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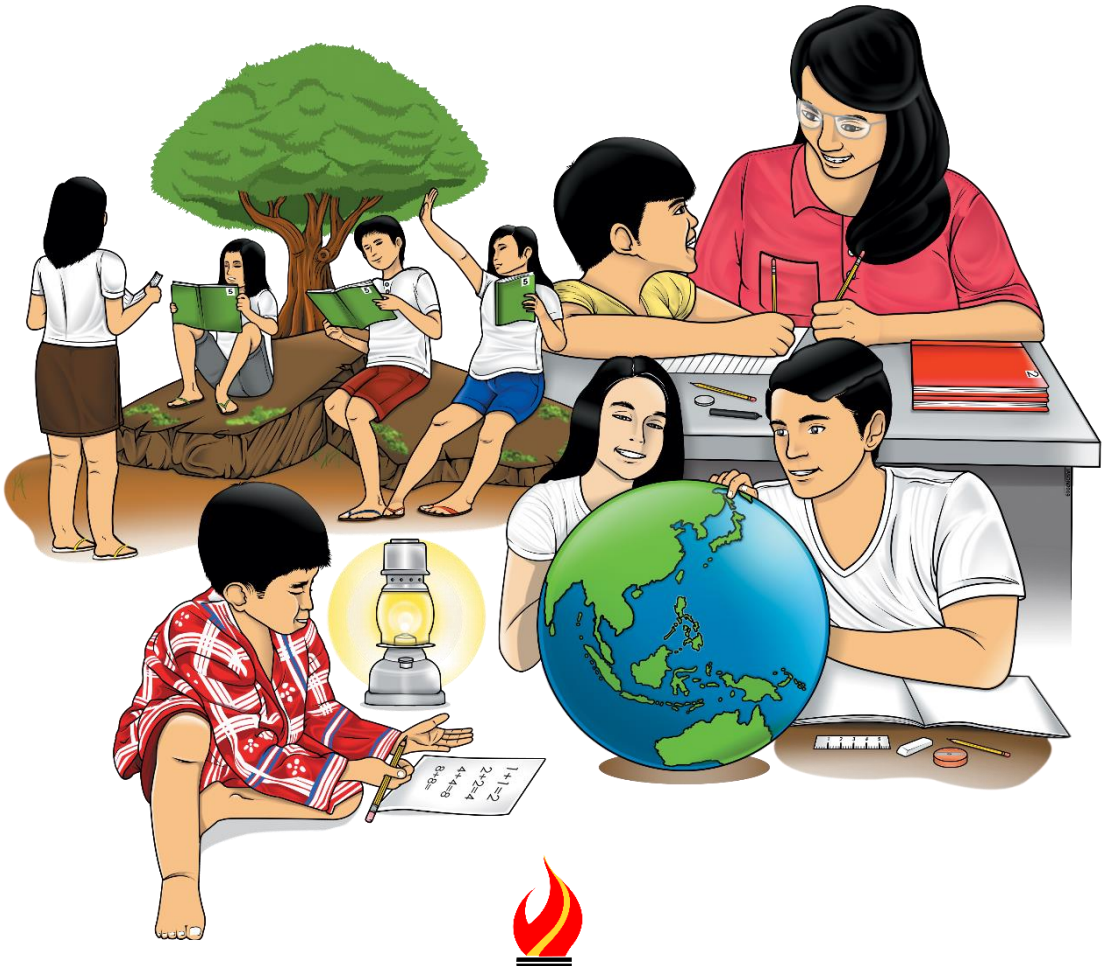
DEPARTMENT OF EDUCATION

Mathematics 7

Quarter 2 – Module 8: Algebraic Expressions, Linear Equations and Inequalities



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Introductory Message

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

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

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

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

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

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

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master the Algebraic Expressions, Linear Equations and Inequalities. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module is comprised of only one lesson:

- Algebraic Expressions, Linear Equations and Inequalities

After going through this module, you are expected to:

1. define and differentiate linear equation and inequality in one variable; and
2. illustrate linear equation and inequality in one variable.

What I Know

Choose the letter of the correct answer. Write the chosen letter on a separate sheet of paper.

1. It is a mathematical sentence which states that the two expressions are unequal.
   A. Equation
   B. Equivalent
   C. Expression
   D. Inequality

2. It is a statement in which two expressions, at least one containing the variable are equal.
   A. Equation
   B. Equivalent
   C. Expression
   D. Inequality

3. Complete the statement: "When the highest power of the variable of an equation is 1, the equation is _____."
   A. Equivalent
   B. Indirect
   C. Inequality
   D. Linear

4. All of the following are linear inequality, EXCEPT:
   A. $x \leq 7$
   B. $x + 2 < 1$
   C. $2x - 4 \leq 3$
   D. $4x+7 = 12$

5. All of the following are linear equations, EXCEPT:
   A. $12 + y \neq 10$
   B. $3x - 6 = 9$
   C. $7(x- 3) = 42$
   D. $3x + 9 = 27$

6.The symbol "=" is used to indicate _____.
   A. Equation
   B. Equality
   C. Inequality
   D. Equivalent

7. The symbol "<, >, ≤, ≥, ≠" is used to indicate _____.
   A. Equation
   B. Equality
   C. Inequality
   D. Equivalent

8. Which of the following is a linear equation in one variable?
   A. $3x - 4 < 2$
   B. $5x - 4 = 12$
   C. $8x - 6 = 2y$
   D. $10x + 30$

9. How many variables are there in equation $5x + 2x = 10x - 20$?

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

10. Which expression represents the phrase " a number **x** less the number **y**"?

   A. $x < y$
   B. $y - a$
   C. $y < x$
   D. $x - y$

11. Express $2 (x + 3) = 25$ in the standard form of linear equation $ax + b = c$.

   A. $2x + 6 = 25$

   B. $2x + 3 = - 25$

   C. $2x - 6 = - 25$

   D. $2x - 3 = 25$

12. Which of the following is a linear inequality in one variable?
   A. $2x + 4 < 2$
   B. $3x > y+1$
   C. $22x - 1 = 0$
   D. $4x + 9 = -11$

13. A part of an algebraic expression separated by the "+" and "-" signs.
   A. Coefficient
   B. Constant
   C. Term
   D. Variables

14. What is the simplified form of $7 (x - 2) = 5x - 10$?
   A. $7x - 14 =10$
   B. $2x - 14 = 10$
   C. $2x - 14 = -10$
   D. $7x-14 = 5x -10$

15. What is the simplified form of $2(x - 8) < 10$?
   A. $2x - 16 = 10$
   B. $x - 4 < 5$
   C. $2x - 16 < 10$
   D. $2x - 16 >10$

Lesson 1 Algebraic Expressions, Equations and Inequalities

In this lesson, you will learn the definition and differences between linear equation and inequalities in one variable.

What's In

Before going to the actual topic, let's review!

Algebraic Expressions are expressions made up of constant and variable, along with algebraic operations such as addition and subtraction. A **variable,** usually represented by a letter, takes a quantity or value that may vary. A **constant** is a number, letter, or symbol whose value is fixed.

Examples:

5a - 75	2y + 5y	3m - 4

An **equation** is a mathematical statement which expresses that two numbers or two algebraic expressions are equal. An equation that contains a variable is an **open sentence** which can be true or false depending on the value of the variable. The value of the variable that makes the equation true is a **solution** of the equation.

Examples:

5m + 20 = 10	6b - 23 = 27	4p - 29 = -11

A **closed sentence** is a mathematical statement containing no variables.

Examples:

1 + 2 = 3	2 (6) = 12	10 - 2 = 8

Do the exercise below.

Exercise: Shown below are two columns, A and B. Column A contains expression while Column B contains equations. Observe and compare the items under each column then answer the questions that follow.

Column A	Column B
Mathematical Expressions	Mathematical Equations
x + 2	x + 2 = 5
2x - 5	4 = 2x - 5
x + 4bc	x = 2
7x - 7	7 = 3 - x
_____	_____

1. How are items in column B different from Column A?

2. What symbol is common in all items of Column B?

3. Write at least two other examples on the space provided below each column.

What's New

Previously, you just have learned about expression and equation. Now, let's try to review about inequalities.

An **inequality** is any mathematical statement relating two quantities using an inequality symbol such as <, >, ≤ or ≥.

Examples:

$z \geq 7$ $\quad$ $n + 9 > 7$ $\quad$ $k - 9 < 18$

Now, let's try this!

Group the following to which they belong.

$2x - 2 < 6x - 5$	$7b + 5 = -9$	$8p - 90$
$6y + 1 \geq 3$	$3c + 9$	$4a - 11 = 18$
$a + 2 = 22$	$68 + 2y$	$3x > 7$

Expression	Equation	Inequalities

Answer the following questions:

1. How many groups are there?

_____

_____

2. What symbols did you observe in each group?

_____

_____

3. How many variables are there in each expression?

_____

_____

What is It

Linear Equation is defined as one degree equation or the highest degree of an equation is one. To determine a linear equation, look at the highest degree of an equation. If the highest degree of the equation is one, then it is a linear equation. If the highest degree of the equation is not one, then it is not a linear equation.

Examples of linear equation:

$4x + 3y = 8$ $\quad$ $8x + 4 = 12$ $\quad$ $3a + 4b - 5c = 10d$

Examples of not linear equation:

$2xy = 10$ $\quad$ $3x + 4xy - 6z = 20$ $\quad$ $5ab + 10 = 20$

Linear Equation in One Variable

A linear equation in one variable is an equation has a maximum of one variable of order 1, which is expressed in the form **ax + b = c** where a and b are integers and x is a variable and has only one solution. The symbol "=" is used to indicate equality.

Standard Form of Linear Equation in One Variable

The standard form of linear equations in one variable is represented as:

left side ← $ax + b = c$ → right side

↓

Equal sign

where a,b, and c are real numbers and $a \neq 0$.

The following are some examples of linear equations in one variable.

$3x = 1$ $\quad$ $22x - 1 = 0$ $\quad$ $4x + 9 = -11$

$5(y - 2) = 5y - 10$ $\quad$ $x = 7$ $\quad$ $3z + 4 = 12 - z$

Linear Inequality in One Variable

A linear inequality is a statement involving one variable which exponent is 1,where inequality rather than equality is the center of focus. The word "inequality" indicates that the expression on the left and right sides of inequality are not equal.

Inequality Symbols	
$<$	less than
$>$	greater than
$\leq$	less than, equal to or at most
$\geq$	greater than or equal to, at least
$\neq$	not equal to

Standard Form Linear Inequality in One Variable

Is an inequality which can be put into the form

left side ← $ax + b > c$ → right side

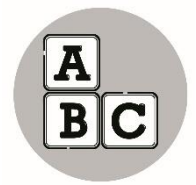
↓

Inequality sign

where a, b and c are real numbers and $a \neq 0$.

The following are some examples of linear inequalities in one variable.

$2x + 4 < 2$	$x > -2$	$x \geq 0$
$2x - 2 < 6x - 5$	$6x + 1 \geq 3(x - 5)$	$2(x - 8) < 10$



What's More

Identify which of the following expressions is an <u>equation</u> or an <u>inequality</u>. Write your answer on a separate sheet of paper. Do not copy the expressions anymore.

_____1) $7x + 2 = -19$

_____2) $3(x + 4) = 21$

_____3) $5x - 4 < 21$

_____4) $3x - 9 > 5x - 3$

_____5) $3(x - 3) = 4(2x + 1)$

_____6) $7x - 2 = 8 - x$

_____ 7) $2x - 6 \geq 0$

_____ 8) $2(x - 1) + 2(3x - 1) \leq 0$

_____ 9) $4 + 3x = 2 - 2x$

_____ 10) $8 - 2x = 5 - 4x$

What I Have Learned

To check your understanding of the linear equation and inequality, accomplish this compare and contrast chart. You can provide your own examples in establishing how are they alike and how are they different.

Compare and Contrast Chart Graphic Organizer

Linear Equation | Linear Inequality

How are they alike?

How are they different?

Linear Equation	Linear Inequality

What I Can Do

Complete the following table by placing a check mark (✔) on the cells that illustrate linear equation or inequality in one variable.

	Equation	Inequality
1.) $4x - 5 = 3$		
2.) $x - 6x > 0$		
3.) $10x = x + 3$		
4.) $3x - 2x = 1$		
5.) $15 + 2x < 8$		
6.) $15y = y - 3$		
7.) $5p > 8 + 2$		
8.) $8x - 12 = 4$		
9.) $-2y + 9y > 0$		
10.) $7y + 2 < 50$		

Assessment

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

1. It is a combination of numbers, operations and variables.
   A. Equation
   B. Equivalent
   C. Expression
   D. Inequality

2. It is a statement which expresses that two numbers or algebraic expressions are equal.
   A. Equation
   B. Equivalent
   C. Inequality
   D. Linear

3. It is any mathematical statement relating two quantities using the symbol >, <, ≤ or ≥.
   A. Equation
   B. Equality
   C. Inequality
   D. Equivalent

4. The symbol "=" is used to indicate _____.
   A. Equation
   B. Expression
   C. Inequality
   D. Sign

5. Complete the statement: "When the highest power of the variable of an equation in one variable is 1, the equation is _____".
   A. Indirect
   B. Inequality
   C. Linear
   D. Solution

6. All of the following are linear inequality, EXCEPT:
   A. $x \leq 0$
   B. $x = 2$
   C. $x - 4 \leq 3$
   D. $x - 4 \neq 12$

7. All of the following are linear equation, EXCEPT:
   A. $5 + y \neq 10$
   B. $3x - 6 = 21$
   C. $3(x- 3) = 81$
   D. $7x + 8 = 72$

8. Which mathematical equation has one variable?
   A. $x - 5y = 5$
   B. $12 + y \neq 10$
   C. $y + 8 = 10$
   D. $5x - 1 = 2y+4$

9. Which mathematical inequality has one variable?
   A. $x - 5 = 5$
   B. $12 + y = 10$
   C. $y + 8 \neq 2y + 10$
   D. $5x - 1 < 2y+4$

10. Which of the following is a linear equation in one variable?
   A. $3x - 4 < 2$
   B. $5x - 4 > 12$
   C. $8x > 1$
   D. $10x = 30$

11. Which of the following is a linear inequality in one variable?
   A. $5x \geq 4$
   B. $3x - 6$
   C. $7(x- 3) = 42$
   D. $3x + 9 = 27$

12. Which of the following is a linear equation in one variable?
   A. $3x + 7 = 16$
   B. $-2x + 1 \geq 21$
   C. $2x + 3 > 4$
   D. $3x + 7y = 6$

13. Which of the following is a linear inequality in one variable?

   A. $2x + 4 < 2$
   B. $3x = 1$
   C. $5y < x$
   D. $4x + 9 = -11$

14. Write the simplified form of $3(x - 2) = 2 (x - 2)$.
   A. $3x - 6 = 4x - 4$
   B. $3x = 10$
   C. $x - 6 = -4$
   D. $x-6 > 4$

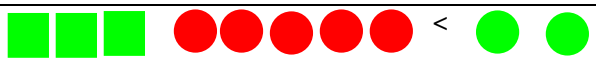
15. Write the simplified form of $2(x +9) < 10$.
   A. $2x - 18 = 10$
   B. $x - 18 < 10$
   C. $2x +18 < 10$
   D. $2x + 18 = 10$

Additional Activities

Illustrate each linear equations and inequalities in one variable by modeling each expression. An example is provided for you.

Legend:

- - represent constant 1 (positive)
- - represent constant 1 (negative)
- - represent variable x (positive)
- - represent variable x (negative)

Expression	Illustration
1. $3x - 5 < 2$	
2. $x + 3 > 1$	
3. $3x \geq 6$	
4. $2 - 3x > x - 3$	
5. $2x - 3 \leq 5$	

Answer Key

What I Know

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

What's In

1. Column A consists of mathematical phrases while Column B consists of two mathematical sentences.
2. The equal sign "="
3. Answer may vary.

What's New

1. Three groups.

Group of Expression

8p -90, 3c + 9, 68 + 2y

Group of Equation

4a - 11 = 18 , 7b + 5 = -9

a+ 2 = 22

Group of Inequality

2x - 2 < 6x - 5, 6y + 1 ≥ 3

3x > 7

2. There are three groups. Expression used variable and constant. Linear equation used equal sign while linear inequality used inequality symbol.

3. One variable.

What's More

1. Equation
2. Equation
3. Inequality
4. Inequality
5. Equation
6. Equation
7. Inequality
8. Inequality
9. Equation
10. Equation

What I Have Learned

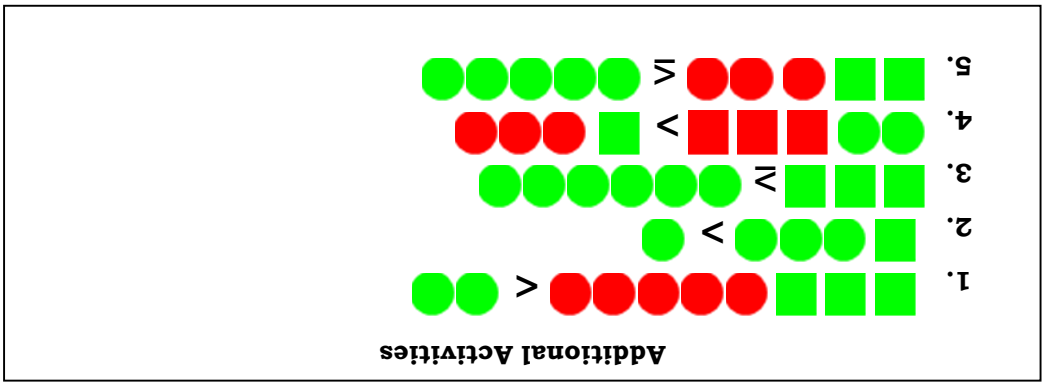
1. How are they alike? They have one variable with the highest exponent of 1.
2. How are they different? Linear equation used equality symbol while linear inequality used inequality symbol.

What I Can Do

1. Equation
2. Inequality
3. Equation
4. Equation
5. Inequality
6. Equation
7. Inequality
8. Equation
9. Inequality
10. Inequality

Assessment

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



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