y = 6x + 12$	$y \leq 6x + 12$
$9y - 8 = 4x$	$9y - 8 < 4x$

QUESTIONS ?

1. How do you describe the mathematical statements in each set?
2. What do you call the left member and the right member of each mathematical statement?
3. How do you differentiate $2x + 1$ from $y = 2x + 1$? How about $9y - 8$ and $9y - 8 = 4x$?
4. How would you differentiate mathematical expressions from mathematical equations?
5. Give at least three examples of mathematical expressions and mathematical equations.
6. Compare the two sets of mathematical statements. What statements can you make?
7. Which of the given sets is the set of mathematical equations? How about the set of inequalities?
8. How do you differentiate mathematical equations from inequalities?
9. Give at least three examples of mathematical equations and inequalities.

In Activity 4, let the students identify situations illustrating linear inequalities and let them write the inequality model. Emphasize that there are cases that the word “more than” does not really mean that you will use the symbol “>”. Let them realize also the importance of linear inequality in daily life.

Answer Key

Activity 4

1. Inequality $p < d$
2. Inequality $f > m$
3. Not $g = 1 + 2b$
4. Inequality $c \leq 80$
5. Not $w = 4$
6. Inequality $g \geq 75$
7. Inequality $j < g$
8. Not $7m = f$
9. Inequality $f > c$
10. Not $p = 103\ 000\ 000$

Teacher’s Note and Reminders

Were you able to differentiate mathematical expressions from mathematical equations? How about mathematical equations and inequalities? In the next activity, you will identify real-life situations involving linear inequalities.

Activity 4 “WHAT AM I?”

Directions: Identify the situations which illustrate inequalities and write the inequality model in the appropriate column.

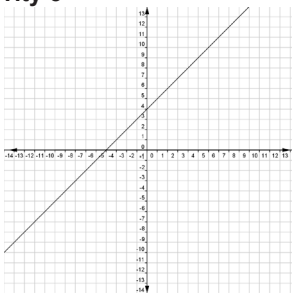
Real-Life Situations	Classification (Inequalities or Not)	Inequality Model
1. The value of one Philippine peso (p) is less than the value of one US dollar (d)		
2. According to the NSO, there are more female (f) Filipinos than male (m) Filipinos		
3. The number of girls (g) in the band is one more than twice the number of boys (b).		
4. The school bus has a maximum seating capacity (c) of 80 persons		
5. According to research, an average adult generates about 4 kg of waste daily (w)		
6. To get a passing mark in school, a student must have a grade (g) of at least 75		
7. The daily school allowance of Jillean (j) is less than the daily school allowance of Gwyneth (g)		

Provide the students opportunity to recall and describe graphs of linear equations in two variables. Ask them to perform Activity 5. Emphasize that the graph can be a line that rises to the right if the slope is positive and a line that falls to the right if the slope is negative. This activity will lead students in learning how to graph linear inequalities in two variables.

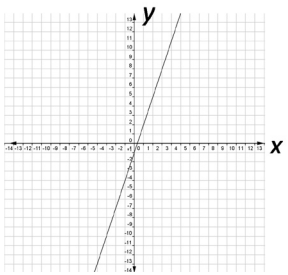
Answer Key

Activity 5

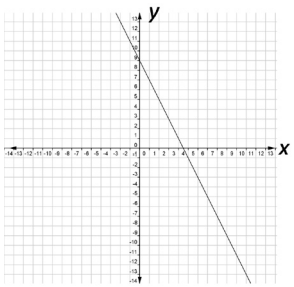
1.



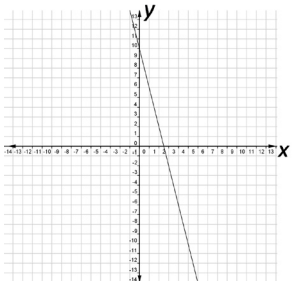
2.



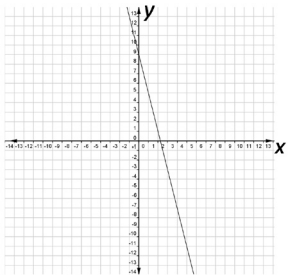
3.



4.



5.



8. Seven times the number of male teachers (m) is the number of female teachers (f)		
9. The expenses for food (f) is greater than the expenses for clothing (c)		
10. The population (p) of the Philippines is about 103 000 000		

QUESTIONS ?

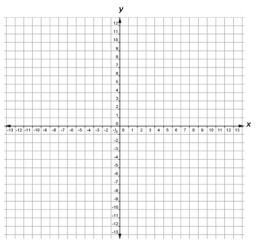
1. How do you describe the situations in 3, 5, 8 and 10? How about the situations in 1, 2, 4, 6, 7 and 9?
2. How do the situations in 3, 5, 8 and 10 differ from the situations in 1, 2, 4, 6, 7 and 9?
3. What makes linear inequality different from linear equations?
4. How can you use equations and inequalities in solving real-life problems?

From the activity done, you have seen real-life situations involving linear inequalities in two variables. In the next activity, you will show the graphs of linear equations in two variables. You need this skill to learn about the graphs of linear inequalities in two variables.

Activity 5 GRAPH IT! A RECALL...

Directions: Show the graph of each of the following linear equations in a Cartesian coordinate plane.

1. $y = x + 4$
2. $y = 3x - 1$
3. $2x + y = 9$
4. $10 - y = 4x$
5. $y = -4x + 9$



Let the students identify different points on a given line and describe the other points on the Cartesian plane not on the line. Ask them to perform Activity 6. In this activity, let the students realize that a line drawn on a plane divides it into two half-planes. Furthermore, deepen their understanding of the solutions of linear equations and the significance of the points that are on a given line. Lead the students in understanding linear inequalities in two variables using the points that are not on the line.

Teacher's Note and Reminders

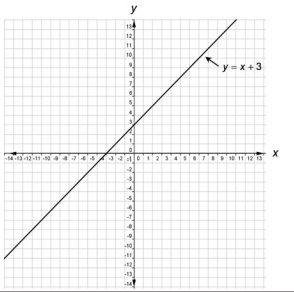
QUESTIONS ?

1. How did you graph the linear equations in two variables?
2. How do you describe the graphs of linear equations in two variables?
3. What is the y-intercept of the graph of each equation? How about the slope?
4. How would you draw the graph of linear equations given the y-intercept and the slope?

Were you able to draw and describe the graphs of linear equations in two variables? In the next task, you will identify the different points and their coordinates on the Cartesian plane. These are some of the skills you need to understand linear inequalities in two variables and their graphs.

Activity 6 INFINITE POINTS.....

Directions: Below is the graph of the linear equation $y = x + 3$. Use the graph to answer the following questions.



QUESTIONS ?

1. How would you describe the line in relation to the plane where it lies?
2. Name five points on the line $y = x + 3$. What can you say about the coordinates of these points?
3. Name five points not on the line $y = x + 3$. What can you say about the coordinates of these points?
4. What mathematical statement would describe all the points on the left side of the line $y = x + 3$?

   How about all the points on the right side of the line $y = x + 3$?

5. What conclusion can you make about the coordinates of points on the line and those which are not on the line?

The succeeding activities are all about linear inequalities in two variables. Before the students perform these activities, let them read and understand some important notes on linear inequalities in two variables including their graphs. Tell them to study carefully the examples presented.

Teacher's Note and Reminders

From the activity done, you were able to identify the solutions of linear equations and linear inequalities. But how are linear inequalities in two variables used in solving real-life problems? You will find these out in the activities in the next section. Before performing these activities, read and understand first important notes on linear inequalities in two variables and the examples presented.

A linear inequality in two variables is an inequality that can be written in one of the following forms:

$Ax + By < C$ $\qquad$ $Ax + By \leq C$

$Ax + By > C$ $\qquad$ $Ax + By \geq C$

where A, B, and C are real numbers and A and B are both not equal to zero.

Examples:
1. $4x - y > 1$
2. $x + 5y \leq 9$
3. $3x + 7y < 2$
4. $8x - 3y \geq 14$
5. $2y > x - 5$
6. $y \leq 6x + 11$

Certain situations in real life can be modeled by linear inequalities.

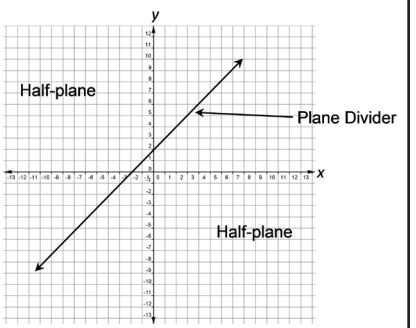
Examples: 1. The total amount of 1-peso coins and 5-peso coins in the bag is more than Php 150.

The situation can be modeled by the linear inequality $x + 5y > 150$, where x is the number of 1-peso coins and y is the number of 5-peso coins.

2. Emily bought two blouses and a pair of pants. The total amount she paid for the items is not more than Php 980.

The situation can be modeled by the linear inequality $2x + y \leq 980$, where x is the cost of each blouse and y is the cost of a pair of pants.

The graph of a linear inequality in two variables is the set of all points in the rectangular coordinate system whose ordered pairs satisfy the inequality. When a line is graphed in the coordinate plane, it separates the plane into two regions called **half- planes**. The line that separates the plane is called the **plane divider**.



Teacher's Note and Reminders

To graph an inequality in two variables, the following steps could be followed.

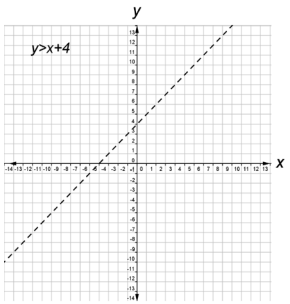
1. Replace the inequality symbol with an equal sign. The resulting equation becomes the plane divider.

   Examples:

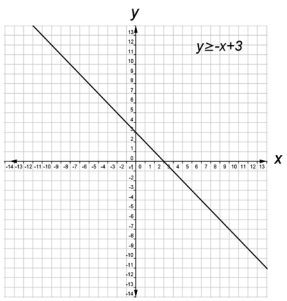
   a. $y > x + 4$ $\quad$ $y = x + 4$
   b. $y < x - 2$ $\quad$ $y = x - 2$
   c. $y \geq -x + 3$ $\quad$ $y = -x + 3$
   d. $y \leq -x - 5$ $\quad$ $y = -x - 5$

2. Graph the resulting equation with a solid line if the original inequality contains ≤ or ≥ symbol. The solid line indicates that all points on the line are part of the solution of the inequality. If the inequality contains < or > symbol, use a dashed or broken line. The dash or broken line indicates that the coordinates of all points on the line are not part of the solution set of the inequality.

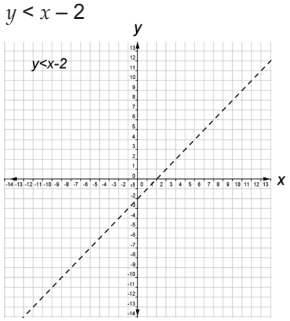
   a. $y > x + 4$



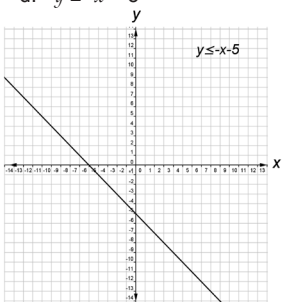
   c. $y \geq -x + 3$



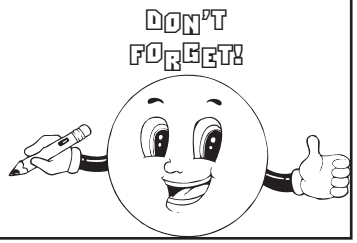
   b. $y < x - 2$



   d. $y \leq -x - 5$

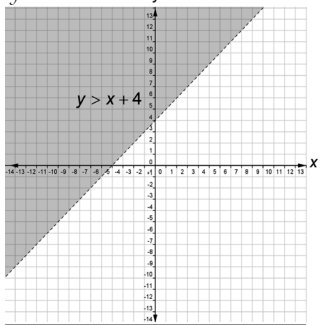


Teacher's Note and Reminders



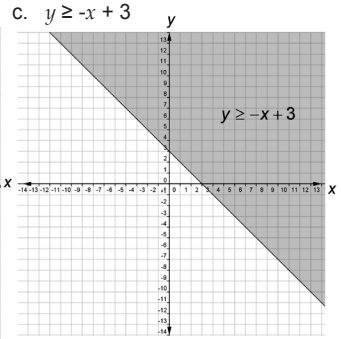
3. Choose three points in one of the half-planes that are not on the line. Substitute the coordinates of these points into the inequality. If the coordinates of these points satisfy the inequality or make the inequality true, shade the half-plane or the region on one side of the plane divider where these points lie. Otherwise, the other side of the plane divider will be shaded.

a. $y > x + 4$



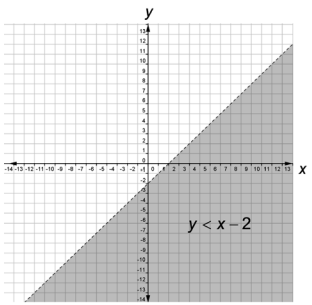
For example, points (0, 3), (2, 2), and (4, -5) do not satisfy the inequality $y > x + 4$.
Therefore, the half-plane that does not contain these points will be shaded.
The shaded portion constitutes the solution of the linear inequality.

c. $y \geq -x + 3$



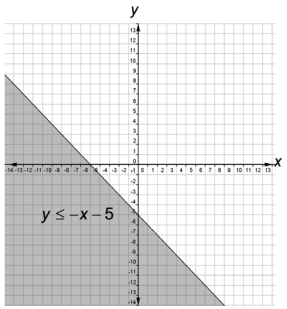
For example, points (-2, 8), (0, 7), and (8, -1) satisfy the inequality $y \geq -x + 3$.
Therefore, the half-plane containing these points will be shaded.
The shaded portion constitutes the solution of the linear inequality.

b. $y < x - 2$



For example, points (0, 5), (-3, 7), and (2, 10) do not satisfy the inequality $y < x - 2$.
Therefore, the half-plane that does not contain these points will be shaded.
The shaded portion constitutes the solution of the linear inequality.

d. $y \leq -x - 5$



For example, points (12, -3), (0, -9), and (3, -11) satisfy the inequality $y \leq -x - 5$.
Therefore, the half-plane containing these points will be shaded.
The shaded portion constitutes the solution of the linear inequality.

Learn more about Linear Inequalities in Two Variables through the WEB. You may open the following links.

1. http://library.thinkquest.org/20991/alg/systems.html
2. http://www.kgsepg.com/project-id/6565-inequalities-two-variable
3. http://www.montereyinstitute.org/courses/Algebra1/COURSE_TEXT_RESOURCE/U05_L2_T1_text_final.html
4. http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-237s.html
5. http://www.purplemath.com/modules/ineqgrph.html
6. http://math.tutorvista.com/algebra/linear-equations-in-two-variables.html

What to Process

Let the students check their understanding of linear inequalities in two variables by doing Activities 7, 8, 9, and 10. Test if they really understood the notes they have read.

Answer Key

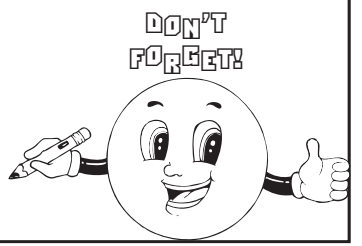
Activity 7

1. Linear inequality
2. Not linear inequality
3. Not linear inequality
4. Linear inequality
5. Linear inequality
6. Not Linear inequality
7. Linear inequality
8. Not Linear inequality
9. Not Linear inequality
10. Linear inequality

Activity 8

1. Solution
2. Solution
3. Not a solution
4. Not a solution
5. Solution
6. Not a solution
7. Solution
8. Solution
9. Not a solution
10. Not a solution

Teacher's Note and Reminders



Now that you learned about linear inequalities in two variables and their graphs, you may now try the activities in the next section.

What to Process

Your goal in this section is to learn and understand key concepts of linear inequalities in two variables including their graphs and how they are used in real-life situations. Use the mathematical ideas and the examples presented in answering the activities provided.

Activity 7 THAT'S ME!

Directions: Tell which of the following is a linear inequality in two variables. Explain your answer.

1. $3x - y \geq 12$
2. $19 < y$
3. $y = \frac{2}{5}x$
4. $x \leq 2y + 5$
5. $7(x - 3) < 4y$
6. $-6x = 4 + 2y$
7. $x + 3y \leq 7$
8. $x > -8$
9. $9(x - 2) < 15$
10. $13x + 6 < 10 - 7y$

QUESTIONS ?

a. How did you identify linear inequalities in two variables? How about those which are not linear inequalities in two variables?
b. What makes a mathematical statement a linear inequality in two variables?
c. Give at least three examples of linear inequalities in two variables. Describe each.

How did you find the activity? Were you able to identify linear inequalities in two variables? In the next activity, you will determine if a given ordered pair is a solution of a linear inequality.

Answer Key

Activity 8

1. Solution	6. Not a solution
2. Solution	7. Solution
3. Not a solution	8. Solution
4. Not a solution	9. Not a solution
5. Solution	10. Not a solution

Teacher's Note and Reminders

Answer Key

Activity 9

1. a. No	3. a. Yes	5. a. No
b. Yes	b. No	b. Yes
c. No	c. Yes	c. No
d. Yes	d. Yes	d. No
e. Yes	e. Yes	e. No
2. a. No	4. a. Yes	
b. Yes	b. No	
c. Yes	c. No	
d. Yes	d. Yes	
e. Yes	e. No	

Activity 8 WHAT'S YOUR POINT?

Directions: State whether each given ordered pair is a solution of the inequality. Justify your answer.

1.	$2x - y > 10$;	(7, 2)	6.	$-3x + y < -12$;	(0, -5)
2.	$x + 3y \le 8$;	(4, -1)	7.	$9 + x \ge y$;	(-6, 3)
3.	$y < 4x - 5$;	(0, 0)	8.	$2y - 2x \le 14$;	(-3, -3)
4.	$7x - 2y \ge 6$;	(-3, -8)	9.	$\frac{1}{2}x + y > 5$;	$(4, \frac{1}{2})$
5.	$16 - y > x$;	(-1, 9)	10.	$9x + \frac{2}{3}y < 2$;	$(\frac{1}{5}, 1)$

QUESTIONS ?

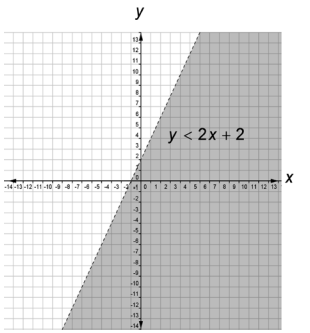
a. How did you determine if the given ordered pair is a solution of the inequality?
b. What did you do to justify your answer?

From the activity done, were you able to determine if the given ordered pair is a solution of the linear inequality? In the next activity, you will determine if the given coordinates of points on the graph satisfy an inequality.

Activity 9 COME AND TEST ME!

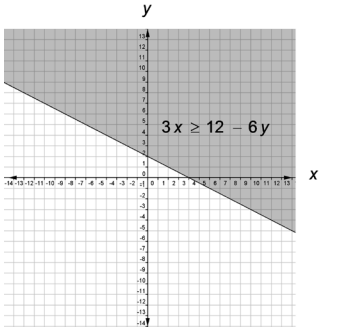
Directions: Tell which of the given coordinates of points on the graph satisfy the inequality. Justify your answer.

1. $y < 2x + 2$
   a. (0, 2)
   b. (5, 1)
   c. (-4, 6)
   d. (8, -9)
   e. (-3, -12)

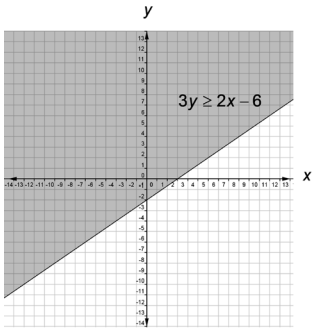


Teacher's Note and Reminders

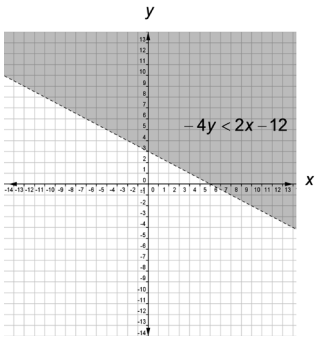
2. $3x \geq 12 - 6y$
   a. (1, -1)
   b. (4, 0)
   c. (6, 3)
   d. (0, 5)
   e. (-2, 8)



3. $3y \geq 2x - 6$
   a. (0, 0)
   b. (3, -4)
   c. (0, -2)
   d. (-9, -1)
   e. (-5, 6)



4. $-4y < 2x - 12$
   a. (2, 4)
   b. (-4, 5)
   c. (-2, -2)
   d. (8.2, 5.5)
   e. $(4, \frac{1}{2})$



Teacher's Note and Reminders

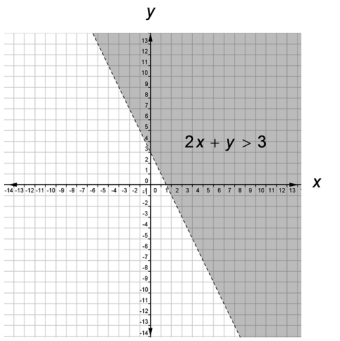
Answer Key

Activity 10

1. right side of the plane divider
2. left side of the plane divider
3. left side of the plane divider
4. right side of the plane divider
5. left side of the plane divider

5. $2x + y > 3$

   a. $(1\frac{1}{2}, 0)$
   b. $(7, 1)$
   c. $(0, 0)$
   d. $(2, -12)$
   e. $(-10, -8)$



QUESTIONS ?

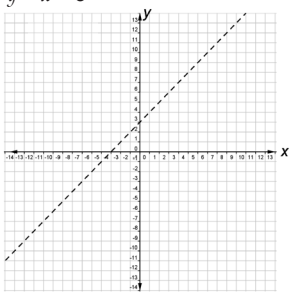
a. How did you determine if the given coordinates of points on the graph satisfy the inequality?
b. What did you do to justify your answer?

Were you able to determine if the given coordinates of points on the graph satisfy the inequality? In the next activity, you will shade the part of the plane divider where the solutions of the inequality are found.

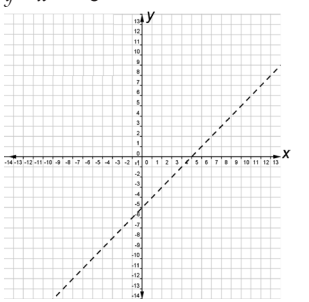
Activity 10 COLOR ME!

Directions: Shade the part of the plane divider where the solutions of the inequality is found.

1. $y < x + 3$

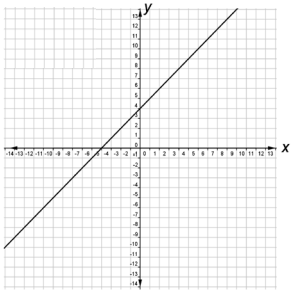


2. $y - x > -5$

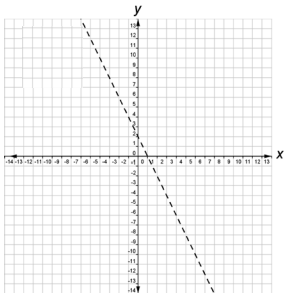


Teacher's Note and Reminders

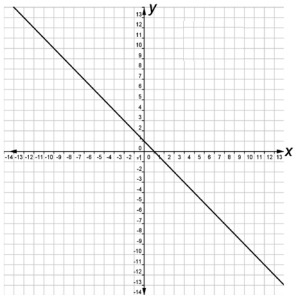
3. $x \leq y - 4$



5. $2x + y < 2$



4. $x + y \geq 1$



QUESTIONS ?

a. How did you determine the part of the plane to be shaded?
b. Suppose a point is located on the plane where the graph of a linear inequality is drawn. How do you know if the coordinates of this point is a solution of the inequality?
c. Give at least 5 solutions for each linear inequality.

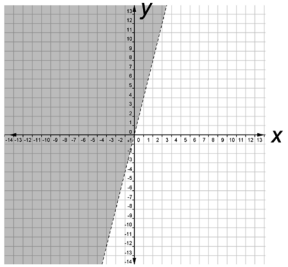
From the activity done, you were able to shade the part of the plane divider where the solutions of the inequality are found. In the next activity, you will draw and describe the graph of linear inequalities.

Ask the students to draw and describe the graphs of linear inequalities. Let them perform Activity 11. Emphasize that one of the half-planes contain the solutions of the linear inequality. Use solid line if the symbol ≥ or ≤ is used and broken line if the symbol used is > or <. If math software like GeoGebra is available, ask the students to make use of this. **GeoGebra** is a dynamic mathematics software that can be used to visualize and understand concepts in algebra, geometry, calculus, and statistics.

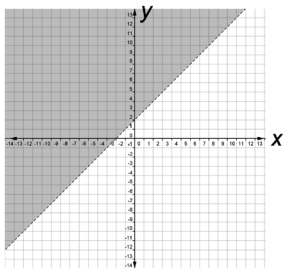
Answer Key

Activity 11

1.



2.



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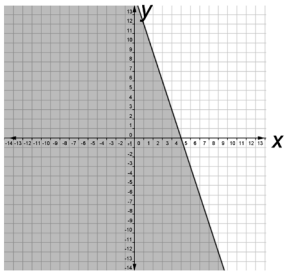

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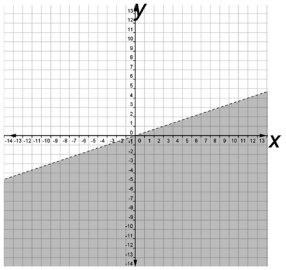

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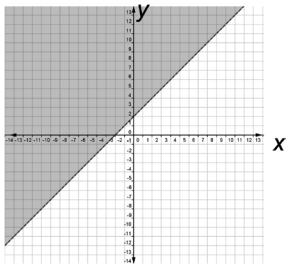
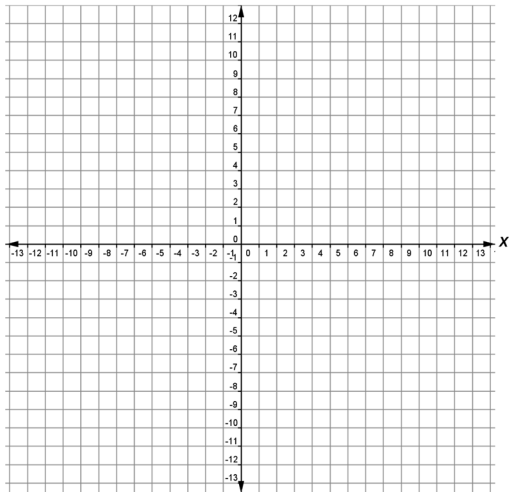


Activity 11 GRAPH AND TELL...

Directions: Show the graph and describe the solutions of each of the following inequalities. Use the Cartesian coordinate plane below.

1. $y > 4x$
2. $y > x + 2$
3. $3x + y \leq 5$
4. $y < \frac{1}{3}x$
5. $x - y < -2$



QUESTIONS ?

a. How did you graph each of the linear inequalities?
b. How do you describe the graphs of linear inequalities in two variables?
c. Give at least 3 solutions for each linear inequality.
d. How did you determine the solutions of the linear inequalities?

Were you able to draw and describe the graph of linear inequalities? Were you able to give at least 3 solutions for each linear inequality? In the next activity, you will determine the linear inequality whose graph is described by the shaded region.

Let the students determine the linear inequality whose graph is described by the shaded region. Ask them to perform Activity 12. Encourage them to use different ways of finding the linear inequality. In this activity, one possible error that students might commit is the wrong use of inequality symbol. Let them check their own errors by testing some ordered pairs against the inequality they have formulated. Emphasize to them also the meanings of the broken and solid lines.

Answer Key

Activity 12

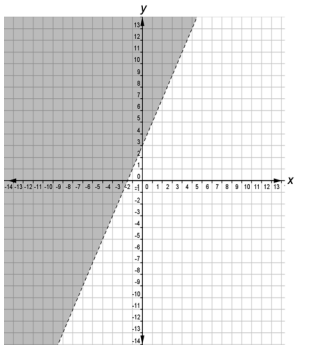
1. $y > 2x + 3$
2. $x + 3y \leq 1$
3. $y < 2x + 2$
4. $y + x \geq 4$
5. $5 < 3x + y$

Teacher's Note and Reminders

Activity 12 NAME THAT GRAPH!

Directions: Write a linear inequality whose graph is described by the shaded region.

1.



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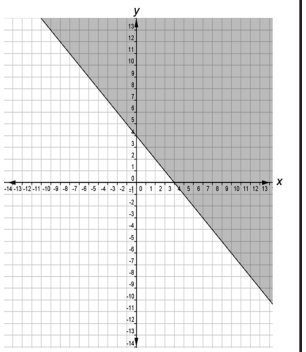

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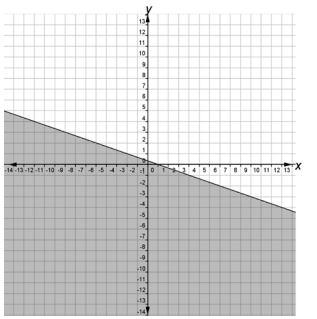

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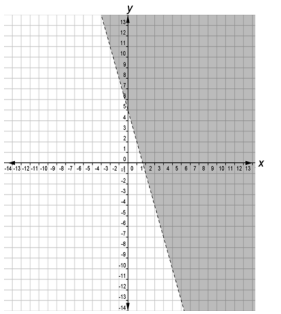

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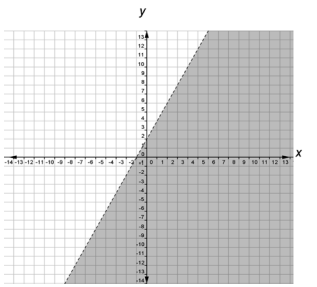


Teacher's Note and Reminders

In Activity 13, let the students translate real-life situations into linear inequalities in two variables. Give emphasis on the meanings of the phrases "less than", "more than", "greater than", "at most" and "at least". Let the students differentiate also "less than" and "is less than" and "more than" and "is more than". Provide examples on how these are used for students to understand their differences.

Answer Key

Activity 13

1. $t + f > 420$
2. $d - p \geq 26$
3. $5r + 2 < h$
4. $f + e \leq 8000$
5. $m - 36\,000 \leq b$
6. $12s + 6p \leq 960$
7. $p - q \geq 30$
8. $3r < b$
9. $2p + a > 24$
10. $2b + 3s \leq 1150$

QUESTIONS ?

a. How did you determine the linear inequality given its graph?
b. What mathematics concepts or principles did you apply to come up with the inequality?
c. When will you use the symbol >, <, ≥, or ≤ in a linear inequality?

From the activity done, you were able to determine the linear inequality whose graph is described by the shaded region. In the succeeding activity, you will translate real-life situations into linear inequalities in two variables.

Activity 13 TRANSLATE ME!

Directions: Write each statement as linear inequality in two variables.

1. The sum of 20-peso bills (t) and fifty peso bills (f) is greater than Php 420.
2. The difference between the weight of Diana (d) and Princess (p) is at least 26.
3. Five times the length of a ruler (r) increased by two inches is less than the height of Daniel (h).
4. In a month, the total amount the family spends for food (f) and educational expenses (e) is at most Php 8, 000.
5. The price of a motorcycle (m) less Php 36,000 is less than or equal to the price of a bicycle (b).
6. A dozen of short pants (s) added to half a dozen of pajamas (p) has a total cost of not greater than Php 960.
7. The difference of the number of 300-peso tickets (p) and 200-peso tickets (q) is not less than 30.
8. Thrice the number of red balls (r) is less than the number of blue balls (b).
9. The number of apples (a) more than twice the number of ponkans (p) is greater than 24.
10. Nicole bought 2 blouses (b) and 3 shirts (s) and paid not more than Php 1,150.

Let students broaden their understanding of linear inequalities in two variables as to how they are used in solving real-life problems. Ask them to perform Activity 14. Encourage them to use different ways of arriving at the solutions to the problems. More importantly, provide them the opportunities to choose the most convenient way of solving each problem.

Answer Key

Activity 14

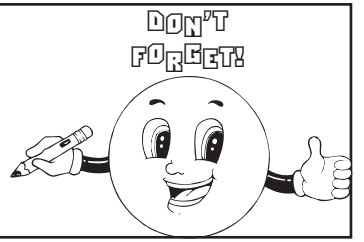
1. a. $c - j \leq 1.5$; c represents Connie's height and j Janel's height
   b. Connie
   c. 3 ft and 9 inches and below

2. a. $y \geq 4 - \frac{x}{20}$
   b. about 2 liters
   c. yes

3. a. $5x + 2y < 400$
   b. Php 109
   c. Php 116

4. a. $x + y \leq 270$
   b. possible answers: car = 65 km/hr and bus = 55 km/hr car = 70 km/hr and bus = 65 km/hr
   c. 65 km/hr
   d. possible
   e. not possible

Teacher's Note and Reminders



QUESTIONS ?

a. How did you translate the given situations into linear inequalities?
b. When do we use the term "at most"? How about "at least"?
c. What other terms are similar to "at most"? How about "at least"?
d. Give at least two statements that make use of these terms.
e. In what real-life situations are the terms such as "at most" and "at least" used?

Were you able to translate real-life situations into linear inequalities in two variables? In the next activity, you will find out how linear inequalities in two variables are used in real-life situations and in solving problems.

Activity 14 MAKE IT REAL!

Directions: Answer the following questions. Give your Complete solutions or explanations.

1. The difference between Connie's height and Janel's height is not more than 1.5 ft.
   a. What mathematical statement represents the difference in heights of Connie and Janel? Define the variables used.
   b. Based on the mathematical statement you have given, who is taller? Why?
   c. Suppose Connie's height is 5 ft and 3 in, what could be the height of Janel? Explain your answer.

2. A motorcycle has a reserved fuel of 0.5 liter which can be used if its 3-liter fuel tank is about to be emptied. The motorcycle consumes at most 0.5 liters of fuel for every 20 km of travel.
   a. What mathematical statement represents the amount of fuel that would be left in the motorcycle's fuel tank after travelling a certain distance if its tank is full at the start of travel?
   b. Suppose the motorcycle's tank is full and it travels a distance of 55 km, about how much fuel would be left in its tank?
   c. If the motorcycle travels a distance of 130 km with its tank full, is the amount of fuel in its tank be enough to cover the given distance? Explain your answer.

3. The total amount Jurene paid for 5 kilos of rice and 2 kilos of fish is less than Php 600.
   a. What mathematical statement represents the total amount Jurene paid? Define the variables used.
   b. Suppose a kilo of rice costs Php 35. What could be the greatest cost of a kilo of fish to the nearest pesos?
   c. Suppose Jurene paid more than Php 600 and each kilo of rice costs Php 34. What could be the least amount she will pay for 2 kilos of fish to the nearest pesos?

Teacher's Note and Reminders

What to Understand

Have students take a closer look at some aspects of linear inequality in two variables and their graphs. Provide them opportunities to think deeper and test further their understanding of the lesson by doing Activity 15.

Answer Key

Activity 15

1. Linear inequalities in two variables are inequality that can be written in one of the following forms: $Ax + By < C$, $Ax + By \leq C$, $Ax + By > C$ and $Ax + By \geq C$ while linear equations in two variables are mathematical statements indicating that two expressions are equal and using the symbol "="
2. Infinite/many
3. No
4. Maybe the amount of those canned goods she is buying is higher than what she is expecting.
   $x + y < 200$
5. a. Possible answers: 6m by 4m; 8m by 3m; 12m by 2m
   b. Yes
   c. $2l + 2w = 20$; $2l + 2w = 22$; $2l + 2w = 28$

4. A bus and a car left a place at the same time traveling in opposite directions. After two hours, the distance between them is at most 350 km.
   a. What mathematical statement represents the distance between the two vehicles after two hours? Define the variables used.
   b. What could be the average speed of each vehicle in kilometers per hour?
   c. If the car travels at a speed of 70 kilometers per hour, what could be the maximum speed of the bus?
   d. If the bus travels at a speed of 70 kilometers per hour, is it possible that the car's speed is 60 kilometers per hour? Explain or justify your answer.
   e. If the car's speed is 65 kilometers per hour, is it possible that the bus' speed is 75 kilometers per hour? Explain or justify your answer.

From the activity done, you were able to find out how linear inequalities in two variables are used in real-life situations and in solving problems. Can you give other real-life situations where linear inequalities in two variables are illustrated? Now, let's go deeper by moving on to the next part of this module.

What to Understand

In this part, you are going to think deeper and test further your understanding of linear inequalities in two variables. After doing the following activities, you should be able to answer the question: **In what other real-life situations will you be able to find the applications of linear inequalities in two variables?**

Activity 15 THINK DEEPER....

Directions: Answer the following questions. Give your Complete solutions or explanations.

1. How do you differentiate linear inequalities in two variables from linear equations in two variables?
2. How many values of the variables would satisfy a given linear inequality in two variables? Give an example to support your answer.
3. Airen says any values of x and y satisfying the linear equation $y = x + 5$ also satisfy the inequality $y < x + 5$. Do you agree with Airen? Justify your answer.
4. Katherine bought some cans of sardines and corned beef. She gave the store owner Php 200 as payment. However, the owner told her that the amount is not enough. What could be the reasons? What mathematical statement would represent the given situation?

Before the students move to the next section of this lesson, give a short test (formative test) to find out how well they understood the lesson.

What to Transfer

Give the students opportunities to demonstrate their understanding of linear inequalities in two variables by doing some practical tasks. Let them perform Activities 16 and 17. You can ask the students to work individually or in group. Emphasize that they must come up with some linear inequalities in two variables. Before giving the activity, present first how to make a budget proposal including its parts. Moreover, students must be given the opportunity to solve the problems they have formulated.

Teacher's Note and Reminders

5. Jay is preparing a 24-m^2 rectangular garden in a 64-m^2 vacant square lot.
   a. What could be the dimensions of the garden?
   b. Is it possible for Jay to prepare a 2 m by 12 m garden? Why?
   c. What mathematical statement would represent the possible perimeter of the garden? Explain your answer.

QUESTIONS ?

What new insights do you have about linear inequalities in two variables? What new connections have you made for yourself?

Now extend your understanding. This time, apply what you have learned in real life by doing the tasks in the next section.

What to Transfer

In this section, you will be applying your understanding of linear inequalities in two variables through the following culminating activities that reflect meaningful and relevant situations. You will be given practical tasks where in you will demonstrate your understanding.

Activity 16 LET'S ROLE-PLAY!

Directions: Cite and role-play at least two situations in real-life where linear inequalities in two variables are illustrated. Formulate problems out of these situations then solve them. Show the graphs of the linear inequalities drawn from these situations.

RUBRIC: Real-life Situations on Linear Inequalities in Two Variables

4	3	2	1
The situation is clear, realistic and the use of linear inequalities in two variables and other mathematical statements are properly illustrated. The problem formulated is relevant to the given situation and the answer is accurate.	The situation is clear and the use of linear inequalities in two variables is not illustrated. The problem formulated is related to the situation and the answer is correct.	The situation is not too clear and the use of linear inequalities in two variables is not illustrated. The problem formulated is related to the situation and the answer is incorrect.	The situation is not clear and the use of linear inequalities in two variables is not illustrated. The problem formulated is not related to the situation and the answer is incorrect.

Teacher's Note and Reminders

Activity 17 PLAN FIRST!

Directions: Read the situation below then come up with the appropriate budget proposal. The budget proposal should be clear, realistic, and make use of linear inequalities in two variables and other mathematical statements.

Due to the rising prices of food commodities, you decided to raise broiler chickens for your family's consumption. You sought permission from your parents and asked them to give you some amount to start with. Your parents agreed to give you some money; however, they still need to see how you will use it. They asked you to prepare a budget proposal for the chicken house that you will be constructing, the number of chickens to be raised, the amount of chicken feeds, and other expenses.

RUBRIC: Budget Proposal of Raising Broiler Chickens

4	3	2	1
The budget proposal is clear, accurate, practical, and the use of linear inequalities in two variables and other mathematical statements are properly illustrated.	The budget proposal is clear, practical and the use of linear inequalities in two variables is illustrated.	The budget proposal is not too clear and the use of linear inequalities in two variables is not properly illustrated.	The budget proposal is not clear and the use of linear inequalities in two variables is not illustrated.

How did you find the different performance tasks? How did the tasks help you see the real world use of linear inequalities in two variables?

You have completed this lesson. Before you go to the next lesson on system of linear equation and inequalities, you have to answer the following post-assessment.

This module was about linear inequalities in two variables. In this module, you were able to differentiate between mathematical expressions and mathematical equations, differentiate between mathematical equations and inequalities, illustrate linear inequalities in two variables, and graph linear inequalities in two variables on the coordinate plane and solve real-life problems involving linear inequalities in two variables. More importantly, you were given the chance to formulate and solve real-life problems, and demonstrate your understanding of the lesson by doing some practical tasks.

Summary/Synthesis/Generalization:

This module was about linear inequalities in two variables. In this module, you were able to differentiate between mathematical expressions and mathematical equations; differentiate between mathematical equations and inequalities; illustrate linear inequalities in two variables; graph linear inequalities in two variables on the coordinate plane; and solve real-life problems involving linear inequalities in two variables. More importantly, you were given the chance to formulate and solve real-life problems, and demonstrate your understanding of the lesson by doing some practical tasks.

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SUMMARY

This module was about linear inequalities in two variables. In this module, you were able to differentiate between mathematical expressions and mathematical equations, differentiate between mathematical equations and inequalities, illustrate linear inequalities in two variables, and graph linear inequalities in two variables on the coordinate plane and solve real-life problems involving linear inequalities in two variables. More importantly, you were given the chance to formulate and solve real-life problems, and demonstrate your understanding of the lesson by doing some practical tasks.

GLOSSARY OF TERMS USED IN THIS LESSON:

1. **Cartesian coordinate plane** – the plane that contains the x- and y-axes
2. **Coordinates of a point** – any point on the plane that is identified by an ordered pair of numbers denoted as (x, y)
3. **Geogebra** – a dynamic mathematics software that can be used to visualize and understand concepts in algebra, geometry, calculus, and statistics.
4. **Half plane** – the region that is divided when a line is graphed in the coordinate plane
5. **Linear equation** in two variables/mathematical equation – a mathematical statement indicating that two expressions are equal and using the symbol "**=**"
6. **Linear inequality in two variables** – a mathematical statement that makes use of inequality symbols such as >, <, ≥, ≤ and ≠
7. **Mathematical expression** – the left or the right member of any mathematical statement
8. **Plane divider** – the line that separates the cartesian coordinate plane into two half planes
9. **Slope of a line** – the steepness of a non-vertical line
10. **Solutions of linear equations** – points in the coordinate plane whose ordered pairs satisfy the equality
11. **Solutions of linear inequalities** – points in the coordinate plane whose ordered pairs satisfy the inequality
12. **Variables** – any quantity represented by a letter of the alphabet
13. **x-intercept** – the x-coordinate of the point where a graph intersects the x-axis

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Answer Key

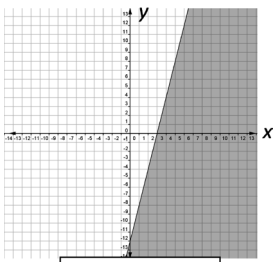
Summative Test

Part I

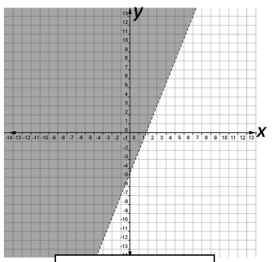
1. A	5. B	9. D	13. B	17. B
2. D	6. B	10. C	14. D	18. D
3. B	7. A	11. B	15. D	19. C
4. C	8. B	12. B	16. C	20. D

Part II

1. $4x - y \geq 12$ and $5x - 2y < 9$
2. $3x + y = 10$ and $3x - 5 \leq 6$
4.



$4x - y \geq 12$



$5x - 2y < 9$

Part III

1. Php4,800
2. Php35

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WEBSITE Links as References and for Learning Activities:

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9. http://www.classzone.com/books/algebra_1/page_build.cfm?id=lesson5&ch=6
10. http://www.mathchamber.com/algebra7/unit_06/unit_6.htm
11. http://www.mathwarehouse.com/algebra/linear_equation/linear-inequality.php
12. http://www.montereyinstitute.org/courses/Algebra1/COURSE_TEXT_RESOURCE/U05_L2_T1_text_final.html
13. http://www.netplaces.com/algebra-guide/graphing-linear-relationships/graphing-linear-inequalities-in-two-variables.htm
14. http://www.netplaces.com/search.htm?terms=linear+inequalities+in+two+variables
15. http://www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/MathAlgor/linear.html
16. http://www.purplemath.com/modules/ineqgrph.html
17. http://www.saddleback.edu/faculty/lperez/algebra2go/begalgebra/index.html#systems
18. http://www.tutorcircle.com/solving-systems-of-linear-equations-and-inequalities-t71gp.html#close_iframe#close_iframe
19. http://www.wyzant.com/Help/Math/Algebra/Graphing_Linear_Inequalities.aspx

WEBSITE Links for Videos:

1. http://www.phschool.com/atschool/academy123/english/academy123_content/wl-book-demo/ph-237s.html
2. http://video.search.yahoo.com/search/video?p=linear+inequalities+in+two+variables
3. http://video.search.yahoo.com/search/video?p=systems+of+linear+equations+and+inequalities

WEBSITE Links for Images:

1. http://lazyblackcat.files.wordpress.com/2012/09/14-lex-chores-copy.png
2. http://www.google.com.ph/imgres?q=filipino+doing+household+chores&start=166&hl=fil&client=firefox-a&hs=IHa&sa=X&tbo=d&rls=org.mozilla:en-US:official&biw=1024&bih=497&tbm=isch&tbnid=e6JZNmWnlFvSaM:&imgrefurl=http://lazyblackcat.wordpress.com/2012/09/19/more-or-lex-striking-home-with-lexter-maravilla/&docid=UATH-VYeE9bTNM&imgurl=http://lazyblackcat.files.wordpress.com/2012/09/14-lex-chores-copy.png&w=1090&h=720&ei=4EC_ULqZJoG4iQfQroHACw&zoom=1&iact=hc&vpx=95&vpy=163&dur=294&hovh=143&hovw=227&tx=79&ty=96&sig=103437241024968090138&page=11&tbnh=143&tbnw=227&ndsp=17&ved=1t:429,r:78,s:100,i:238

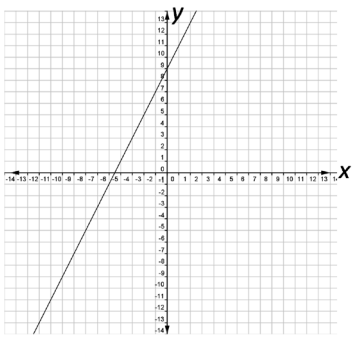
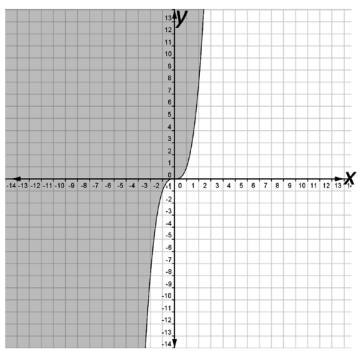
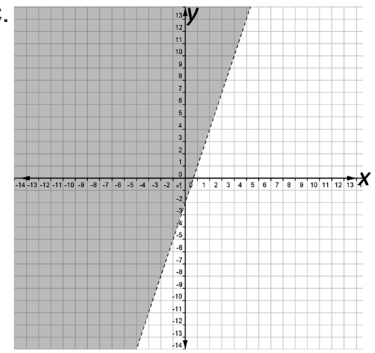
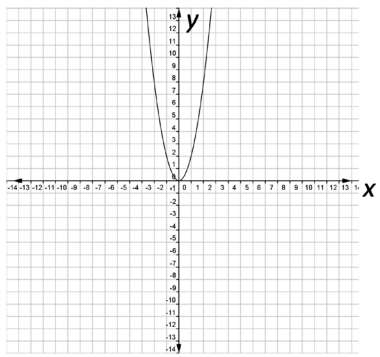
SUMMATIVE TEST

Part I. Select the letter corresponding to your answer.

1. Carl bought 10 big notebooks and 15 small notebooks. The total amount he paid was at most Php 550. If x represents the cost of big notebooks and y the cost of small notebooks, which of the following mathematical statements represent the given situation?
   a. $10x + 15y \leq 550$
   b. $10x + 15y \geq 550$
   c. $10x + 15y > 550$
   d. $10x + 15y < 550$

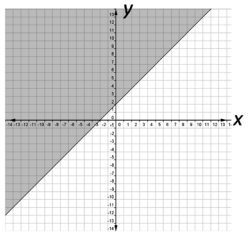
2. Which of the following is true about the number of solutions a linear inequality in two variables has?
   a. It has no solution
   b. It has one solution
   c. It has two solutions
   d. It has infinite number of solutions

3. Which of the following ordered pairs is a solution of the inequality $2x - 3y > 1$?
   a. (2, 3) b. (-3, -3) c. (5, 4) d. (-4, -1)

4. Which of the following is a graph of a linear inequality in two variables?
   a. 
   b. 
   c. 
   d. 

5. The difference between Billy's score and Alvin's score in the test is not more than 4 points. Suppose Billy's score is 26 points, what could be the score of Alvin?
   a. Between 22 and 30
   b. 22 to 30
   c. 30 and below
   d. 22 and above

6. What linear inequality is represented by the graph at the right?
   a. $x - y \geq 2$
   b. $x - y \leq 2$
   c. $-x + y \geq 2$
   d. $-x + y \leq 2$



7. Mrs. Abad gave the fish vendor Php 500-bill for 1.5 kg of *bangus* and three kg of *tilapia* that cost more than Php 350. Suppose a kilo of bangus costs Php 130. Which of the following could be the cost of a kilo of *tilapia*?
   a. Php 95 b. Php 105 c. Php 110 d. Php 120

8. Which of the following is a linear inequality in two variables?
   a. $3a - 2 > 12$ c. $2p \geq 15$
   b. $15 + 8x < 14y$ d. $9m + 15 = 7n$

9. Grecia has some Php 50 and Php 20 bills. The total amount of these bills is less than Php 2,500. Suppose there are 35 Php 50-bills. Which of the following is true about the number of Php2 0-bills?
   IV. The number of Php 20-bills is less than the number of Php 50-bills.
   V. The number of Php 20-bills could be more than the number of Php 50-bills.
   VI. The number of Php 20-bills is equal to the number of Php 50-bills.

   a. I and II b. I and III c. II and III d. I, II, and III

10. A businessman would like to make a model which he can use as a guide in writing a linear inequality in two variables. He will use the inequality in determining the number of sacks of rice and corn that he needs to stock in his warehouse given the total cost (T), the cost (R) of each sack of rice and the cost (C) of each sack of corn. Which of the following models should he make and follow?

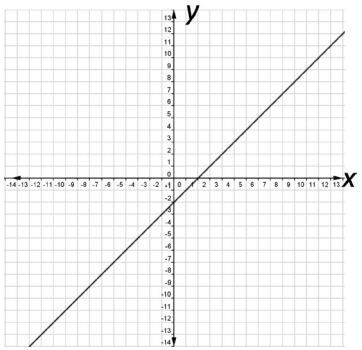
I. $Rx + Cy = T$ II. $Rx + Cy \leq T$ III. $Rx + Cy \geq T$

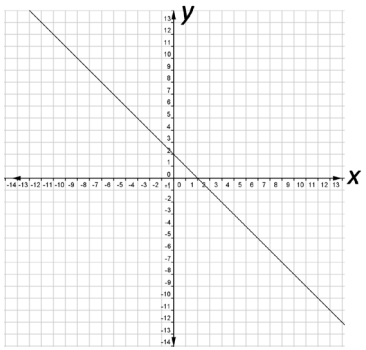
a. I and II b. I and III c. II and III d. I, II, and III

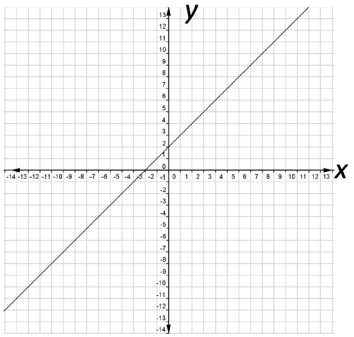
11. In the inequality $6a + 4b \geq 10$, what could be the possible value of a if $b = 2$?

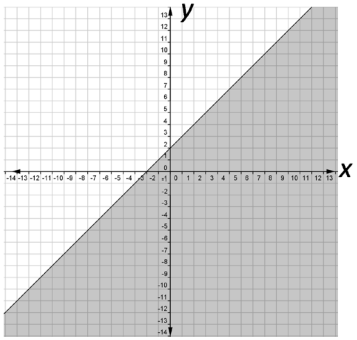
a. $a \leq \frac{1}{3}$ b. $a \geq \frac{1}{3}$ c. $a < \frac{1}{3}$ d. $a > \frac{1}{3}$

12. Which of the following shows the plane divider of the graph of $y \leq x + 2$?

a.


c.


b.


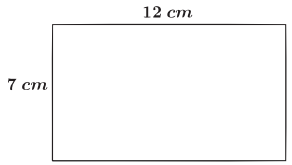
d.


13. Ana and Marielle went to the grocery to buy cans of milk sachets of coffee. Ana paid Php 672 for 12 cans of milk and 24 sachets of coffee. Marielle bought the same cans of milk and sachets of coffee but only paid less than Php 450. Suppose each sachet of coffee costs Php 5.50. How many cans of milk and sachets of coffee could Marielle have bought?
    a. six cans of milk and 36 sachets of coffee
    b. eight cans of milk and 16 sachets of coffee
    c. 10 cans of milk and 12 sachets of coffee
    d. 12 cans of milk and 8 sachets of coffee

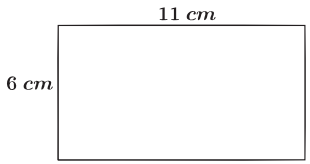
14. A bus and a car left a place at the same time traveling in opposite directions. After 2 hours, the distance between them is less than 300 km. If the car travels at a speed of 70 kilometers per hour (kph), which of the following could be the speed of the bus?
    a. 100 kph b. 90 kph c. 80 kph d. 70 kph

15. Darcy is making a design of window grill that is rectangular in shape. Suppose the perimeter of the window grill design is less than 30 cm. Which of the following could be the frame of the window grill design Darcy is making?

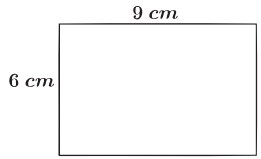
a.



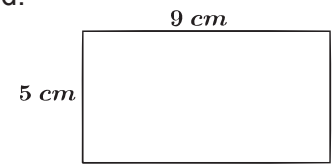
c.



b.



d.



16. There are at least 15 large and small tables that are placed inside a function room for at least 150 guests. Suppose only eight people can be seated around the large table and only six people for the small tables. Which of the following number of tables are placed inside the function room?
    a. ten large tables and 8 small tables
    b. nine large tables and 12 small tables
    c. eight large tables and 16 small tables
    d. six large tables and 15 small tables

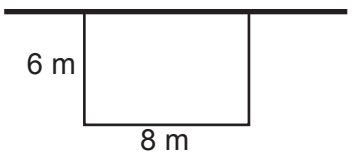
17. Melanie is using two mobile networks to make phone calls. One network charges her Php 6.50 for every minute of call to other networks. The other network charges her Php 5 for every minute of call to other networks. In a month, she spends more Php 400 for these calls. Suppose she wants to model the total costs of her mobile calls to other networks using a mathematical statement. Which of the following mathematical statements could it be?

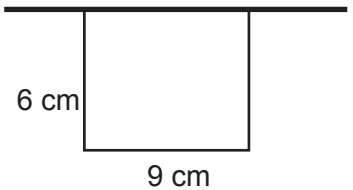
a. $6.50x + 5y = 400$
b. $6.50x + 5y > 400$
c. $6.50x + 5y \geq 400$
d. $6.50x + 5y \leq 400$

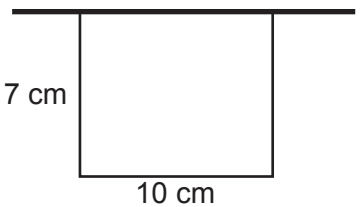
18. Mr. Miranda would like to increase his profit on hog and poultry raising to the maximum if possible. To do it, he has to prepare a business plan to determine the additional expenses and projected profit. Which of the following should Mr. Miranda prepare to come up with the business plan?
I. Marketing Plan
II. Operational Plan
III. Financial Plan

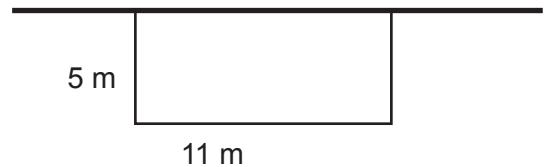
a. I only
b. II only
c. III only
d. I, II, and III

19. Mr. Tolentino would like to use one side of the concrete fence for the rectangular garage that he will be constructing. This is to minimize the construction materials to be used. To help him determine the amount of construction materials needed for the other three sides whose total length is more than 21 m, he drew a sketch of the garage. Which of the following could be the sketch of the garage that Mr. Tolentino had drawn?

a.


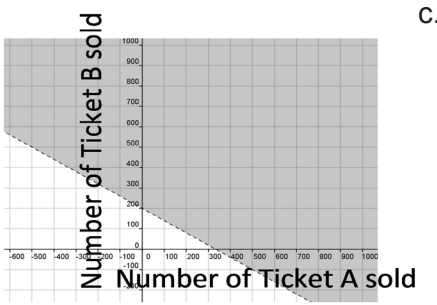
b.


c.


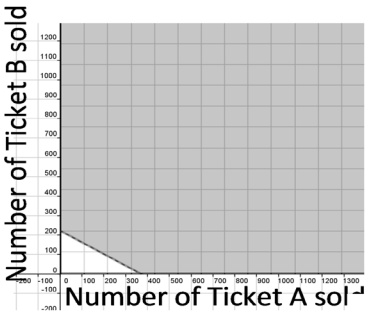
d.


20. A non-government organization is raising funds for the indigent families living in some remote areas by selling two kinds of concert tickets. They expect to raise at least Php 50,000 from the concert. After the concert, the officers of the organization need to account all sold tickets and their total cost then present it graphically to their members. Which of the following graphs could be prepared and presented by the officers considering the expected amount to be raised?

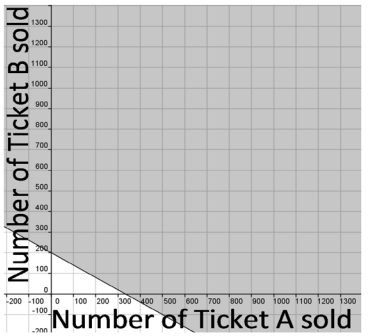
a.



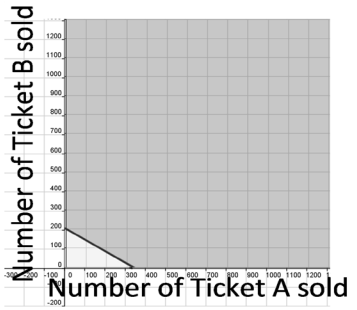
c.



b.



d.

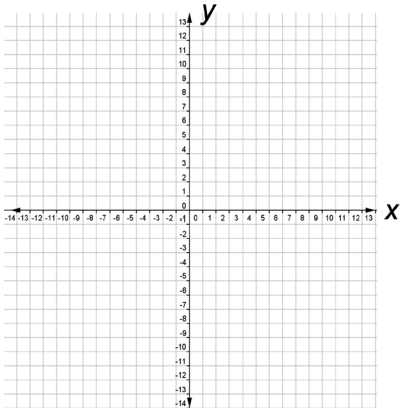


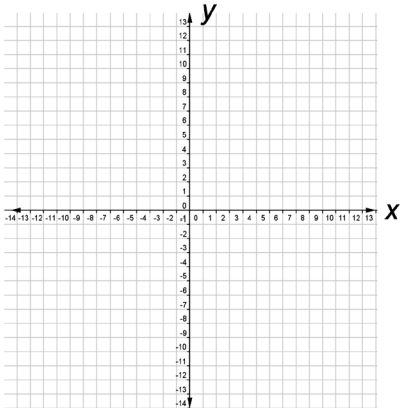
Part II. Use the following mathematical statements to answer the questions that follow.

$3x + y = 10$	$4x - y \geq 12$	$3x - 5 \leq 6$	$4x - 2y < 9$

1. Which of the given mathematical statements are linear inequalities in two variables?
2. Which of the given mathematical statements are not linear inequalities in two variables? Explain your answer.

3. Give three ordered pairs that satisfy each linear inequality in two variables. Show how you obtained these ordered pairs.
4. Draw the graph of each linear inequality in two variables.





Do the ordered pairs you have given in #3 are on the graph of the linear inequality? If NOT, explain why.

5. Describe the solution set of each linear inequality in two variables

Part III. Solve the following problems.

1. Mr. Villamayor rented a construction crane for five hr and a backhoe for seven hr. The total amount he paid is less than Php 9,000. Suppose the hourly rate for the crane is Php 800. What is the maximum amount he paid for the backhoe to the nearest hundreds?

2. Wally paid at most Php 350 for the five notebooks and four pad papers that he bought. Suppose each notebook costs Php 42. What could be the greatest price of each pad of paper to the nearest peso?

Part IV. Plan First! (GRASPS Assessment)

Goal: Present simple budget proposal for raising broiler chickens
Role: A son or daughter who wish to raise broiler chickens for family's consumption

Audience: Your parents

Situation: Due to the rising prices of food commodities, you decided to raise broiler chickens for your family's consumption. You sought permission from your parents and asked them to give you some amount to start with. Your parents agreed to give you some money, however, they still need to see how you will use it. They asked you to prepare a budget proposal for the chicken house that you will be constructing, the number of chickens to be raised, the amount of chicken feeds, and other expenses.

Product: Simple Budget Proposal

Standards: The budget proposal should be clear, realistic, and makes use of linear inequalities in two variables and other mathematical statements.

Use the rubric below to check students' work.

RUBRIC: Budget Proposal of Raising Broiler Chickens

4	3	2	1
The budget proposal is clear, accurate, practical, and the use of linear inequalities in two variables and other mathematical statements are properly illustrated.	The budget proposal is clear, practical and the use of linear inequalities in two variables is illustrated.	The budget proposal is not too clear and the use of linear inequalities in two variables is not properly illustrated.	The budget proposal is not clear and the use of linear inequalities in two variables is not illustrated.