8

Lesson Exemplar for Mathematics

Quarter 1

Lesson

3

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Lesson Exemplar for Mathematics Grade 8
Quarter 1: Lesson 3 (Week 3)
SY 2025-2026

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MATHEMATICS / QUARTER 1 / GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners demonstrate knowledge and understanding of algebraic expressions and operations with monomials, binomials, and multinomials.
B. Performance Standards	By the end of the quarter, the learners are able to add and subtract monomials, and multiply combinations of monomials, binomials, and multinomials. (NA)
C. Learning Competencies and Objectives	By the end of the lesson, the learners are able to ***1. Multiply and divide simple monomials, leading to the derivation of the laws of exponents*** *Lesson Objectives: 1. Derive the law of exponent use in multiplying and dividing polynomials.* *2. Multiply and divide monomials.* **2. Multiply simple monomials and binomials with simple binomials and multinomials, using the distributive property with various techniques and models.** *Lesson Objectives: 1. Multiply and divide binomials and multinomials by a monomial applying distributive property.* *2. Use different ways in multiplying a binomial by a binomial.* (FOIL and Vertical Form) *** Division of Multinomial by a Binomial** *Lesson Objective: 1. Divide a multinomial by a binomial.*
D. Content	5.1 Use expanded form in Multiplication of Monomials to derive the laws of exponents. 5.2 Use expanded form in Division of Monomials to derive the laws of exponents. 6.1 Multiplication and Division of Binomials and Multinomials by Monomial. 6.2 Multiplication of Binomials using distributive property with various techniques (FOIL and Vertical Form) 6.3 Division of Multinomial by a Binomial
E. Integration	

II. LEARNING RESOURCES

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III. TEACHING AND LEARNING PROCEDURE

A. Activating Prior Knowledge

DAY 1

1. Short Review

Activity 1: Multiplication Squares

Directions: Complete the entries by multiplying the integers. An example is given as your guide to fill in the missing boxes.

(4) (-2) = -8

(-3) (-2) = 6

•	4	-3
-2	-8	6
7	28	-21

(4) (7) = 28

(-3) (7) = -21

	7	4
8		
5		

	-6	-9
-3		
-2		

	-12	3
0		
-8		

	11	-5
-4		
9		

NOTES TO TEACHERS

Activity 1-A is intended for the lesson Multiplication of Monomials only.

Activity 1 Answer Key:

•	7	4
8	56	32
5	35	20

•	-6	-9
-3	18	27
-2	12	18

•	-12	3
0	0	0
-8	96	-24

•	11	-5
-4	-44	20
9	99	-45

Activity 2: Division Squares

Directions: Complete the entries by dividing the integers. The dividend is the integers written in the row while the integers in the column are the divisor. An example is given as your guide to fill in the missing boxes.

÷	18	-12
3	6	-4
-2	-9	6

(18)÷(3) = 6

(-12)÷(3) = -4

(18)÷(-2) = -9

(-12)÷(-2) = 6

÷	21	42
3		
7		

÷	-24	-36
-6		
-4		

÷	0	70
7		
-5		

÷	44	-32
-4		
2		

Activity 2 is intended for the lesson Division of Monomials only.

Activity 2 Answer Key:

÷	21	42
3	7	14
7	3	6

÷	-24	-36
-6	4	6
-4	6	9

÷	0	70
7	0	10
-5	0	-14

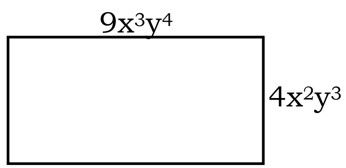
÷	44	-32
-4	-11	8
2	22	-16

2. **Feedback (Optional)**

B. Establishing Lesson Purpose

1. **Lesson Purpose**

Space in the Place. An engineer presented the floor plan of a building with the given dimensions as shown in the following figure. Find its floor area.



Questions:

1. What kind of polynomial is $9x^3y^4$ and $4x^2y^3$?
2. Is it possible for these polynomials to be multiplied?
3. How do you find its floor area?

1. monomial
2. yes
3. Area = (length)(width)

	2. Unlocking Content Vocabulary • **MONOMIAL** – polynomial with one term • **NUMERICAL COEFFICIENT** – the number that is the multiplier of the variables. in an algebraic term • **LITERAL COEFFICIENT** – the variable or letter part in an algebraic term including its exponent • **BASE** – the number or variable that needs to be multiplied repeatedly • **EXPONENT** – the number of times the base needs to be multiplied • **POWER** – expression representing the repeated multiplication of the same factor • **SIMILAR TERMS** – terms that have the same variable and raised to the same exponent.	
C. Developing and Deepening Understanding	**SUB-TOPIC 1 (LC 5): Use expanded form in multiplication of monomials to derive the laws of exponents** **1. Explicitation** A. Expand the following monomials. a) x^2 b) x^4 c) y^6 d) $4m^3$ **Question:** How did you expand the given monomials? B. From expanding x^2 and x^4, suppose that x^2 is to be multiplied to x^4. What will be its product? Given: $(x^2)(x^4)$ Solution: (x^2) (x^4) $(x \bullet x)$ $(x \bullet x \bullet x \bullet x)$ **Questions:** 1. Do the expressions have the same base? 2. How many times is "x" used as a factor? 3. What do you think is its product? C) From expanding x^4 and y^6, suppose that x^4 is to be multiplied to y^6. What will be its product? Given: $(x^4)(y^6)$ Solution: (x^4) (y^6) $(x \bullet x \bullet x \bullet x)$ $(y \bullet y \bullet y \bullet y \bullet y \bullet y)$	The teacher can first recall the parts in an expression with exponent Example: $(3x)^2$ 3x is the base, 2 is the exponent or the power. A. a) $x \bullet x$ b) $x \bullet x \bullet x \bullet x$ c) $y \bullet y \bullet y \bullet y \bullet y \bullet y$ d) $2 \bullet 2 \bullet m \bullet m \bullet m$ Through the exponent, it tells how many times the base is to be multiplied. B. 1. Yes. 2. 6 3. x^6

Questions:

1. Do the expressions have the same base?
2. How many times is "x" used as a factor?
3. How many times is "y" used as a factor?
4. What do you think is its product?

C.
1. No.
2. 4
3. 6
4. x^4y^6

2. **Worked Example**

In the previous examples, you have derived the Product Rule.

Product Rule: $\mathbf{x^m \bullet x^n = x^{m+n}}$

When multiplying powers having the same base, the exponents are added, where x is a real number and m and n are real numbers.

From their responses to the questions, the teacher can give emphasis to students that only the exponents of the same base can be added.

Examples: Find the product of the following monomials.

1. $x^8 \bullet x^2 = \mathbf{x^{10}}$
2. $a^2 \bullet a^3 = \mathbf{a^5}$
3. $2^2 \bullet 2^5 = \mathbf{2^7}$
4. $y^4 \bullet y = \mathbf{y^5}$
5. $(xy^2)(x^2y)(xy) = x^{1+2+1} \bullet y^{2+1+1}$
   $= \mathbf{x^4y^4}$

Example 6: The area of a rectangle is found by multiplying its length and width. Consider the problem in the "Space in the Place". $(9x^3y^4)(\ 4x^2y^3)$. Express the given monomials in expanded form then multiply.

Solution: $(9x^3y^4)\ (4x^2y^3) = (9 \bullet x \bullet x \bullet x \bullet y \bullet y \bullet y \bullet y)\ (4 \bullet x \bullet x \bullet y \bullet y \bullet y)$

$= 9 \bullet 4 \bullet x \bullet x \bullet x \bullet x \bullet x \bullet y \bullet y \bullet y \bullet y \bullet y \bullet y \bullet y$

$= \mathbf{36x^5y^7}$

Questions:

1. Do the monomials $9x^3y^4$ and $4x^2y^3$ have the same base?
2. If the numerical coefficients of the monomials to be multiplied are different, what will you do?
3. What have you observed on the literal coefficients of $9x^3y^4$ and $4x^2y^3$ when multiplied?
4. What is the area of the rectangular space?

1. No.
2. Multiply the numerical coefficients
3. Exponents of the same variables are added.
4. $36x^5y^7$ square units

Example 7: Find the product of the following monomials

a) $(-5x^3y^2)\ (3x^3y^4)$ Answer: a) $-15x^6y^6$

b) $(-6a^3bc^4)\ (-3abc)$ Answer: b) $18a^4b^2c^5$

3. Lesson Activity

Activity 3: The Monomial Fish

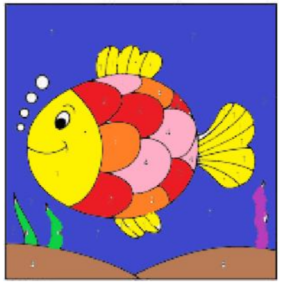
Directions:

1. Find the product of the given monomials applying the Product Rule.
2. Encircle the correct answer from the Answer Box.
3. Use the corresponding number and the color from the correct answer to shade each part of the figure.

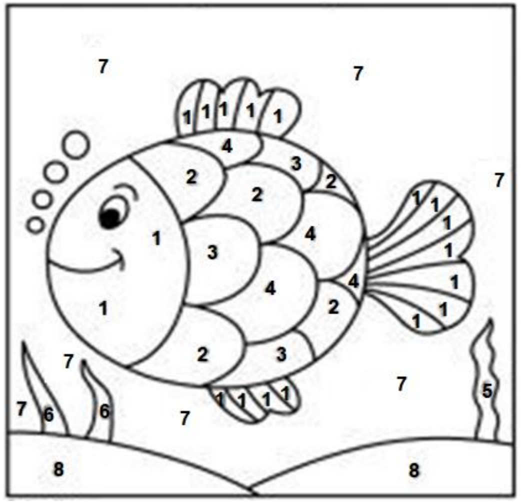
		ANSWER BOX		
1	$(3x^2y^2z)\ (4xyz)$	Red $12x^3y^3z$	Pink $12x^2y^2z$	Yellow $12x^3y^3z^2$
2	$(-7x^3y^5)\ (-9x^2y^2z)$	Brown $-63x^5y^7z$	Red $63x^5y^7z$	Green $72x^5y^7$
3	$(-6xy^3z^4)\ (5x^2y^4z^3)$	Green $-30x^2y^7z^7$	Pink $30x^3y^7z^7$	Orange $-30x^3y^7z^7$
4	$(-12x^3y^3z^4)(-x^2y^4z^3)$	Pink $12x^5y^7z^7$	Blue $-12x^5y^7z^7$	Violet $12x^6y^6z^7$
5	$(-xyz)\ (-xyz)$	Violet $x^2y^2z^2$	Green $-x^2y^2z^2$	Pink $-2xyz$
6	$(-8x^3y^3z^2)(-2x^2y^4z^3)$	Blue $16x^3y^7z^3$	Orange $-16x^5y^7z^5$	Green $16x^5y^7z^5$
7	$(-4x^3y^3)\ (9x^2z^3)$	Red $36x^5y^3z^3$	Blue $-36x^5y^3z^3$	Orange $-36x^3y^3z^3$
8	$(12x^2z^5)\ (3x^2y^3)$	Brown $36x^4y^3z^5$	Yellow $-36x^4y^3z^5$	Pink $15\ x^4y^3z^5$

Activity 3 Answer Key:

		ANSWER BOX		
1	$(3x^2y^2z)(4xyz)$	Red $12x^3y^3z$	Pink $12x^2y^2z$	Yellow $12x^3y^3z^2$
2	$(-7x^3y^5)(-9x^2y^2z)$	Brown $-63x^5y^7z$	Red $63x^5y^7z$	Green $72x^5y^7$
3	$(-6xy^3z^4)(5x^2y^4z^3)$	Green $-30x^2y^7z^7$	Pink $30x^3y^7z^7$	Orange $-30x^3y^7z^7$
4	$(-12x^3y^3z^4)(-x^2y^4z^3)$	Pink $12x^5y^7z^7$	Blue $-12x^5y^7z^7$	Violet $12x^6y^6z^7$
5	$(-xyz)(-xyz)$	Violet $x^2y^2z^2$	Green $-x^2y^2z^2$	Pink $-2xyz$
6	$(-8x^3y^3z^2)(-2x^2y^4z^3)$	Blue $16x^3y^7z^3$	Orange $-16x^5y^7z^5$	Green $16x^5y^7z^5$
7	$(-4x^3y^3)(9x^2z^3)$	Red $36x^5y^3z^3$	Blue $-36x^5y^3z^3$	Orange $-36x^3y^3z^3$
8	$(12x^2z^5)(3x^2y^3)$	Brown $36x^4y^3z^5$	Yellow $-36x^4y^3z^5$	Pink $15\ x^4y^3z^5$



Take Note:
The teacher can choose only one activity (Monomial Fish or The Root of Joy) in applying laws of exponents used in multiplication/division of monomials.



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SUB-TOPIC 2 (LC5): Use expanded form in division of monomials to derive the laws of exponents.

1. Explicitation

A. Divide the following integers.

a) $\frac{5}{5}$ b) $\frac{-3}{-3}$ c) $\frac{12}{12}$ d) $\frac{-20}{-20}$

Questions:

1. What can you say about its dividend and divisor?
2. What have you noticed in the quotients of the given integers?

B. Expand and divide $\frac{x^5}{x^3}$. Use the rule obtained in the first set of examples that any number or term divided by itself is equal to one.

Solution: $\frac{x^5}{x^3} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x}$

Questions:

1. What can you say about the quotient of $\frac{x}{x}$?
2. After dividing the common terms, how many “x” was left in the numerator?
3. Is there an “x” left in the denominator after the common terms are divided?

A.

1. The dividend and the divisor are the same integers.
2. The quotient is one.

B.

1. 1
2. 2
3. none

4. What do you think is the quotient of $\frac{x^5}{x^3}$?
5. What can you conclude when you divide terms of the same base??

Here are some examples:
Divide:

a) $\frac{a^7}{a^4}$ b) $\frac{b^6}{b^5}$ c) $\frac{-y^2}{y}$ d) $\frac{-m^9}{-m^5}$ e) $\frac{a^4b^6}{a^3b^3}$ f) $\frac{x^3y^9z^5}{-xy^5z^2}$

Solutions:

a) $\frac{a^7}{a^4} = \frac{\cancel{a}\cdot\cancel{a}\cdot\cancel{a}\cdot\cancel{a}\cdot a\cdot a\cdot a}{\cancel{a}\cdot\cancel{a}\cdot\cancel{a}\cdot\cancel{a}}$

= $\mathbf{a^3}$

b) $\frac{b^6}{b^5} = \frac{\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot b}{\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}}$

= $\mathbf{b}$

c) $\frac{-y^2}{y} = \frac{-(\cancel{y})(y)}{\cancel{y}}$

= $\mathbf{-y}$

d) $\frac{(-m)^9}{(-m)^5} = \frac{(-\cancel{m})(-\cancel{m})(-\cancel{m})(-\cancel{m})(-\cancel{m})(-m)(-m)(-m)(-m)}{(-\cancel{m})(-\cancel{m})(-\cancel{m})(-\cancel{m})(-\cancel{m})}$

= $\mathbf{m^4}$

e) $\frac{a^4b^6}{a^3b^3} = \frac{\cancel{a}\cdot\cancel{a}\cdot\cancel{a}\cdot a\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}\cdot b\cdot b\cdot b}{\cancel{a}\cdot\cancel{a}\cdot\cancel{a}\cdot\cancel{b}\cdot\cancel{b}\cdot\cancel{b}}$

= $\mathbf{ab^3}$

f) $\frac{x^2y^9z^5}{-xy^5z^2} = \frac{\cancel{x}\cdot x\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot y\cdot y\cdot y\cdot y\cdot\cancel{z}\cdot\cancel{z}\cdot z\cdot z\cdot z}{-\cancel{x}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{y}\cdot\cancel{z}\cdot\cancel{z})}$

= $\mathbf{-xy^4z^3}$

Question: From the given examples, what can you conclude about the Quotient Rule?

C. Here is another example. Find the quotient of $\frac{42x^3}{7x^5}$

Solution: $= \frac{\cancel{7}\cdot 6\cdot\cancel{x}\cdot\cancel{x}\cdot\cancel{x}}{\cancel{7}\cdot\cancel{x}\cdot\cancel{x}\cdot\cancel{x}\cdot x\cdot x}$

$= \frac{6}{x^2}$, since there are 2 "x" left in the denominator or divisor, it remains in the denominator.

Questions:

1. What will you do if the bases of the monomials you will divide have different numerical coefficients?
2. In dividing monomials, you have learned that you need to subtract the exponents of the same variables. What do you think will be the difference when the exponents of $\frac{x^3}{x^5}$ is subtracted or x^{3-5}?

4. x^2
5. Subtract the exponents of the same bases in division of monomials.

Give emphasis to the learners that the quotients were the terms left after dividing the same bases.

In dividing monomials with the same base, subtract the exponents and copy the common base.

1. Divide their numerical coefficients as you would ordinary numbers if the bases of the monomials you will divide have different numerical coefficients.

3. Since $x^{3-5} = x^{-2}$, what can you say about the exponent becoming negative?

Here are some examples: Divide the following monomials.

1) $\frac{y^2}{y^7}$ 2) $\frac{6x^2}{2x^3}$ 3) $\frac{-15m^5}{5m^8}$

Solutions:

1) $\frac{y^2}{y^7} = \frac{\cancel{y}\cdot\cancel{y}}{\cancel{y}\cdot\cancel{y}\cdot y\cdot y\cdot y\cdot y\cdot y} = \frac{1}{y^5}$

2) $\frac{6x^2}{2x^3} = \frac{\cancel{2}\cdot 3\cdot\cancel{x}\cdot\cancel{x}}{\cancel{2}\cdot x\cdot\cancel{x}\cdot\cancel{x}} = \frac{3}{x}$

3) $\frac{-15m^5}{5m^8} = \frac{-3\cdot\cancel{5}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}}{\cancel{5}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot\cancel{m}\cdot m\cdot m\cdot m} = \frac{-3}{m^3}$

Questions:

In example 1:

a) You can also say that $\frac{y^2}{y^7}$ is $y^{2-7} = y^{-5}$. What do you think is the denominator of y^{-5}?

b) What have you observed in the solution of example 1 that made y^{-5} a positive exponent?

In example 2:

a) $\frac{6}{2} = 3$, while $\frac{x^2}{x^3}$ is $x^{2-3} = x^{-1}$. So $\frac{6x^2}{2x^3} = 3x^{-1}$. What do you think is the exponent of the base 3?

b) In $3x^{-1}$, what have you observed in the solution of example 2 that made x^{-1} a positive exponent?

In example 3:

a) $\frac{-15}{5} = -3$, while $\frac{m^5}{m^8}$ is $m^{5-8} = m^{-3}$. So $\frac{-15m^5}{5m^8} = -3m^{-3}$. What do you think is the exponent of the base -3?

b) b) In $-3m^{-3}$, what have you observed in the solution of example 3 that made m^{-3} a positive exponent?

Question: What can you conclude to make the exponent of a base positive?

2. If the minuend in the exponent of the same variable is less than the subtrahend, then the difference is negative, hence it is x^{-2}.

3. $\frac{x^3}{x^5}$ in expanded form is $\frac{\cancel{x}\cdot\cancel{x}\cdot\cancel{x}}{x\cdot x\cdot x\cdot x\cdot x}$ so $\frac{x^3}{x^5} = \frac{1}{x^2}$

Give emphasis to the students that the quotients were the remaining terms left after dividing the same bases.
Take note also that polynomials have positive exponents.

In example 1:

a. y^5

b. Get the reciprocal of base in y^{-5} then change the sign of the exponent to positive. Therefore, $\frac{y^2}{y^7} = \frac{1}{y^5}$

In example 2:

a) 1

b) Get the reciprocal of the base x^{-1} then change the sign of the exponent to positive. Multiply $\frac{1}{x}$ by 3, since the exponent of 3 in $3x^{-1}$ is positive.

Therefore, $\frac{6x^2}{2x^3} = \frac{3}{x}$

2. Worked Example

In the previous examples, you have derived the two rules of exponents used in division of monomials.

Quotient Rule: $\frac{x^m}{x^n} = \mathbf{x^{m-n}}$

When dividing powers having the same base, the exponents are subtracted, where x is a real number and m and n are real numbers.

Negative Exponents: $\frac{x^m}{x^n} = \mathbf{x^{m-n}}$**, where m<n,** $\mathbf{x^{m-n}}$ **or** $\frac{1}{x^{n-m}}$

When dividing monomials with the same literal coefficient, and the exponent of the divisor is greater than the exponent in the dividend, a negative exponent can be its result. Negative exponents denote a reciprocal value. A term raised to a negative exponent is equal to one over the number raised to the positive opposite power.

Examples: Find the quotient of the following monomials.

1. $\frac{m^5n^7o^3}{m^4n^3o^3} = \mathbf{mn^4}$
2. $\frac{8x^5}{2x^2} = \mathbf{4x^3}$
3. $\frac{-21d^3e^7f^5}{7d^2e^7f^3} = \mathbf{-3df^2}$
4. $\frac{-54x^5y^8}{-9x^3y^7} = \mathbf{6x^2y}$
5. $\frac{36x^3y^3z}{-4x^2y^3} = \mathbf{-9xz}$
6. $\frac{x^2y^3}{x^5y^4} = \mathbf{\frac{1}{x^3y}}$
7. $\frac{-24a^4b^2c^5}{8a^5b^4} = -\mathbf{\frac{3c^5}{ab^2}}$
8. $\frac{72m^2n^2p^3}{-8m^2n^3p^7} = -\mathbf{\frac{9}{np^4}}$

3. Lesson Activity

Activity 4: "The Root of Joy"

Directions: Divide the given monomials. Write the letter that is paired with the question and the correct answer below to decode the "Root of Joy".

According to an Austrian American monk and author David Steindl-Rast, the root of joy is __________.

In example 3:
a) 1
b) Get the reciprocal of the base m^{-3} then change the sign of the exponent to positive. Multiply $\frac{1}{m^3}$ by -3, since the exponent of -3 in $-3m^{-3}$ is positive. Therefore, $\frac{-15m^5}{5m^8} = \frac{-3}{m^3}$.

To make a negative exponent positive, get the reciprocal of the base and change the sign of the exponent to positive.

T	C	A	D
$\frac{x^4y^6z^5}{x^6y^7z^4}$	$\frac{10x^7y^2z^5}{-5x^6y^7z^7}$	$\frac{x^6y^7z^3}{x^4y^6z^4}$	$\frac{28x^4y^4z^8}{-7x^2y^8z^8}$
R	E	G	I
$\frac{-12xy}{-6x}$	$\frac{-30x^2y^5z^3}{6x^2y^5z^3}$	$\frac{6xy}{3y}$	$\frac{27x^7y^3}{-3x^4y^3}$
B	T	O	U
$\frac{-14x^4y^8}{2x^6y^6}$	$\frac{-16x^6y^6}{2x^6y^6}$	$\frac{48x^5y^9}{-6x^4y^3}$	$\frac{-36x^4y^5z^3}{-4x^4y^7z^6}$

___	___	___	___	___	___	___	___	___
2x	2y	$\frac{x^2y}{z}$	$\frac{z}{x^2y}$	$-9x^3$	-8	$\frac{9}{y^2z^3}$	$-\frac{4x^2}{y^4}$	−5

Activity 4 Answer Key:

G	R	A	T	I	T	U	D	E
2x	2y	$\frac{x^2y}{z}$	$\frac{z}{x^2y}$	$-9x^3$	-8	$\frac{9}{y^2z^3}$	$-\frac{4x^2}{y^4}$	−5

DAY 2

SUBTOPIC 1 (LC6): Multiplication and Division of Binomials and Multinomials by Monomial.

1. **Explicitation**

A. Find the product of the following monomials.

1. $(3x^2)\ (4x^4)$
2. $(-6ab)\ (2ab)$
3. $(-9d^3e)\ (-2de^3)$
4. $(xy^2z^3)\ (x^2y^2z^2)$
5. $(5m^2n)\ (-3m^3n)$

B. Find the quotient of the following monomials.

1. $\frac{45x^3}{9x}$
2. $\frac{-42a^3b^4}{6ab}$
3. $\frac{-36x^4y^2}{-4x^2y}$
4. $\frac{56m^3n^2}{-7mn^2}$
5. $\frac{27x^2y^2}{-27x^2y^2}$

Recall rules in multiplying and dividing monomials.

A.
1. $12x^6$
2. $-12a^2b^2$
3. $18d^4e^4$
4. $x^3y^4z^5$
5. $-15m^5n^2$

B.
1. $5x^2$
2. $-7a^2b^3$
3. $9x^2y$
4. $-8m^2$
5. -1

2. **Worked Example**

A. Multiplication of Binomials and Other Polynomials by a Monomial.

1. Given: (2d) (d+5)

Questions:

1. What will you do if a monomial is multiplied to a polynomial?
2. How will you find its product?

Solution: (2d) (d+5)
= 2d(d) + 2d(5) — Distribute 2d to the binomial (d+5)
= $2d^2 + 10d$ — Apply rules in multiplying monomials.

Therefore, (2d)(d+5) = $\mathbf{2d^2 + 10d}$.

1. Distribute the monomial to the polynomial.
2. Apply distributive property. Then combine similar terms if necessary.

	2. Given: (-3x) (4x-2y+8) Solution: (-3x) (4x-2y+8) = (-3x)(4x) + (-3x)(-2y) + (-3x)(8) Distribute -3x to the trinomial (4x-2y+8). = $-12x^2$ + 6xy – 24x Apply rules in multiplying monomials. Therefore, (-3x) (4x – 2y + 8) = **$-12x^2 + 6xy - 24x$** 3. Given: $(a^2b^3c)(2ab - 4ac + 8)$ Solution: $(a^2b^3c)(2ab - 4bc + 8)$ **=** $(a^2b^3c)(2ab) + (a^2b^3c)(-4bc) + (a^2b^3c)(8)$ = $2a^3b^4c - 4a^2b^4c^2 + 8\ a^2b^3c$ Therefore, (a^2b^3c) $(2ab - 4ac + 8)$ = **$2a^3b^4c - 4a^2b^4c^2 + 8\ a^2b^3c$** **B. Division of Binomials and Multinomials by Monomial.** 1. Given: $\frac{8x^2+4x^3}{4x}$ **Question:** How do you divide a multinomial by a monomial like in the given $\frac{8x^2+4x^3}{4x}$?	1. Divide each term of the dividend to the given divisor.
	Solution: $\frac{8x^2}{4x}+\frac{4x^3}{4x}$ = **$2x+ x^2$** Each term in the dividend is divided to the given divisor. Then follow the rules in dividing monomials. 2. Given: $\frac{12a^5-9a^3+6a^2}{-3a^2}$ Solution: $\frac{12a^5}{-3a^2}-\frac{9a^3}{-3a^2}+\frac{6a^2}{-3a^2}$ = **$-4a^3+3a-2$** 3. Given: $\frac{-36x^4y^4-9x^3x^2+27x^2y^2}{9x^2y}$ Solution: $\frac{-36x^4y^4}{9x^2y}-\frac{9x^3x^2}{9x^2y}+\frac{27x^2y^2}{9x^2y}$ =**$-4x^2y^3 - xy + 3y$**	
	3. Lesson Activity **Activity 5** A. Find the product of the following polynomials. 1. (6a) (5a + 2) 2. $(-9x^2y)$ (3xy – 2x) 3. (4) (-6c – 2d) 4. $(-7c^2d^2)$ $(-4cd + 6cd^3 - 2d)$ 5. (–xyz) $(-6xy + 2x^2y^2z - 4xy^2)$	A. 1. $30a^2 + 12a$ 2. $-27x^3y^2 + 18x^3y$ 3. -24c – 8d 4. $28\ c^3d^3-42c^3d^5+14c^2d^3$ 5. $6x^2y^2z - 2x^3y^3z^2+ 4x^2y^3z$

B. Find the quotient of the following polynomials.

1. $\frac{18x^5+27x^4}{3x^2}$
2. $\frac{-10a^6b^4+25a^3b^3}{-5a^2b^3}$
3. $\frac{16m^3n^3-32m^2n^5}{4m^2n^2}$
4. $\frac{50ab^3c^4+40ab^5c^7-30a^2b^4c^3}{10ab^2c^3}$
5. $\frac{-m^5n^4+m^4n^5-m^3n^3}{-m^3n^3}$

SUBTOPIC 2 (LC6): Multiplication of Binomials using distributive property with various techniques (FOIL and Vertical Form)

1. **Explicitation**

Multiply (x+8)(x+3) using Distributive Property.

Solution:

(x+8)(x+3) — Distribute (x) to each term of (x+3) and (8) to each term of (x+3)

(x)(x) + (x)(3) + (8)(x) + 8(3)

= x^2 + 3x + 8x + 24 — Apply rules in multiplying monomials.

= x^2 + 11x + 24

Therefore, (x+8)(x+3) = **x^2 + 11x + 24**.

2. **Worked Example**

In multiplying a binomial to another binomial, you can use other ways aside the distributive property. You can use the FOIL Method. FOIL tells precisely what terms to be multiplied and in what order. It is the acronym for:

F = First terms of the 2 given binomials to be multiplied
O = Outer terms of the 2 given binomials to be multiplied
I = Inner terms of the 2 given binomials to be multiplied
L = Last terms of the 2 given binomials to be multiplied

Example 1. Multiply: (x+8)(x+3)

Solution:

F L F L
(x + 8)(x + 3)
O I I O

F: (x)(x) = **x^2**
O: (x)(3) = 3x
I: (8)(x) = 8x
(O and I:) 3x + 8x = **11x** — Since 3x and 8x are similar terms, then add these similar terms.
L: (8)(3) = **24**

Therefore, (x+8)(x+3) = **x^2 + 11x + 24**.

Example 2. Multiply: (x – 4) (x – 9).

B.
1. $6x^3 + 9x^2$
2. $2a^4b$ -5a
3. $4mn - 8n^3$
4. $5bc + 4b^3c^4 - 3ab^2$
5. $m^2n - mn^2 + 1$

Solution:

F: (x)(x) = $\mathbf{x^2}$

O: (x)(-9) = -9x

I: (-4)(x) = -4x

-9x + (-4x) = **-13x** (similar)

L: (-4)(-9) = **36**

Therefore (x – 4) (x – 9) = $\mathbf{x^2 – 13x + 36}$.

Since -9x and -4x are similar terms, then add these terms.

3: Multiply: (x – 5) (x + 7).

Solution:

F: (x)(x) = $\mathbf{x^2}$

O: (x)(7) = 7x

I: (-5)(x) = -5x

7x + (-5x) = **2x** (similar)

L: (-5)(7) = **-35**

Therefore, (x – 5) (x + 7) = $\mathbf{x^2 + 2x – 35}$.

Since 7x and -5x are similar terms, then add these terms.

Questions:

1. Does the FOIL Method also apply the distributive property?
2. How do you multiply (34)(56)?

Another way of multiplying a binomial by another binomial is by using the Vertical Method. This is quite similar to multiplying whole numbers.

Example 1: Multiply: (x+8)(x+3)

Solution:

Step 1:
$$\begin{array}{r} x + 8 \\ \underline{x + 3} \\ x^2+8x \end{array}$$
Start by multiplying (x+8) by (x).

Step 2:
$$\begin{array}{r} x + 8 \\ \underline{x + 3} \\ 3x + 24 \end{array}$$
Multiply (x+8) by (3). Make sure to align similar terms.

Step 3:
$$\begin{array}{rr} & x + 8 \\ & \underline{x + 3} \\ & x^2+8x \\ (+) & \underline{\quad 3x + 24} \\ & \mathbf{x^2 + 11x + 24} \end{array}$$
x^2 + 11x + 24 → **product**

Add the partial products.

1. Yes.
2.
$$\begin{array}{r} 34 \\ \underline{56} \\ 204 \\ \underline{170} \\ 1904 \end{array}$$

Example 2: Multiply (x – 4) (x – 9).

Solution:

$$\begin{array}{rl} & x - 4 \\ & \underline{x - 9} \\ & x^2 - 4x \\ (+) & \underline{\quad - 9x + 36} \\ & \mathbf{x^2 - 13x + 36} \end{array}$$

Example 3: Multiply (x – 5) (x + 7).

Solution:

$$\begin{array}{rl} & x - 5 \\ & \underline{x + 7} \\ & x^2 - 5x \\ (+) & \underline{\qquad 7x - 35} \\ & \mathbf{x^2 + 2x - 35} \end{array}$$

Questions:

1. Do the two methods of multiplying binomials have the same product?
2. Which method for you is easier? Why?

1. Yes.
2. Allow students to choose any method when they multiply binomials

3. Lesson Activity

Activity 6: Binomial Bingo

Directions:

1. Let the students create a 3x3 grid on a piece of paper.
2. Have them select and write a trinomial product from each box on their grid.

TRINOMIAL PRODUCT:

$x^2+6x-27$	$x^2-9x+18$	x^2-x-6	$x^2+5x-36$	$x^2-8x+16$
$x^2-7x+12$	$x^2+17x+72$	x^2-2x-8	$x^2+18x-27$	
$x^2+5x-24$	$x^2-4x-12$	$x^2-6x-56$	$x^2+18x+81$	
$x^2+3x-54$	$x^2-10x+24$	$x^2+4x-32$	$x^2-12x+36$	
$x^2+11x+18$	$x^2+2x-48$	x^2-6x+9	x^2+4x+4	

3. Write the following six binomials on the board.

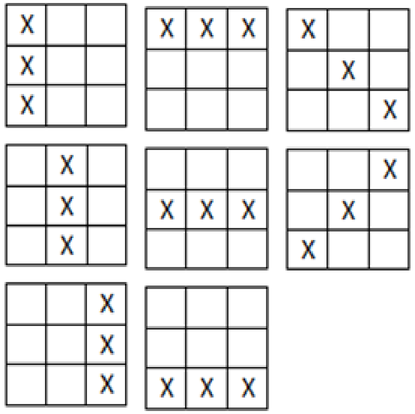
BINOMIALS TO BE MULTIPLIED:

1. (x – 3)	4. (x + 2)
2. (x + 9)	5. (x – 4)
3. (x – 6)	6. (x + 8)

Binomial Bingo can also be done by pairs.

4. Let the students roll a die twice. The number that comes out are the binomials to be multiplied.
5. Once the product is in their list, the student crosses it out.
6. The first students that completes any of the given pattern wins the Binomial Bingo.

PATTERN FOR THE BINOMIAL BINGO



Take Note: Students can use any of the given patterns to be able to win the Bingo game.

DAY 3

SUBTOPIC 3 (LC6): Division of Multinomial by a Binomial

1. Explicitation

Divide 736 by 23.

Solution:

```
      3 2
23 | 7 3 6
     6 9
       4 6
       4 6
         0
```

Therefore, 736 ÷ 23 = **32**.

To check if the quotient is correct multiply 23 by 32.

```
   23
   32
   46
  69
 7 3 6
```

Inform the students that if the obtained quotient and the product of the divisor and dividend are equal, then the obtained quotient must be correct.

2. Worked Example

Division of a multinomial by a binomial is similar to division of whole numbers,

Example 1: Divide $\frac{x^2+7x+12}{x+3}$

Solution:

Step 1:

$$\begin{array}{r} x \\ x+3\,\overline{\big)\,x^2+7x+12} \end{array}$$

Divide the first term of the dividend by the first term of the divisor. Write the quotient above the second term in the dividend.

Step 2:

$$\begin{array}{r} x \\ x+3\,\overline{\big)\,x^2+7x+12} \\ \underline{-\;x^2+3x} \end{array}$$

Multiply the quotient by the divisor

Step 3:

$$\begin{array}{r} x \\ x+3\,\overline{\big)\,x^2+7x+12} \\ \underline{-\;x^2+3x} \\ 4x+12 \end{array}$$

Subtract the product obtained from the first 2 terms in the dividend. Then bring down the next term in the dividend.

Step 4:

$$\begin{array}{r} x+4 \\ x+3\,\overline{\big)\,x^2+7x+12} \\ \underline{-\;x^2+3x} \\ 4x+12 \end{array}$$

Divide the first term of the new dividend by the first term of the divisor.

Step 5:

$$\begin{array}{r} x+4 \\ x+3\,\overline{\big)\,x^2+7x+12} \\ \underline{-\;x^2+3x} \\ 4x+12 \\ 4x+12 \end{array}$$

Multiply the obtained quotient by the divisor.

Step 6:

$$\begin{array}{r} x+4 \\ x+3\,\overline{\big)\,x^2+7x+12} \\ \underline{-\;x^2+3x} \\ 4x+12 \\ \underline{-\;4x+12} \\ 0 \end{array}$$

Subtract the product obtained in step 5 from the new dividend.

Step 7:

$(x+4)(x+3) = x^2 + 7x + 12$

Check if the quotient is correct by multiplying the quotient and the divisor.

Therefore, $\frac{x^2+7x+12}{x+3} = \mathbf{x+4}$

Example 2: Divide $\frac{x^2-13x+42}{x-7}$

Solution:

$$\begin{array}{r|l} & x - 6 \\ \hline x-7 & x^2-13x+42 \\ & \underline{x^2 - 7x} \\ & \quad -6x+42 \\ & \quad \underline{-6x+42} \\ & \qquad 0 \end{array}$$

Check: $(x - 6)(x - 7) = x^2 - 13x + 42$

Therefore, $\frac{x^2-13x+42}{x-7}$ = $\mathbf{x - 6}$.

Example 3: Divide $\frac{x^2-5x-6}{x-6}$

Solution:

$$\begin{array}{r|l} & x + 1 \\ \hline x-6 & x^2-5x-6 \\ & \underline{x^2 - 6x} \\ & \quad x-6 \\ & \quad \underline{x-6} \\ & \quad 0 \end{array}$$

Check: $(x+1)(x-6) = x^2 - 5x - 6$

Therefore, $\frac{x^2-5x-6}{x-6}$ = $\mathbf{x + 1}$.

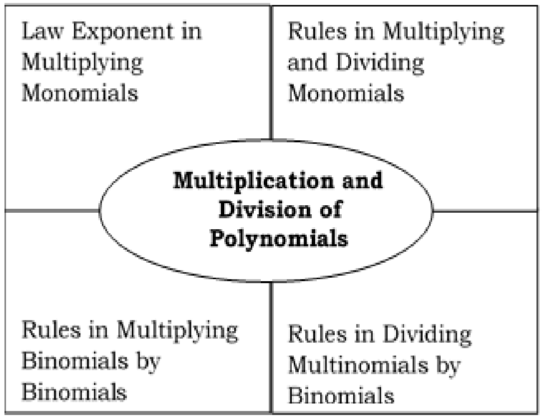
3. **Lesson Activity**

Activity 7: Find the quotient of the following polynomials.

1. $\frac{x^2+5x+6}{x+2}$
2. $\frac{x^2-2x+1}{x-1}$
3. $\frac{x^2+3x-4}{x+4}$
4. $\frac{x^2+11x+10}{x+1}$
5. $\frac{x^2+8x-20}{x-2}$

Activity 7 Answer Key:

1. x + 3
2. x – 1
3. x -1
4. x + 10
5. x + 10

D. Making Generalizations	**DAY 4** **1. Learners' Takeaways** Use the Frayer Diagram to show what you learned.  **2. Reflection on Learning** Are there any challenges or misconceptions you encountered while studying the lesson? What are those?	The teacher will ask the learners of the important lessons they've learned.

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Perform the indicated operation. 1) $(2n^2)(8n^5)$ 14) $(12ab^3)(-2a - 5a^2b^2 + 3a^3b)$ 2) $(6k^5)(-11k^2)$ 15) $(4m^3n)(-8m - 5n + 6)$ 3) $(-u^3)(3v^3)$ 16) $\frac{-72x^3y^2-48x^2y}{-8x^2y}$ 4) $(9x^4y^3z^4)(2xy^6z)$ 17) $\frac{a^8b^6+a^5b^3}{a^3b^3}$ 5) $(-12mn^4)(7m^4n)$ 18) $\frac{x^8y^4z^2+x^4y^5z^3-x^2y^2z^2}{x^2y^2z^2}$	**Formative Assessment Answer Keys:** 1) $16n^7$ 2) $-66k^7$ 3) $-3u^3v^3$ 4) $18x^5y^9z^5$ 5) $-84m^5n^5$ 6) $-6d^3ef^6$ 7) $\frac{5x^2z}{y^2}$ 8) $\frac{7b^3}{a^3}$ 9) 1 10) $\frac{-9x^2}{z}$

6) $\frac{-24d^5e^8f^9}{4d^2e^7f^3}$

7) $\frac{45x^4y^5z^2}{9x^2y^7z}$

8) $\frac{-63a^3b^{11}}{-9a^6b^8}$

9) $\frac{d^3e^2f^6}{d^3e^2f^6}$

10) $\frac{-45x^4y^7z^9}{5x^2y^7z^{10}}$

11) $(-11a^2b^2c)(2abc - 5ab^2c)$

12) $(9j^3k^4l^2)(-3j^2k^3l + 4jk)$

13) $(8x)(2xy + 5y - 4)$

19) $\frac{-32b^5c^4-40b^3c^6-8b^6c^3}{-8b^3c^2}$

20) $\frac{12x^3y-18x^5y^2+15x^4y^4}{3x^2y}$

21) $(x+6)(x+8)$

22) $(x - 1)(x-7)$

23) $(x - 8)(x+ 5)$

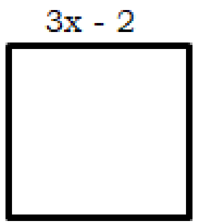
24) $\frac{x^2+10x+21}{x+3}$

25) $\frac{x^2+9x-36}{x-3}$

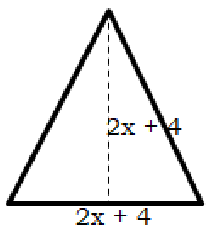
2. Homework (Optional)

Solve the following problems.

1. What is the area of a square whose side is $3x - 2$?



2. The height of a triangle is $2x + 4$ and its base is equal to its height. Find its area.



11) $-22a^3b^3c+55a^3b^4c^2$
12) $-27j^5k^7l^3 + 36j^4k^5l^2$
13) $16x^2y + 40xy - 32x$
14) $-24a^2b^3-60a^3b^5+36a^4b^4$
15) $-32m^4n-20m^3n^2+24m^3n$
16) $9xy + 6$
17) $a^5b^3 + a^2$
18) $x^6y^2 + x^2y^3z - 1$
19) $4b^2c^2 + 5c^4 + b^3c$
20) $4x - 6x^3y + 5x^2y^3$
21) $x^2 + 14x + 48$
22) $x^2 - 8x + 7$
23) $x^2 - 3x - 40$
24) $x + 7$
25) $x + 12$

Homework Answer Keys:

1. Given: $s = 3x - 2$

Solution:

$A = s^2$

$A = (3x - 2)(3x - 2)$

$A = 9x^2 - 12x + 4$

Therefore, the area is $9x^2 - 12x + 4$ square units.

2. Given:

base = $2x+4$

height = $2x+4$

$A = \frac{bh}{2}$

$A = \frac{(2x+4)(2x+4)}{2}$

$A = \frac{4x^2+16x+16}{2}$

$A = 2x^2+8x+2$

Therefore, the area is $2x^2+8x+2$ square units.

<table>
<tr><td rowspan="5">B. Teacher's Remarks</td><td>Note observations on any of the following areas:</td><td>Effective Practices</td><td>Problems Encountered</td><td rowspan="5">The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement, and other related stuff.

Teachers may also suggest ways to improve the different activities explored/lesson exemplar.</td></tr>
<tr><td>strategies explored</td><td></td><td></td></tr>
<tr><td>materials used</td><td></td><td></td></tr>
<tr><td>learner engagement/ interaction</td><td></td><td></td></tr>
<tr><td>others</td><td></td><td></td></tr>
<tr><td>C. Teacher's Reflection</td><td colspan="3">Reflection guide or prompt can be on:
• <u>principles behind the teaching</u>
What principles and beliefs informed my lesson?
Why did I teach the lesson the way I did?

• <u>students</u>
What roles did my students play in my lesson?
What did my students learn? How did they learn?

• <u>ways forward</u>
What could I have done differently?
What can I explore in the next lesson?</td><td>Teacher's reflection in every lesson conducted/facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.</td></tr>
</table>