7

MATHEMATICS

Quarter 2 - Module 4:
Evaluating Algebraic Expressions
Adding and Subtracting Polynomials

AIRs - LM

MATHEMATICS 7
Quarter 2 - Module 4: Evaluating Algebraic Expressions Adding and Subtracting Polynomials
Second Edition, 2021

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7

MATHEMATICS

Quarter 2 - Module 4:
Evaluating Algebraic Expressions
Adding and Subtracting Polynomials

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.

Target

In the previous lesson, you have learned how to classify algebraic expressions which are polynomials according to degree and number of terms. In this module, you will learn how to evaluate algebraic expressions, add and subtract polynomials. After going through this module, you are expected to

Learning Competency:

- Evaluates algebraic expressions for given values of the variables **(M7AL-IIc-4)**;
- Add and subtract polynomials **(M7AL-IId-2)**.

Learning Objectives:

1. Enumerate the steps on how to evaluate algebraic expressions.
2. Identify the similar/like terms of algebraic expressions.
3. Explain the rules in adding and subtracting polynomials.

Before we start the lesson, find out how much you already know about these topics.

Pre – Assessment

***Directions*:** Read carefully each statement below. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. What is the value of the algebraic expression 2a + 3a – 2 if a = 4 ?

   A. 13 B. 15 C. 18 D. 20

2. If b = -3, what would be the value of 2b – 3b + 5?

   A. -8 B. -2 C. 2 D. 8

3. What is the value of $(3a + b)^2$ if a = 5 and b = -8?

   A. 14 B. 23 C. 46 D. 49

4. Evaluate the given expression $\frac{a+b}{c+d}$) if a = -4, b = -3, c = 2 and d = -1. What is the result?

   A. -7 B. -1 C. 1 D. 7

5. What is the value of $\frac{2}{3}$ ($\frac{ac}{b}$) if a = 6, b = -4, c = 9?

   A. -12 B. -9 C. -6 D. -4

6. What is the sum of $(9a + 5b^2)$ and $(6a +12b^2)$?

   A. $3a + 7b^2$ B. $3a^2 + 7b^4$

   C. $15a + 17b^2$ D. $15a^2 + 17b^4$

7. If (-15x3 – 4xy) is added to (-8x3 – 11xy), what is the sum?

   A. $-7x^3 – 7xy$ B. $-23x^3 – 15xy$

   C. $-7x^6 – 7x^2y^2$ D. $-23x6 – 15x^2y^2$

8. What is the sum of $(5m^2 – 7n^2)$ and $(8m^2 + 6n^2)$?

   A. $13m^2 - n^2$ B. $13m^2 + n^2$

   C. $3m^2 – 13n^2$ D. $3m^2 + 13n^2$

9. What must be added to (-2xyz + 4abc + 9) to obtain (3xyz – 6abc - 4)?

   A. –xyz + 2abc - 5 B. –xyz – 2abc – 5

   C. 5xyz + 10abc - 13 D. 5xyz – 10abc - 13

10. If you combine the expressions (3x2 + 4x +7), (x2 +2x + 8) and (4x2 - 5x - 6) what is the sum?

    A. $7x^2 – x – 9$ B. $7x^2 + x + 9$

    C. $8x^2 – x – 9$ D. $8x^2 + x + 9$

11. What is the difference of (7b2) and (b2)?

    A. $-7b^2$ B. $- 6b^2$

    C. $6b^2$ D. $7b^2$

12. What is the difference of (– 4xy) and (– 5xy)?

A. - 9xy B. - xy C. xy D. 9xy

13. If (8m2 + 12n2) is subtracted from (8m2 – 9n2), what is the difference?

A. $-21n^2$ B. $21n^2$ C. $16m^2 – 21n^2$ D. $16m^2 + 21n^2$

14. What would be the expression to be subtracted from (abc + 6) to obtain (–10abc – 1)?

A. 9abc - 5 B. - 9abc + 5

C. 11abc + 7 D. -11abc - 7

15. What is the difference if (3x2 + 4x +7) is subtracted from (4x2 - 5x - 6)?

A. $-x^2 – 9x - 13$ B. $-x^2 + x + 13$

C. $x^2 – 9x – 13$ D. $x^2 + x + 13$

Lesson 1: Evaluating Algebraic Expression

Jumpstart

Previously, you learned about the concepts of algebraic expressions. So, let us recall the symbols and operations in algebraic expressions.

Activity 1: Match Me.

Match column A to column B by identifying the operations used in each expression. Write the letter of the correct answer.

COLUMN A	**COLUMN B**
___1) a + b	A. addition
___2) ab	B. subtraction
___3) a – b	C. multiplication
___4) $\frac{a}{b}$	D. division
___5) 2a	
___6) a ÷ b	
___7) (a)(b)	
___8) 5 • 7	

Discover

The above activity illustrates how the concept of symbols of operations can be used in algebraic expressions

We learned that, in an algebraic expression, letters can stand for numbers.

To evaluate an algebraic expression, here are the steps.

1. **Replace each letter in the expression with the assigned value.**
   First, replace each letter in the expression with the value that has been assigned to it. To make your calculations clear and avoid mistakes, always enclose the numbers you're substituting with parentheses. The value that's given to a variable stays the same throughout the entire problem, even if the letter occurs more than once in the expression.
2. **Perform the operations in the expression using the correct order of operations.**
   Don't forget to use the correct order of operations: first do any operations involving exponents, then do multiplication and division, and finally do addition and subtraction!

Here's an example. Let's evaluate the expression $\mathbf{2x^3 - x^2 + y}$ for x = 3 and y = –2.

Evaluate: $\mathbf{2x^3 - x^2 + y}$ **for x = 3, y = –2**	Write the expression down and what each variable is.
$\mathbf{2(3)^3 - (3)^2 + (-2)}$	Replace each variable in the expression with its value. In this example, this means each x becomes a 3 and each y becomes a -2. It's a good idea to use parentheses to keep track of this. **Tip: Be extra careful with negative numbers!**

$2(3)^3 - (3)^2 + (-2)$ $2(27) - 9 + (-2)$	Perform operations with exponents.
$2(27) - 9 + (-2)$ $54 - 9 + (-2)$	Perform operations with multiplication
$54 - 9 + (-2)$ $45 + (-2)$ 43	Perform operations with addition and subtraction

Study more examples in evaluating algebraic expression.

1. Evaluate 3x -2y + 5 when x =2 and y =4.

Solution:

$3x - 2y + 5 = 3(2) - 2(4) + 5$

$= 6 - 8 + 5$

$= -2 + 5$

$= 3$

2. Evaluate 4(a - 3) + 3(a + 2) when a = 5

Solution:

$4(a - 3) + 3(a + 2) = 4(5 - 3) + 3(5 + 2)$

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

$= 8 + 21$

$= 29$

3. Evaluate $(3x + y)^2$ when x = 3 and y = -2

Solution:

$(3x + y)^2 = [3(3) + -2]^2$

$= (9 + -2)^2$

$= (7)^2$

$= 49$

4. Evaluate $\frac{x-y}{x+y}$ when x = 12 and y = -4

Solution:

$\frac{x-y}{x+y} = \frac{12-(-4)}{12+(-4)}$

$= \frac{12+4}{12-4}$

$= \frac{16}{8}$

$= 2$

Explore

Activity 2: Solve Me.

Evaluate the following algebraic expressions when
a = 4, b = -3, x = -2 and y = 5

1. x + y

Solution: x + y = ___ + 5
= ___

2. ab – xy

Solution: ab – xy = 4(___) – (___)5
= -12 – (___)
= -12 + ___
= ___

3. $\frac{3a}{b}$

Solution: $\frac{3a}{b} = \frac{3(\_\_)}{-3}$
= —
= ___

4. $(x - y)^2$

Solution: $(x - y)^2$ = (___ - ___)^2
= (___)^2
= ____

5. $2(3b + 5)^2$

Solution: $2(3b + 5)^2 = 2[3(\_\_\_) + 5]^2$
= 2 (____ + 5)^2
= 2(____)^2
= 2(____)
= _____

6. a + 3b =

7. $\frac{x+y}{a}$ =

8. 2 $(x - y)^2$ =

9. 5a – 3b + 4 =

10. $\frac{4\,(x^2 - y^2)}{ab}$ =

Deepen

This activity will enable you to formulate your own way or strategy to come up with the correct answer.

Activity 3: Think of Me.

Answer each item carefully.

1) In the expression -5 +___ = 7, what is the missing number to make it true?

2) What should be the value of x in 5x + 9 = 24 to make the statement true?

3) If a = –2, what is the value of $7a^2 - 3a$?

4) What will be the value of $6x^2 - 4xy - 8y^2$ if x = 2 and y = –2?

5) Evaluate the expression:
$2x^2y$ divided by (x – y), where x = 5 and y = 1.

Lesson 2: Adding and Subtracting Polynomials

Jumpstart

Activity 4: Find Me!

Directions: Find the similar terms in each pair of polynomials.

1. $(5x + 4y)$ and $(-3x + 7y)$

   Example: $5x, -3x$ $4y, 7y$

2. $2x^2 + 6x + 5$ and $3x^2 - 2x - 1$

   Example: $2x^2, 3x^2$ $6x, -2x$ $5, -1$

3. $(-12ab + 3b^2)$ and $(-8ab + 6b^2)$

   _____ _____

4. $(8x^3y^4 - 4x^2y^3)$ and $(-3x^2y^3 + 9x^3y^4)$

   _____ _____

5. $(14x^2y^2 - 23xy - 17)$ and $(15x^2y^2 + 23xy - 16)$

   _____ _____ _____

6. $(6xy^2 - 4x^2y - 8)$, $(7xy^2 - 4x^2y)$ and $(-4x^2y - 4)$

   _____ _____ _____

7. $(x^2 + 6x + 5)$, $(3x^2 - 5xy - x)$ and $(6xy + 4)$

   _____ _____ _____ _____

Process Question:

How are you going to add or subtract polynomials? What are like terms?

Discover

ADDING POLYNOMIALS

Activity 4 illustrates the concepts on how to add polynomials in which similar terms are combined or you may arrange them in column then add the numerical coefficients and affix the literal coefficients.

Similar/Like Terms are terms with the same literal coefficients.

Example: 9xy is similar to 3xy because they have the same literal coefficient xy

$-2x^2y$ is similar to $4x^2y$

$-3x^2y$ is not similar to $6x^2y^2$ because y has different exponents.

Consider the following examples in adding polynomials.

Combine like terms by arranging the expression in column. Add the numerical coefficients just like adding integers then copy the literal coefficients.

1) $14x + 8x$

Solution:

$$\begin{array}{r} 14x \\ +\ 8x \\ \hline 22x \end{array}$$

2) $8y^2 + (-5y^2) + (-7y^2)$

Solution:

$$\begin{array}{r} 8y^2 \\ +\ -5y^2 \\ -7y^2 \\ \hline -4y^2 \end{array}$$

3) $(2x + 3y) + (-5x + 2y)$

Solution:

$$\begin{array}{r} (2x + 3y) \\ +\ (-5x + 2y) \\ \hline -3x + 5y \end{array}$$

4) $(-3a + 5b - c) + (-6a - 8b + 10z)$

Solution:

$$\begin{array}{r} (-3a + 5b - c) \\ +\ (-6a - 8b + 10c) \\ \hline -9a - 3b + 9c \end{array}$$

Remember Me:
Rules in Adding Integers

LIKE SIGNS:
(+) + (+) or (-) + (-)
Find the sum of their absolute values and use sign common to both integers.

UNLIKE SIGNS:
(+) + (-) or (-) + (+)
Find the difference of their absolute values and use the sign of the integer with the greater absolute value.

5) $(2m^2 + 4mn - 3n^2) + (6m^2 - 4n^2) + (-3m^2 - 6mn + 9n^2)$

Solution:

$$\begin{array}{rl} & (2m^2 + 4mn - 3n^2) \\ + & (6m^2 \quad\quad -4n^2) \\ & (-3m^2 - 6mn + 9n^2) \\ \hline & 5m^2 - 2mn + 2n^2 \end{array}$$

6) $(-5x^2 + 7xy - 9y^2) + (8xy - 6y^2) + (-2x^2 - 3xy + 4y^2)$

Solution:

$$\begin{array}{rl} & (-5x^2 + 7xy - 9y^2) \\ + & (\quad\quad 8xy - 6y^2) \\ & (-2x^2 - 3xy + 4y^2) \\ \hline & -7x^2 + 12xy - 11y^2 \end{array}$$

7) $(6xy^2 - 4x^2y - 8) + (7xy^2 - 4x^2y) + (-4x^2y - 4)$

Solution:

$$\begin{array}{rl} & (6xy^2 - 4x^2y - 8) \\ + & (7xy^2 - 4x^2y \quad\;) \\ & (\quad\quad -4x^2y - 4) \\ \hline & 13xy^2 - 12x^2y - 12 \end{array}$$

SUBTRACTING POLYNOMIALS

To subtract polynomials, recall the process on how to subtract integers. Change the sign of the subtrahend then proceed to addition.

Consider the following examples.

1) $8x^2 - 3x^2$

Remember to change the sign of the subtrahend as well as the operation into its opposite.

Solution: $8x^2$ → minuend

$- \underline{3x^2}$ → subtrahend

The given will become

$8x^2$ $\quad$ $8x^2$

$- \quad +$

$\underline{3x^2}$ → $- \underline{3x^2}$

$\mathbf{5x^2}$

Since the operation now is addition then you may proceed on how to add polynomials.

2) $(6a + 9) - (-4a + 7)$

Solution:

$6a + 9$ $\quad$ $6a + 9$

$- \quad +$

$\underline{-4a + 7}$ $\quad$ $\underline{+ 4a - 7}$

Then the answer now will be **10a + 2**

Remember Me:

1. Change the operation to addition as you change the subtrahend to its opposite.
2. Then add the numerical coefficients like adding integers.
3. Just copy the literal coefficients.

3) $(7x + 11y - 8z) - (3x + 10y - z)$

Solution:

$7x + 11y - 8z$ $\quad$ $7x + 11y - 8z$

$- \quad +$

$\underline{3x + 10y - z}$ $\quad$ $\underline{- 3x - 10y + z}$

Therefore, the answer now will be **4x + y – 7z**

4) $(-13x^2 - 9xy + 4y^2) - (-13x^2 - 7xy + 8y^2)$

Solution:

$-13x^2 - 9xy + 4y^2$ $\quad$ $-13x^2 - 9xy + 4y^2$

$- \quad +$

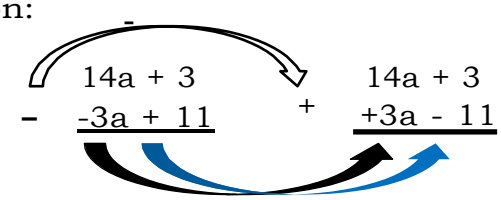
$\underline{-13x^2 - 7xy + 8y^2}$ $\quad$ $\underline{+13x^2 + 7xy - 8y^2}$

Therefore, the answer now will be **$-2xy - 4y^2$**

5) (14a + 3) – (–3a + 11) – (8a – 4)

Subtract the first two polynomials

Solution:

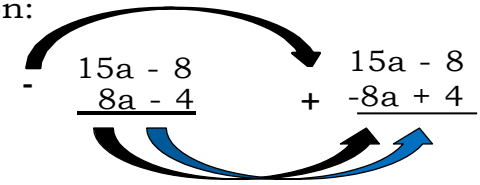


The answer will be **15a – 8**

Then, subtract the third given from the

(15a - 8) – (8a - 4)

Solution:



The answer now will be **7a -4**

Explore

Activity 5: Complete Me
Fill in the blank to make the statement correct.

1) $6 + 7 =$ _____

2) $6b + 7b =$_____b

3) $5ab^2 + 4ab^2 + 13ab^2 =$____ab^2

4) $(5x + 4y) + (-3x + 7y) = 2x +$___y

5) $(3x^2 + 8x - 10) + (8x^2 - 2x + 3) = 11x^2 +$___x – 7

6) $16 - 9 =$ ____

7) $16x - 9x =$____x

8) $15mn^2 - 7mn^2 - 13mn^2 =$__$mn^2$

9) $(8x^2y^3 - 4x^3y^4) - (-3x^2y^3 + 9x^3y^4) = 11x^2y^3 -$ _____x^3y^4

10) $(7x^2 + 11x - 10) - (9x^2 - 7x + 3) = -2x^2 +$_x – 13

Activity 6: Try Me!

Perform the indicated operation.

1) $(9a + 5b) + (2a + 2b)$

2) $(5m - 7n) + (3m - n)$

3) $(6b + 7c - 9) + (8b + 5c - 8)$

4) $(7n + 8) + (5n - 8) + (-2n + 12)$

5) $(x^2 - x + 6) + (4x^2 - x - 12) + (5x + 6)$

6) $9m - 7m$

7) $(-11x) - (-15x)$

8) $(5x + 7y) - (- 5x - 7y)$

9) $(-12ab + 3b^2) - (8ab + 6b^2)$

10) $(14x^2y^2 + 23xy - 17) - (15x^2y^2 + 23xy - 16)$

Deepen

Activity 7

I. Riddle. On What Part of Your Body Can You Find Half-moons?

Directions: Perform the indicated operation. Match column A with Column B. Refer to the boxes at the bottom and write the letter that corresponds to the number to discover the answer of the riddle.

COLUMN A	COLUMN B
1) $-5y-3y+2y$	A. 0
2) $9x+2x-15x$	G. $6x$
3) $(3x2+5x-7)+(-3x+4)$	I. $-4x$
4) $(13x+12y)+(8x-5y)$	L. $-6y$
5) $(2x^2+x-6)-(4x^2+3)$	N. $-5x-7y$
6) $(6x-9y)-(11x-2y)$	O. $21x+7y$
7) $(-8x^2y+9)-(6x^2y-15)$	R. $-14x^2y+24$
8) $(13x^2y+12z)+(8x^2y-5z)$	S. $21x^2y+7z$
9) $(4x^2+5x+9)+(-4x^2+x-9)$	U. $-2x^2+x-3$
10) $(15x^2+6x-14y^2)-(15x^2+6x-14y^2)$	Y. $3x^2+2x-3$

3	4	5	7		6	10	2	1	8

II. Answer each item.

1. If $-32x$ is added to $19x$, what is the sum?
2. Find the difference when $5a^2$ is subtracted from $14a^2$.
3. What should be added to $27x^2 - 32x + 40$ to obtain $56x^2 + 19x + 72$?
4. If $7xyz$ is subtracted from $9xyz$, what is the difference?
5. What expression should be subtracted from $(-6abc + 2)$ to obtain $(2abc + 3)$?

Gauge

Directions: Read carefully each statement below. Select the letter of the correct answer. Write your answer on a separate sheet of paper.

1. What is the value of the algebraic expression –4a + 5a + 6 if a = –3?

   A. –20 B. –3 C. 3 D. 20

2. What would be the value of 6b + 7b – 9, if b = 6?

   A. –87 B. –69 C. 69 D. 87

3. What is the value of $(4a - 3b)^2$ if a = –4 and b = –5?

   A. –31 B. –1 C. 1 D. 3

4. What would be the value of the expression $\frac{3(2a+b)}{4\,(c+d)}$ if a = –1 , b = –2 , c = –3 and d = 4?

   A. –6 B. –3 C. 3 D. 6

5. What is the value of $\frac{4}{5}\left(\frac{ac}{b}\right)$ if a = –5, b = –4, c = 3?

   A. –9 B. –3 C. 3 D. 9

6. What is the sum of $(14a + 7b^2)$ and $(8a + 16b^2)$?

   A. $-22a + 23b^2$ B. $-6a^2 + 9b^2$ C. $6a + 9b^2$ D. $22a + 23b^2$

7. If $(-11x^3 - 9xy)$ is added to $(-6x^3 - 13xy)$, what is the sum?

   A. $-17x^3 - 22xy$ B. $17x^3 - 22xy$ C. $-17x^3 + 22xy$ D. $17x^3 + 22xy$

8. What is the sum of $(12m^2 - 4n^2)$ and $(9m^2 + 12n^2)$?

   A. $-21m^2 - 8n^2$ B. $-21m^2 + 8n^2$ C. $21m^2 - 8n^2$ D. $21m^2 + 8n^2$

9. What must be added to (2xyz + 4abc + 9) to obtain (11xyz + 16abc + 13)?

   A. 9xyz + 12abc + 4 B. 13xyz + 12abc + 4

   C. 9xyz + 20abc + 22 D. 13xyz + 20abc + 22

10. If you combine the expressions $(2x^2 + 3x - 4)$, $(4x^2 + 4x - 12)$ and (x2 – 6x +7), what is the sum?

    A. 6x2 + x – 9 B. 7x2 + x – 9 C. 6x2 + x + 9 D. 7x2 + x + 9

11. What is the difference of $(12b^2)$ and $(5b^2)$?

    A. $-17b^2$ B. $-7b^2$ C. $7b^2$ D. $17b^2$

12. What is the difference of (–12xy) and (–11xy)?

    A. –23xy B. –xy C. xy D. 23xy

13. If $(20m^2 + n^2)$ is subtracted from $(20m^2 – 19n^2)$, what is the difference?

A. $–20n^2$ B. $–18n^2$ C. $40m^2 – 20n^2$ D. $40m^2 – 18n^2$

14. What would be the expression to be subtracted from (2abc + 9) to obtain (–6abc - 5)?

A. –8abc – 14 B. –4abc + 4 C. 4abc + 4 D. 8abc + 14

15. What is the difference if $(2x^2 + 3x +4)$ is subtracted from (5x2 – 7x – 10)?

A. –7x2 – 4x – 6 B. 3x2 – 10x – 14

C. –3x2 – 10x – 14 D. 7x2 + 4x + 6

Great job! You are done with this module.

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