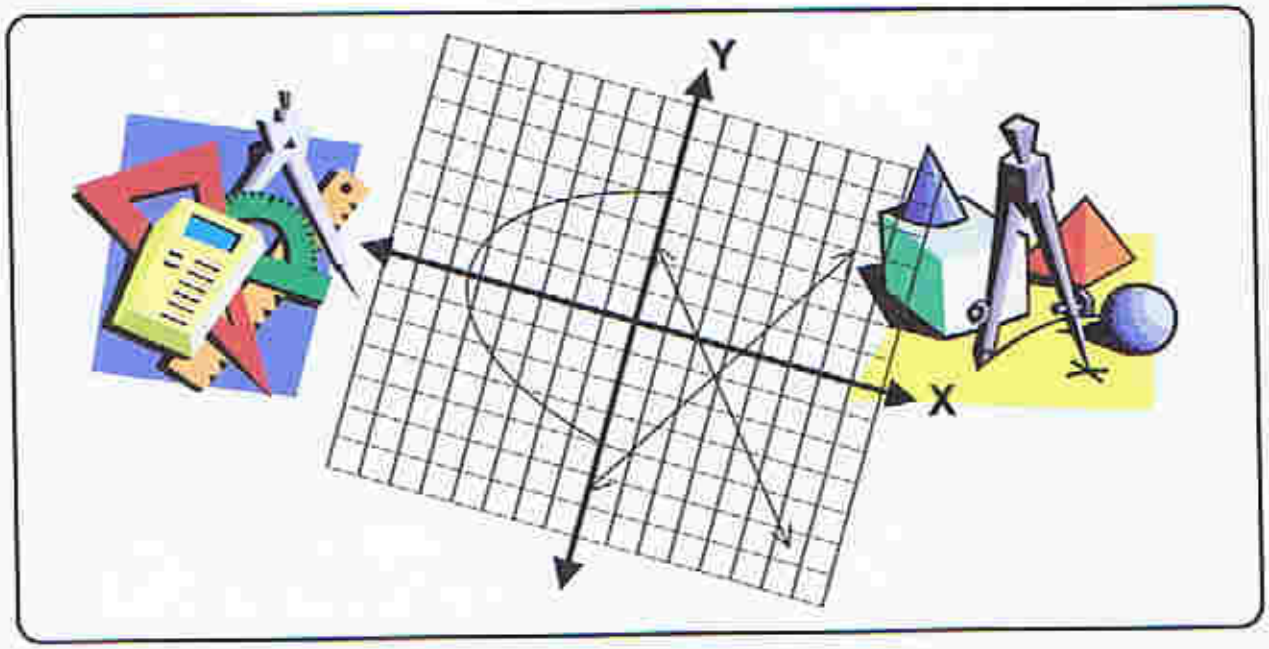
Project EASE

(Effective and Alternative Secondary Education)

MATHEMATICS I



MODULE 6

Express, Translate and Evaluate

BUREAU OF SECONDARY EDUCATION
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Module 6
Express, Translate and Evaluate

What this module is all about

The module is about algebraic expressions. It specifically deals with definitions of variables, constants, and terms, simplification of numerical expressions involving exponents and grouping symbols, translation of verbal phrases into algebraic expressions, and evaluation of algebraic expressions.

This module will make you understand that a quantity can be expressed in an algebraic form such as a term (a constant, a variable, or a product or quotient of a constant and a variable), or the sum and/or difference of terms.

This consists of the following lessons:

Lesson 1 Constants, Variables, Terms, Numerical and Algebraic Expressions
Lesson 2 Translating a Verbal Phrase into an Algebraic Expression and vice versa
Lesson 3 Simplifying Numerical Expressions Involving Grouping Symbols and Exponents
Lesson 4 Evaluating Algebraic Expressions

What you are expected to learn

After using this module, you are expected to:

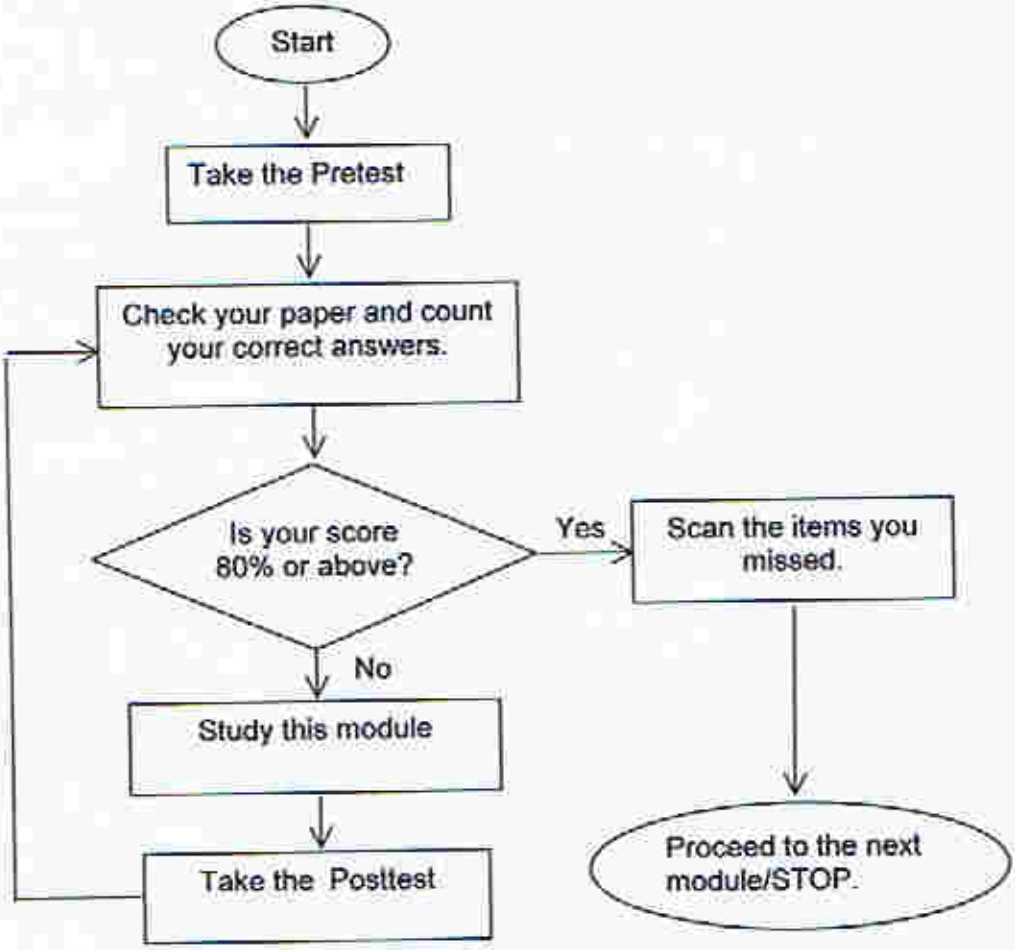
- define a variable, constant, term, numerical and algebraic expressions;
- identify the variable, constant and terms in a given algebraic expression;
- translate verbal phrases to algebraic expressions and vice versa;
- simplify numerical expressions involving exponents and grouping symbols; and
- evaluate algebraic expressions for given values of the variable(s) involved.

How to learn from this module

This is your guide for the proper use of the module:

1. Read the items in the module carefully.
2. Follow the directions as you read the materials.
3. Answer all the questions that you encounter. As you go through the module, you will find help to answer these questions. Sometimes, the answers are found at the end of the module for immediate feedback.
4. To be successful in undertaking this module, you must be patient and industrious in doing the suggested tasks.
5. Take your time to study and learn. **Happy learning!**

The following flowchart serves as your quick guide in using this module.



What to do before (Pretest)

Slow Down!

Answer the following **pretest** first before you proceed with the module.

Directions: Read each item carefully and choose the letter of the correct answer.

1. In an algebraic expression, what do you call the symbols that do not have fixed values?

   a. constant b. phrase c. term d. variable

2. It is a constant, a variable, or a product or a quotient of constant and variable/s.

   a. constant b. phrase c. term d. variable

3. In the expression –4xy, what is the constant?

   a. 4 b. – 4 c. x d. y

4. What is the simplified form of $2^2 + (16\text{-}9)$?

   a. 3 b. 7 c. 10 d. 11

5. The phrase '*a number n decreased by five*' is translated algebraically as

   a. $n + 5$ b. $n - 5$ c. $5 - n$ d. $5n$

6. If x = 3, what is the value of $2x - 4$?

   a. 0 b. 2 c. 7 d. 10

7. The verbal phrase of the algebraic expression $2x + 6$ is

   a. six is more than twice a number x
   b. six more than twice a number x
   c. two numbers increased by six
   d. twice the sum of a number x and 6

8. If $a = 4$ and $b = -3$, what is the value of $(-2a - 3b)$?

   a. -17 b. -1 c. 1 d. 17

9. How many terms are there in the expression $2y - 6$?

a. 1 b. 2 c. 3 d. none

10. Of the following, which is a numerical expression?

a. $x+2$ b. $6+2-4$ c. $x+y=4$ d. $2ab$

11. In the expression $3x - 2y + 5$, what is/are the constant term/s?

a. 3, -2, 5 b. 3, 5 c. 6 d. 5

12. What is the simplest form of the expression $(-2)^2+\{6-3-(4+2)-1-5\}$?

a. -9 b. -1 c. 0 d. 1

13. Which of the following statements does NOT represent an open phrase?

a. Five more than twice a number

b. Square of the sum of a number and 1

c. Seven added to thrice the sum of 3 and 5

d. Twice the difference between a number and 2

14. What is the numerical coefficient in the expression $\frac{-xy}{4}$?

a. -4 b. -1 c. $-\frac{1}{4}$ d. 4

15. Which of the following statements is **NOT** true about the expression *ab*?

a. The constant in the expression is zero.

b. There are two variables in the expression.

c. The constant in the expression is positive 1.

d. There is no constant term in the expression.

Check your answers in the pretest using the correction key at the end of this module. If your score is 13 or 14, scan the material as you review the missed item/s. You may skip the activities following the pretest and proceed to the posttest. If your score is 15, you may just scan the material then proceed to the next module. If your score is below 13, study the whole module patiently then proceed to the posttest.

Answer Key on page 25

What you will do

Lesson 1: Constants, Variables, Terms, Numerical and Algebraic Expressions

Arithmetic is concerned mainly with the study of the structure, operations and applications of whole numbers and positive rational numbers whether in the form of fraction, decimal or percent. Algebra, on the other hand, is concerned with the study of the variables represented by letters and the operations relating these variables. These variables are symbols for numbers from the simple set of counting numbers to the more complicated set of real numbers.

The essence of algebra lies in representing quantities as symbols other than numerals. This is the advantage of applying algebra and not arithmetic alone in solving practical problems. These different symbols are grouped into expressions, which in turn bring meaning to equations and inequalities.

This module will enlighten us on the wonders, powers and usefulness of algebra together with its importance in modern living. Do the following activities for you to explore what algebra is.

"How Do You Group Us?"

Activity 1: Given the symbols below, which should be grouped together?

8, b, -5, ←, ¼, y, 0, a, x, ↖, c, n, 3, ↓

Observe how the symbols are grouped together.

b, ←, y, a, ↖, x, c, n, ↓	Why? _____ What do you call these symbols? _____
8, - 5, ¼, 0, 3,	Why? _____ What do you call these symbols? _____

Does each symbol in the first row have a fixed value? _____

Does each symbol in the second row have a fixed value? _____

Did you know?

Every symbol that has no fixed value and stands for a number is called a ***placeholder symbol***. In arithmetic, students meet problems like 4 + 3 = ←, 3 x 2 = ↓, 12 ÷ ↖ = 3, 2n = 8. Algebra does not use ↖, ←, and ↓ as symbols but uses x, n, y, or any letter to represent numbers. A letter that is used as a placeholder symbol that has no fixed value is called a ***variable*** while a symbol that has a fixed value is called a ***constant***.

Activity 2: Given the following expressions, how should these expressions be grouped together?

$\frac{x}{5}$	2n + 8;	$x^2 + 2y^2$	(5-4)(2+1)
- 2a	$(a-2)^3$	$6-(4+1)$	$10x^2 - 7x + 1$
6 ÷ 3	2(l + w)	$3^2 + (4-2)$	(x – 4) + (2x+3)

Why are the expressions grouped in this way?

$\frac{x}{5}$ - 2a 2n + 8 2(l + w) $(a-2)^3$ $x^2 + 2y^2$ (x – 4) + (2x+3) $10x^2 - 7x + 1$	Why?_____ What do we call these expressions? _____
6 ÷ 3 (5-4)(2+1) $6-(4+1)$ $3^2 + (4-2)$	Why?_____ What do we these expressions? _____

Do the expressions in each group have something in common? _____. If YES, what do the expressions in the first group have that the expressions in the second group do not have?

_____

Did you know?

A mathematical phrase that contains a variable is an ***open phrase***. A ***number phrase*** is an expression that does not contain a variable. It is also referred to as a **numerical expression**. The English phrase '*a certain number added to 5*' is translated to an open phrase 'n + 5' where n stands for a certain number. The English phrase 'seven added to 5' is translated to a number phrase '7 + 5'.

Expressions like 8 + 2, 12 – 2, 5 x 2, and 20 ÷ 2 are some number phrases for the number 10. Expressions like $\frac{x}{5}$, - 2a, 2n + 8, 2(l + w) are examples of open phrases. Another name for open phrase is ***algebraic expression***. An expression composed of constants, variables, grouping symbols, and operation symbols, is called an ***algebraic expression.***

In an open phrase "-7x + 12", -7x and 12 are the terms of the expression. In the term -7x, -7 is the **constant,** also called the ***numerical coefficient*** of x while x is the **variable,** or the ***literal coefficient*** of -7. The numerical coefficient of a term is written before the literal coefficient. A ***term*** is an indicated product or quotient of coefficients. The term 12 is the constant term, which does not have any indicated literal coefficient. Terms in an algebraic expression are separated by the plus (+) or minus (-) sign.

Self-check 1

A. Complete the table. Identify the terms and the constant/s, and variable/s of each term in the expression.

Expression	Term/s	Constant/s	Variable/s
1. $a + 6$			
2. $-4b$			
3. $5x - 2$			
4. $3m$			
5. $\frac{n}{8}$			

B. Write N if the expression is numerical, and write A if the expression is algebraic.

_____ 1. $4x^2$	_____ 6. $12 - x$
_____ 2. $3xy$	_____ 7. $28 - 6$
_____ 3. $x - 4$	_____ 8. $2y + 4$
_____ 4. $2(5 + 7)$	_____ 9. $12 - 6$
_____ 5. $23 + (-4)$	_____ 10. $10 - 2 + 6$

Answer Key on page 25

HISTORICAL NOTE

DIOPHANTUS of Alexandria was a Greek mathematician whom many have considered as the "Father of Algebra". He lived during the third century A.D. and wrote the treatise *Arithmetica*. His fame lies in representing unknowns by 'symbols'.

Diophantus also had a profound influence on the numbers theory. For example, he proved that "no number of the form '8n + 7' can be the sum of three squares".

Error Analysis: Here is an excerpt of an interaction in an algebra class:

Teacher: Given the expression xy^2, what is the literal coefficient?
Student A: The literal coefficient in the expression is xy^2.
Teacher: Very good. How about the constant or the numerical coefficient of the expression xy^2?
Student B: There is no constant or numerical coefficient in the expression.
Teacher: Who can give another answer?
Student C: The constant or the numerical coefficient is zero.
Teacher: Another try?
Student D: The constant or the numerical coefficient in the expression xy^2 is 1.

From the answers given by students B, C, and D, which one is correct?

Lesson 2: Translating a Verbal Phrase into an Algebraic Expression and vice versa

Activity 1: Try to play this game called "**How Do You Write Me?**". Use "▲" to represent any number you will choose (variable), and use "☺" to represent a given number (constant). Follow the directions in the game and draw the pictures opposite the directions. The first two steps are done for you.

Directions	Picture
1. Think of any number.	▲
2. Add 1.	▲ ☺
3. Multiply by 2.	
4. Add 6.	
5. Divide by 2.	
6. Subtract the number you first thought of.	

What is the picture for step 3? for steps 4 to 6?

For steps 3 to 6, it will look like this:

Picture
3. ▲ ▲ ☺ ☺
4. ▲ ▲ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺
5. ▲ ☺ ☺ ☺ ☺
6. ☺ ☺ ☺ ☺

Your answer must be like this one above. The result is 4. You could repeat the game using another number.

Activity 2: Let "▩" represent "x", and "♪" represent "1". Write what each set of picture/s represents using "x" as the variable and a number (constant). Item nos. 1 and 2 are done for you.

Picture	Algebraic Expression
1. ▩	x
2. ▩ ♪♪♪	x + 3
3. ▩ ▩ ▩ ♪♪♪♪♪	
4. ♪♪ ▩ ▩ ▩ ▩ ▩	
5. ▩ ▩ ♪♪♪	

Your answers must be like these.

	Algebraic Expression
3.	3x + 6
4.	2 + 5x
5.	2x + 3

Did you know?

Verbal phrases involving quantities can be translated into algebraic expressions. Constants and variables together with symbols of operations and relations are important in translating verbal phrases into algebraic expressions.

Remember this . . .

The symbols of operations and relations used in algebra are as follows:

Symbol	Meaning
+	addition, plus, increased by, added to, the sum of, more than
-	subtraction, minus, decreased by, subtracted from, less than, diminished by
·, ( )	multiplication, times, multiplied by
/, ÷	division, divided by, ratio of, the quotient of
=	Equals, is equal to
<	is less than
>	is greater than
≤	is less than or equal to
≥	is greater than or equal to
≠	is not equal to

HISTORICAL NOTE

ALGEBRA HAD ITS BEGINNINGS in ancient Egypt and Babylon, where people learned to solve linear ($ax = b$) and quadratic ($ax^2 + bx = c$) equations, as well as indeterminate equations such as $x^2 + y^2 = z^2$, whereby several unknowns are involved. The ancient Babylonians solved arbitrary quadratic equations by essentially the same procedures taught today.

Activity 3: Study how each of the following verbal phrases are translated into algebraic expressions.

Study This

Translate each verbal phrase into an algebraic expression.

Verbal Phrase	Algebraic Expression
1. Sum of two numbers	$a + b$
2. Twice a certain number	$2n$
3. Difference of 8 and thrice a certain number	$8 - 3b$
4. Quotient of a number and 3 diminished by 2	$\frac{x}{3} - 2$
5. Square of the sum of a number and 2	$(x + 2)^2$

Any letter or variable can represent the numbers because the numbers are not known. In item #1, ***a*** and ***b*** are the symbols used to represent the said numbers. We add them because of the word 'sum', hence the use of the plus sign (+).

Item #2, the variable ***n*** represents the number. The phrase is translated as the product of 2 and ***n***.

Item #3, the variable ***b*** represents the number and is used as a coefficient of 3. Their product is subtracted from 8 because of the word 'difference'.

Item #4, the variable ***x*** represents the number with 3 as its denominator because of the word 'quotient'. The phrase 'diminished by 2' is translated as -2.

Item #5, the variable represents the number added to 2. Because of the word square, the quantity $(x + 2)$ is raised to the second power.

Try This

A. Translate each verbal phrase into an algebraic expression.

Verbal Phrase	Algebraic Expression
1. A number y increased by four	
2. Three times a number *m* decreased by 6	
3. Nine added to the quotient of *m* and five	

B. Translate each algebraic expression into a verbal phrase.

Algebraic Expression	Verbal Phrase
4. $8n - 12$	
5. $2(x + y)$	
6. $x^2 + 3$	

Check your answers. If you have understood the examples, you should have answered all of the items correctly. Your answers in letter A should be the same as the expressions found in the Table A and your answers in letter B should be statements having the same meaning as the statements found in the Table B.

Table A

1. y + 4
2. 3m – 6
3. 9 + (m/5)

Table B

4. a) The difference between eight times the number n and twelve b) The product of eight and the number *n* minus twelve c) Eight times the number *n* decreased by twelve d) Twelve less than eight times the number n.
5. a) Twice the sum of the numbers x and y b) Two times the sum of the numbers x and y c) Two multiplied by the sum of the numbers x and y d) The product of two and the sum of two numbers x and y
6. a) The sum of the square of the number x and three b) The square of the number x increased by three c) Three more than the square of the number x d) Three added to the square of the number x

Self-check 2

DO YOU REMEMBER ME? I pioneered the use of symbols in representing numbers and I'm quite well known for that. Answer the matching test to know me.

Matching Test: Directions: Match each verbal phrase in Column A with the algebraic expressions in column B. Write the letter of your answer on the blank provided

before the item number. Read the word formed by the answers to identify the person above.

Answer	Column A	Column B
	1. The square of six minus the number **x**	a) **ab ÷ 20**
	2. Two more than six times the number **n**	d) $6^2 - x$
	3. Three times a number **x** decreased by five	h) 5(3**m**)
	4. The quotient of sixteen and the number **n**	i) 6**n** + 2
	5. Five times the product of the number **m** and three	n) 9 + (**m**÷**n**)
	6. Twenty added to the product of the numbers **a** and **b**	o) 3**x** – 5
	7. Nine increased by the quotient of the numbers **m** and **n**	p) 16 ÷ **n**
	8. The product of twelve and the number **y** divided by seven	s) 4**m**+(**n**÷3)
	9. Eight subtracted from the sum of eleven and the number **y**	t) 12**y**/7
	10. The sum of product of four and the number ***m*** and the quotient of the number **n** and three	u) (**y**+11) - 8

Answer Key on page 25

Lesson 3: Simplifying Numerical Expressions Involving Grouping Symbols and Exponents

"Can You Simplify Me? If Yes, HOW?"

Algebra uses the set of grouping symbols = {( ), { }, [ ]}. Parentheses ( ), braces { }, brackets [ ], and the vinculum ‾ are used to show that the numerals they enclose are treated as one quantity. $2^2 + 3^2$ means the square of 2 added to the square of 3 but $(2 + 3)^2$ read as two plus three quantity squared, means the sum of 2 and 3 is the single quantity that must be squared. – (a + b) means that the subtrahend is the sum of ***a*** and ***b***.

With the knowledge of these different symbols, we can simplify numerical expressions into a single quantity.

Activity 1: Learn from the following examples how each numerical expression with grouping symbols and exponent/s is simplified.

Study This

Illustrative Example 1: Simplify the expression $10 - [(15 - 10) + 3^2]$.

$= 10 - [(15 - 10) + 3^2]$

$= 10 - [5 + 9]$ Computing $15 - 10$ and squaring 3

$= 10 - [14]$ Adding 5 and 9

$= 10 - 14$ Removing the [ ] preceded by '-' sign

$= -4$ Subtracting 14 from 10

Illustrative Example 2: Simplify the expression $-2 + \{2^3 - [3^2 - (12 + 5) + 4] + 5^2\}$.

$= -2 + \{2^3 - [3^2 - (12 + 5) + 4] - 2^4\}$

$= -2 + \{8 - [9 - (17) + 4] - 16\}$ Squaring the terms and computing $12 + 5$

$= -2 + \{8 - [9 - 17 + 4] - 16\}$ Removing the ( ) preceded by -

$= -2 + \{8 - [-4] - 16\}$ Computing $9 - 17 + 4$

$= -2 + \{8 + 4 - 16\}$ Removing the [ ] preceded by -

$= -2 + \{-4\}$ Computing $8 + 4 - 16$

$= -2 - 4$ Removing the { } preceded by '+' sign

$= -6$ Subtracting 4 from -2

Illustrative Example 3: Simplify the expression $2(5-3)^2 - \{7 - [4 - (2^3 - 5) + 1] - 2(3)\}$.

$= 2(5-3)^2 - \{7 - [4 - (2^3 - 5) + 1] - 2(3)\}$

$= 2(2)^2 - \{7 - [4 - (8 - 5) + 1] - 6\}$ Computing 5–3, -2(3), getting the cube of 2

$= 2(4) - \{7 - [4 - (3) + 1] - 6\}$ Squaring 2 and computing 8 - 5

$= 8 - \{7 - [4 - 3 + 1] - 6\}$ Computing 2(4) and removing ( ) preceded by '-' sign

$= 8 - \{7 - [2] - 6\}$ Computing $4 - 3 + 1$

$= 8 - \{7 - 2 - 6\}$ Removing the [ ] preceded by '-' sign

$= 8 - \{-1\}$ Computing $7 - 2 - 6$

$= 8 + 1$ Removing the { } preceded by '-' sign

$= 9$ Adding 8 and 1

Did you know?

Some expressions contain more than one grouping symbol. Parentheses ( ), brackets [ ], and braces { } are all grouping symbols used in algebra. When an expression contains more than one grouping symbol, the computations in the innermost grouping symbols should be done first. When a term is raised to an exponent higher than 1 like in the illustrative example #2: $-2 + \{2^3 - [3^2 - (12 + 5) + 4] - 2^4\}$, find the power first before performing the operation/s. When a mathematical phrase within a pair of grouping symbols is raised to an exponent higher than 1 like in illustrative example #3: $2(5-3)^2 - \{7 - [4 - (2^3 - 5) + 1] - 2(3)\}$, perform the indicated operation within the grouping symbol first before getting the power of the quantity which results in $2(2)^2 - \{7 - [4 - (8 - 5) + 1] - 6\} = 2(4) - \{7 - [4 - (3) + 1] - 6\}$.

Remember These. . .

Steps in simplifying numerical expressions involving grouping symbols and exponents

- Get the power of the terms with exponents higher than one.
- Remove grouping symbols like ( ), [ ], and { } by simplifying the enclosed phrase, beginning from the innermost pair.
- Perform all multiplication and division operations from left to right whichever comes first.
- Perform all addition and subtraction operations from left to right.

Critical Thinking: Use each of the numbers 2, 4, 6, 8, and 10 exactly once, with any operation sign and grouping symbol, to write an expression equal to 10.

Error Analysis: When Bob simplified the expression $72 \div 6 + 3$, his answer was 8. What was Bob's error?

Try This

Simplify the following numerical expressions.

Numerical Expression	Answer
1. $3^2 + 6 - (5^2 - 20)$	
2. $10 - (20 \div 4) - 3^2$	
3. $[(6 + 2^3) - 7] + [4 - (24 \div 2^3)]$	
4. $2\,[(15 - 2^3) + 3^2 - (20 \div 5) - 10]$	

If you answered the items above following the steps mentioned, you should have obtained the following answers. 1) 10; 2) – 4; 3) 8; & 4) 4.

Self-check 3

Why are variables used to represent numbers? It is because of _____.

To find the answer to this question, simplify each numerical expression below by getting the powers and removing the grouping symbols. Then match each item in column A to the options in column B. Write only the letter of your answer.

Column A (Numerical Expressions)	Column B (Options)
1. $-1 - [3 + (2^3 - 3^2) - 2]$	g) 2
2. $2 + [(3^2 \div 3) - (5^2 - 20)]$	a) - 1
3. $-2 + [-4 + (5^2 - 3^2) \div 2]$	m) 5
4. $[(20 - 25) + (10 + 2)] - [(36 \div 4) - 5]$	b) 4
5. $2\,[3 + (2^2 - 7)] + 4^2 - (8 + 4)$	l) 0
6. $[(5^2 - 3^2) \div 2]$	e) 3
7. $\{[10 - (20 \div 4)] \div 5\} - 2$	r) 8

Answer Key on page 25

Lesson 4: Evaluating Algebraic Expressions

Can you think of an instance when substitution is done? In a basketball game, a better player usually replaces a player who does not perform well, or maybe one player needs some rest so another player has to come in. Replacing one player by another player is called **substitution**. In Algebra, we replace a variable with a number. This is called **substituting the variable**. To evaluate an algebraic expression, substitute the variable by a number and simplify the expression. **Evaluating an algebraic expression means obtaining or computing the value of the expression** where value/s of the variable/s is/are assigned.

Study This

Illustrative example 1: Evaluate $2y + 3$ when $y = 3$

Solution:	$= 2(3) + 3$	Substituting y by 3
	$= 6 + 3$	Multiplying 2 and 3
	$= 9$	Adding 6 and 3

Illustrative example 2: Evaluate $3(a + 4) + (a - 2)$ when $a = 6$

Solution:	$= 3(6 + 4) + (6 - 2)$	Substituting a by 6
	$= 3(10) + 4$	Computing 6 + 4 and 6 - 2
	$= 30 + 4$	Multiplying 3 and 10
	$= 34$	Adding 30 and 4

Illustrative example 3. Evaluate $2(x + 4) + 3(y - 3)$ when $x = -3$ and $y = 5$

Solution:	$= 2(-3 + 4)+3(5–3)$	Substituting x by 4 and y by 5
	$= 2(1) + 3(2)$	Computing -3 + 4 and 5 - 3
	$= 2 + 6$	Computing 2(1) and 3(2)
	$= 8$	Computing 2 + 6

Illustrative Example 4. Evaluate $(2x \div 3) - 2y + 2y^2$ when $x = -6$, $y = 3$

Solution:	$= [2(-6) \div 3] - 2(3) + 2(3)^2$	Substituting x by –6 and y by 3
	$= [-12 \div 3] - 6 + 2(9)$	Computing $2(-6)$; $-2(3)$ and $(3)^2$
	$= -4 - 6 + 18$	Computing $-12 \div 3$ and $2(9)$
	$= 8$	Computing $-4 - 6 + 18$

So, are you now familiar with how the substitution is done? We replace the variable with its given value. Then we simplify the expression the way we did in the previous lesson by applying the rules on simplifying expressions.

Try This

Evaluate each of the following expressions. Use the given value of each variable.

Algebraic Expression	Assigned value/s of the variable/s	
1. $7a + 3b$	$a = -4$	$b = 2$
2. $4xy - 2(x + y) - y^2$	$x = 3$	$y = 4$
3. $(3y + y) + y^2$	$y = -5$	
4. $3(m - n) + (6m \div n)$	$m = 6$	$n = -4$
5. $(4x^2 + y) + 3(x - y)$	$x = -3$	$y = 6$

Once you are done, you may check your answers against mine.

1. $7a + 3b$ *if* $a = -4$ and $b = 2$

$= 7(-4) + 3(2)$

$= -28 + 6$

$= -22$

2. $4xy - 2(x + y) - y^2$ if $x = 3$ and $y = 4$

$= 4(3)(4) - 2(3+4) - (4)^2$

$= 48 - 14 - 16$

$= 18$

3. $(3y + y) + y^2$ if $y = -5$

$= [3(-5) + (-5)] + (-5)^2$

$= [-15 - 5] + 25$

$= [-20] + 25$

$= -20 + 25$

$= 5$

4. $3(m - n) + (6m \div n)$ if $m = 6$ and $n = -4$

$= 3[6 - (-4)] + [6(6) \div (-4)]$

$= 3[6 + 4] + [36 \div (-4)]$

$= 3[10] + [-9]$

$= 30 - 9$

$= 21$

5. $(4x^2 \div y) + 3(x - y)$ if x = -3 and y = 6

$= [4(-3)^2 \div 6] + 3[(-3) - 6]$

$= [4(9) \div 6] + 3[-3 - 6]$

$= [36 \div 6] + 3[-9]$

$= 6 - 18$

$= -12$

Self-check 4

Choose the value/s of the variable/s that satisfy the given equation. Write the letter of your answer on the blank provided before the item number.

Example: b $(n + 6 = 10)$

a) n = 10 b) n = 4 c) n = -4

_____ 1. $2ab = 6$

a) a = 2, b = 3 b) a = 1, b = 3 c) a = 1, b = 2

_____ 2. $x + 6 = -5$

a) x = 11 b) x = -10 c) x = -11

_____ 3. $y - 7 = -12$

a) y = -5 b) y = 5 c) y = 19

_____ 4. $(y/2) = 9$

a) y = -18 b) y = 9 c) y = 18

_____ 5. $3x - (x + 8) = -2$

a) x = 3 b) x = 2 c) x = -3

Answer Key on page 25

Let's summarize

A. Key Terms

Algebraic expression is a symbol or set of symbols resulting from the application of one or more fundamental operations of addition, subtraction, multiplication, and division to constants and variables.

Constant is a symbol that has a fixed value.

Numerical expression is a mathematical phrase, which does not contain a variable. It is also called a number phrase.

Open phrase is a mathematical phrase that contains variable/s.

Term is expressed as a product or quotient of coefficients. Terms are parts of an algebraic expression separated by plus or minus signs.

Variable is a symbol having no fixed value; a symbol that could take more than one value.

B. Key Points

1. To simplify a numerical expression involving exponents and grouping symbols, a) get the powers of the terms with exponents higher than one, b) perform the indicated operation/s within a grouping symbol following the MDAS rule, c) remove grouping symbols starting from the innermost.

2. The process of finding the value of an algebraic expression is called evaluating an algebraic expression.

3. A term without an indicated numerical coefficient is understood to have 1 as the numerical coefficient.

4. A term without an indicated literal coefficient is called a constant term.

What to do after (Posttest)

Direction: Choose the letter of the correct answer.

1. It is an expression that is made up of one or more terms joined by + or - signs.
   a. numerical expression
   b. algebraic expression
   c. mathematical sentence
   d. verbal expression

2. It is a part of an algebraic expression that has a fixed value.
   a. variable b. term c. phrase d. constant

3. What is the constant term in the expression $2x - 3$?
   a. -3 b. 2 c. 3 d. 2 and – 3

4. What is the simplest form of the numerical expression $5 + (16 \div 4) - 2^3$?
   a. – 7 b. – 1 c. 1 d. 7

5. Which is the mathematical translation of the phrase "two times a number *n* decreased by ten"?
   a. $2(n - 10)$ b. $10 - 2n$ c. $2n - 10$ d. $2(10 - n)$

6. What is the constant in the expression $-a^2b$?
   a. 2 b. 1 c. 0 d. – 1

7. Which of the following is **NOT** the verbal phrase of the expression $6 + 2b$?
   a. Twice a number b more than 6
   b. Six increased by twice the number b
   c. The sum of 6 and twice the number b
   d. Twice the sum of 6 and the number b

8. What is the value of the expression $2x + y - 6$ when $x = -2$ and $y = 3$?
   a. 7 b. 1 c. – 2 d. – 7

9. Of the following, which is a numerical expression?
   a. $2x + 4$ b. $3 - 6 + y$ c. $2ab$ d. $2(9 - 14)$

10. Evaluate $3(a + 2b)$, if $a = 5$ and $b = -5$
    a. -15 b. 15 c. 25 d. 45

11. How is the numerical expression $(3 - 5)^2$ simplified?
    a. Subtract the square of 5 from 3.
    b. Multiply the difference of 3 and 5 by 2
    c. Square both 3 and 5 then find their difference.
    d. Find the difference of 3 and 5 then square the result.

12. In simplifying an algebraic expression containing the grouping symbols written in the form [({ })], , which grouping symbol is to be removed first?
    a. [ ] b. ( ) c. { } d. any

13. What is the value of x if $2x - 3$ is equal to 5?
    a. – 4 b. – 1 c. 1 d. 4

14. If x = 1 and y = - 1, what is the value of the expression $3x^2 - 3y^2$?
    a. 0 b. 6 c. 8 d. 12

15. Which of the following is the mathematical translation of the phrase 'three more than four-fifths of a number x'?
    a. $\frac{4x}{5} + 3$ b. $3 > \frac{4x}{5}$ c. $\frac{4}{5}(x+3)$ d. $\frac{4x}{5} > 3$

Answer Key on page 25