SECONDARY
JHS

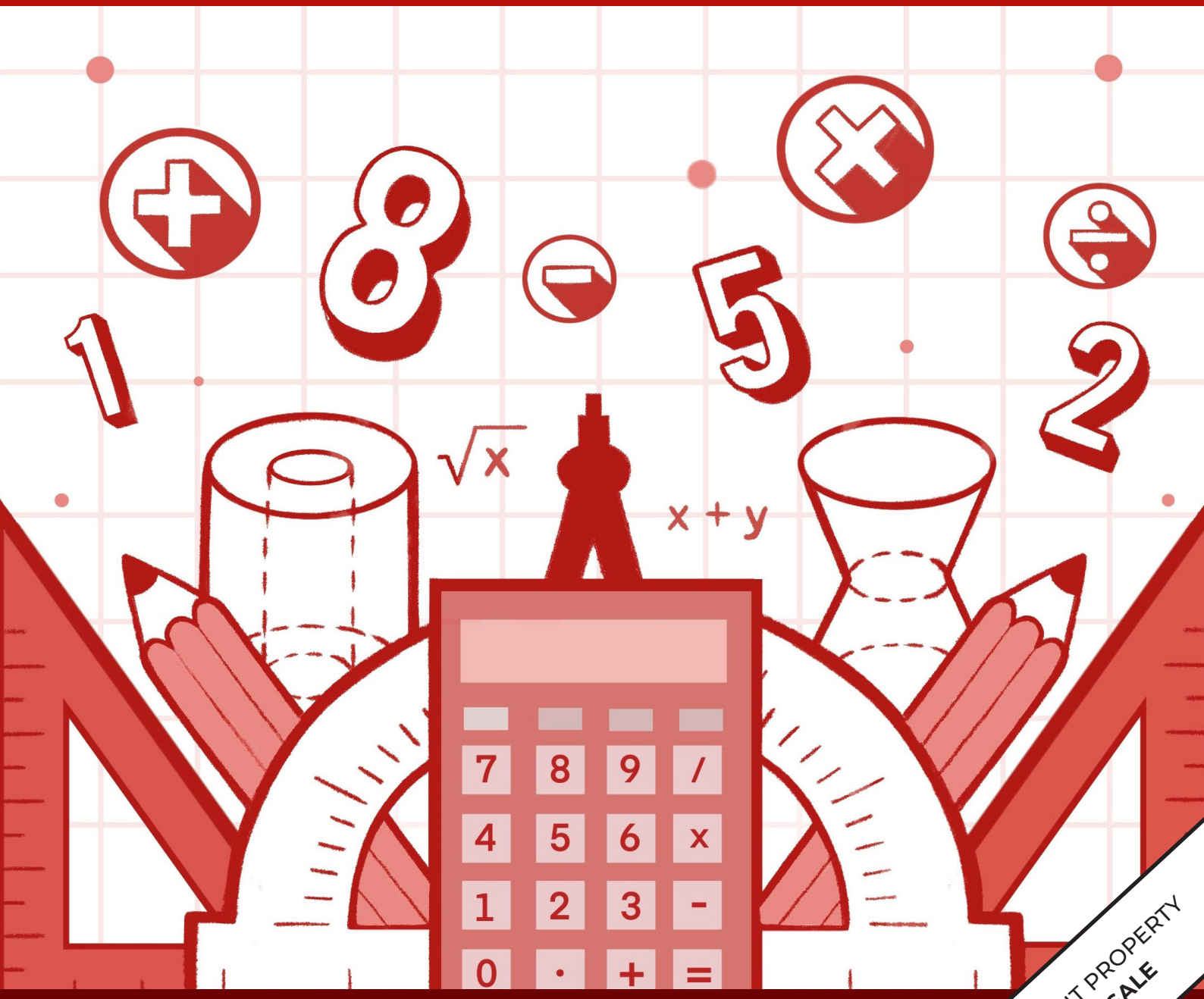
DepED DEPARTMENT OF EDUCATION

ALS Alternative Learning System LIFELONG LEARNING

LEARNING STRAND 3
MATHEMATICAL & PROBLEM-SOLVING SKILLS

SESSION GUIDES FOR MODULE 2:
PLAYING WITH MISSING X'S

ALS Accreditation and Equivalency Program: Junior High School



UNESCO United Nations Educational, Scientific and Cultural Organization

KOICA Korea International Cooperation Agency

LEARNING STRAND 3

SESSION GUIDES

Alternative Learning System - Accreditation and Equivalency (ALS-A&E)

JUNIOR HIGH SCHOOL: MATHEMATICAL AND PROBLEM-SOLVING SKILLS

SESSION GUIDES FOR MODULE 2 (PLAYING WITH MISSING X'S)

ALS Accreditation and Equivalency Program: Junior High School
Learning Strand 3: Mathematical and Problem-Solving Skills
Session Guides for Module 2 (Playing with Missing X's)

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User's Guide

For the ALS Teacher/Instructional Managers/Learning Facilitator:

Welcome to the session guide of this module entitled Playing with Missing X's under Learning Strand 3 Math and Problem-Solving Skills of the ALS K to 12 Basic Education Curriculum (BEC).

The module and the session guides were collaboratively designed, developed and reviewed by select DepEd field officials and teachers from formal school and ALS, and private institutions to assist in helping the ALS learners meet the standards set by the ALS K to 12 Basic Education Curriculum (BEC) while overcoming their personal, social, and economic constraints in attending ALS learning interventions.

This learning resource hopes to engage the learners in guided and independent learning activities at their own pace and time. Furthermore, this also aims to help learners acquire the needed 21st Century skills while taking into consideration their needs and circumstances.

As an ALS Teacher/Instructional Manager/Learning Facilitator, you are expected to orient the learners on how to use this module. You also need to keep track of the learners' progress while allowing them to manage their learning. Moreover, you are expected to encourage and assist the learners as they do the tasks included in the module.

TO COMBINE OR NOT TO COMBINE
Session Guide No. 1

I. **Duration of Session:** 3 hours

II. **Key Understandings to Be Developed**
- Polynomials and Its Classifications
- Addition and Subtraction of Polynomials

III. **Learning Objectives**
1. Define polynomials.
2. Classify polynomial algebraic expressions according to degree and number of terms.
3. Add and subtract polynomials.

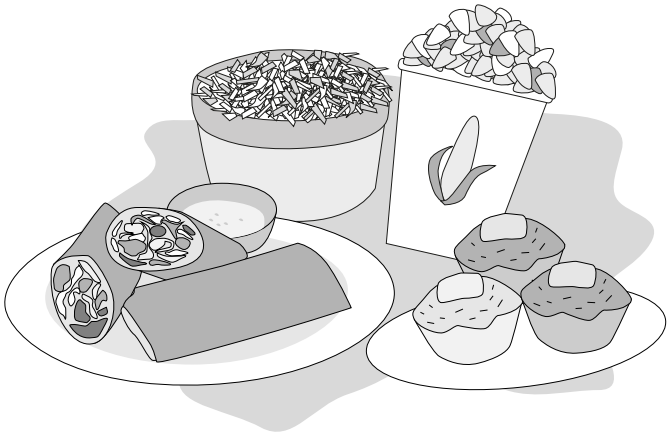
IV. **Resources** (none)

V. **Activity**
1. Ask the learners to imagine themselves as canteen crew members. As crew members, they must record items that their branch has consumed in a month.

   The activity is designed to develop students' skills on sorting and identifying objects that are exactly alike as a stepping-stone in identifying like algebraic terms represented by variables in polynomial expressions.

   See the tables on the next page.

Me: Side dishes

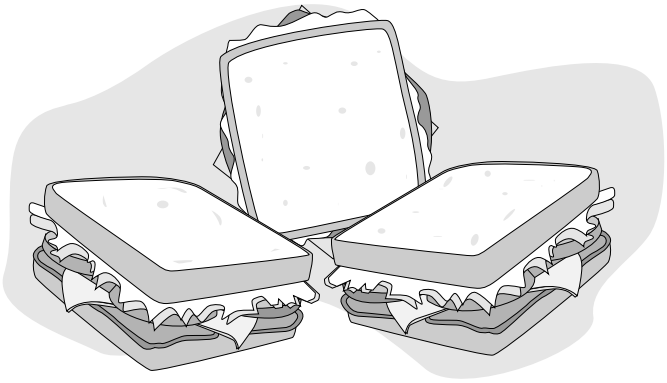


WEEK 1	WEEK 2	WEEK 3	WEEK 4
9 lumpiang toge	3 coleslaw	8 puto	4 coleslaw
4 coleslaw	7 corn	12 lumpiang toge	8 puto
5 corn	11 lumpiang toge		7 lumpiang toge
	2 puto		

Week 1 serves as an example.

	Lumpiang Toge consumed in each week	Coleslaw consumed in each week	Corn consumed in each week	Puto consumed in each week
WEEK 1	9 lumpiang toge	4 coleslaw	5 corn	
WEEK 2				
WEEK 3				
WEEK 4				
TOTAL				

Ivy: Sandwiches



WEEK 1	WEEK 2	WEEK 3	WEEK 4
4 egg sandwich	3 tuna sandwich	4 egg-cheese sandwich	5 egg sandwich
5 tuna sandwich	1 egg-cheese sandwich	2 tuna sandwich	1 tuna-cheese sandwich
2 egg-cheese sandwich	2 tuna-cheese sandwich	1 egg sandwich	
		2 tuna-cheese sandwich	

Week 1 serves as an example.

	Egg Sandwich consumed in each week	Tuna Sandwich consumed in each week	Tune-cheese Sandwich consumed in each week	Egg-cheese sandwich consumed in each week
WEEK 1	4 egg sandwiches	5 tuna sandwiches		2 egg-cheese sandwiches
WEEK 2				
WEEK 3				
WEEK 4				
TOTAL				

2. Ask the learners to prepare a visual aid using available materials and present it in class (or write on the board).

VI. Analysis

1. Based on the activity, ask this question: *How did you come up with your final output?*

   - Help and guide the learners as they discuss the activity.

2. Ask the question: *Where else can we do sorting of common items?*

   - Learners may have experiences at work, at home, etc. where they did sort, so allow them to share their knowledge.
   - If learners cannot share anything, assist them by giving some examples, like buying groceries in the market where same items have the same price and where multiplication is used to make it easier to compute for total price.

3. Explain to the learners that like buying items in the market, there can be groups of algebraic expressions in mathematics that can be added or subtracted.
   - Recall what coefficient, variable, and exponents are. Then, emphasize that only expressions with the same variable and exponents, called **like terms,** can be combined by addition or subtraction.

     A **variable** is a letter that represents a number whose value may vary or change. It also represents the unknown value in the equation.

   - Recall that addition and subtraction of like terms is done by combining the coefficient (constant) and copying the variable. **Unlike terms** cannot be combined and should be left as is.

     We can replace each item in the table of side dishes with variables using different letters.

We let

x = price of one lumpiang toge w = price of one corn
y = price of one coleslaw z = price of one puto

WEEK 1	$9x$	$+ 4y$	$+ 5w$		This represents the expense for Week 1
WEEK 2	$11x$	$+ 3y$	$+ 7w$	$+ 2z$	This represents the expense for Week 2
WEEK 3	$12x$			$+8z$	This represents the expense for Week 3
WEEK 4	$7x$	$+ 4y$		$+ 8z$	This represents the expense for Week 4
TOTAL	$39x$	$+ 11y$	$+ 12w$	$+ 18z$	This represents the total expense for the month

We use variables to represent the amount of side dishes consumed.

Week 1 expenses: $9x + 4y + 5w$
Week 2 expenses: $11x + 3y + 7w + 2z$
Week 3 expenses: $12x + 8z$
Week 4 expenses: $7x + 4y + 8z$

For the table of sandwiches, represent egg sandwich and egg-cheese sandwich using:

e = amount of each egg sandwich
e^2 = amount of each egg-cheese sandwich

Represent tuna sandwich and tuna-cheese sandwich using:

t = amount of each tuna sandwich
t^2 = amount of each tuna-cheese sandwich

WEEK 1	$4e$	$+ 5t$		$+ 2e^2$	This represents the expense for Week 1
WEEK 2		$+ 3t$	$+ 2t^2$	$+ e^2$	This represents the expense for Week 2
WEEK 3	e	$+ 2t$	$+ 2t^2$	$+ 4e^2$	This represents the expense for Week 3
WEEK 4	$5e$		$+ t^2$		This represents the expense for Week 4
TOTAL	$39e$	$+ 10t$	$+ 5t^2$	$+ 7e^2$	This represents the total expense for the month

We use variables to represent the amount of sandwiches consumed.

Week 1 expenses: $4e + 5t + 2e^2$
Week 2 expenses: $3t + 2t^2 + e^2$
Week 3 expenses: $e + 2t + 2t^2 + 4e^2$
Week 4 expenses: $5e + t^2$

- Give examples from the pre-assessment test.

VII. Abstraction/Generalization

1. Present the definition and examples.

A polynomial is the sum or difference of algebraic expressions (consisting of constants and variables). Common variables used are x and y. Each algebraic expression in a polynomial is called a term. Some examples of terms are $2x$, $4y3$, and -7.

2. **Polynomial:**

- Use the polynomial expressions learners came up with in the activity as examples.
- Emphasize that each algebraic expression separated by plus "+" or minus "–" signs are called **terms.**
- Terms in a polynomial expression may use different variables.

- Mention the different types of polynomial expressions based on the number of terms, then give additional examples for each.

  Types of polynomials based on the number of terms.

  Examples:

  $-2x$ has exactly one term. This is called a **monomial**

  4 has exactly one term which is a constant. This is also a **monomial.**

  $x + 1$ has exactly two terms, x and 1. This is called a **binomial.**

  $x^2 + 3x - 4$ has exactly three terms, x^2, $3x$ and -4. This is called a **trinomial.**

  $x^3 - 3x^2 + 6x - 15$ has four terms. Polynomials with four or more terms are generally referred to as **multinomial**

  Degree of a term

  Examples:

  The degree of $-2x^2 y^2$ is 4 because the variable x has exponent 2 and variable y has exponent 2 as well. By adding them, we get $2 + 2 = 4$.

  The degree of 5 is 0 because 5 can be written as $5x^0$ with exponent 0.

  The degree of $-5z$ is 1 because $-5z$ is the same as $-5z^1$ with exponent 1.

  The degree of x^2yz^3 is 6 because the variable x has exponent 2, the variable y has exponent 1 and the variable z has exponent 3. By adding them, we get $2 + 1 + 3 = 6$.

Degree of a polynomial

Examples:

POLYNOMIAL	DEGREE OF THE TERM	DEGREE OF THE POLYNOMIAL (highest among the degrees in the 2nd column)
$2x + 3y^2$	$2x$ has a degree of 1 $3y^2$ has a degree of 2	2
$6x^4 - 3xy^2 + 2y^3$	$6x^4$ has a degree of 4 $-3xy^2$ has a degree of 3 $2y^3$ has a degree of 3	4
$-10x^4y^2 + x^2y^2 + 3xy^3$	x^2y^2 has a degree of 4 $3xy^3$ has a degree of 4 $-10x^4y^2$ has a degree of 6	6

3. **Addition and subtraction of polynomials:**
   - Show the process of adding and subtracting polynomial expression. Remind the learners to identify like terms correctly.
   - Emphasize the importance of aligning like terms vertically before performing the operation.
   - Recall addition and subtraction of positive and negative numbers. Use money to explain integers where positive numbers are money earned (e.g., salary or allowance) and negative numbers are money borrowed (e.g., debt or loan).

   Example: $1 + 5 \rightarrow$ *You have 1 peso and you were given another 5 pesos, how much money do you have now?*

   $-3 + -4 \rightarrow$ You already borrowed 3 pesos and you borrowed 4 pesos again, how much is your debt?

Examples:

Add: $(3x^2 + 4x + 1) + (2x^2 - 2x + 5)$

	$3 + 2 = 5$	$4 + (-2) = 2$	$1 + 5 = 6$
	$3x^2$	$+ 4x$	$+ 1$
	$2x^2$	$- 2x$	$+ 5$
Result	$5x^2$	$+ 2x$	$+ 6$

Subtract:

	$7 - 4 = 3$	$(-3) - 5 = -8$
	$7x$	-3
	$4x$	$+5$
Result	$3x$	-8

VIII. Application

1. Ask the learners to define polynomial and classify its types according to the number of terms and degree.
2. Have them add and subtract polynomials.
3. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments which aim to develop their skills on:

   a. identifying like terms with similar variables and exponents.
   b. classifying polynomials according to the number of terms.
   c. determining the degree of a polynomial.
   d. applying operations involved in a given polynomial expression.

4. Process the activity by allowing learners to explain their answers.

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of polynomial expressions to real life.

LET'S DISTRIBUTE AND SHARE
Session Guide No. 2

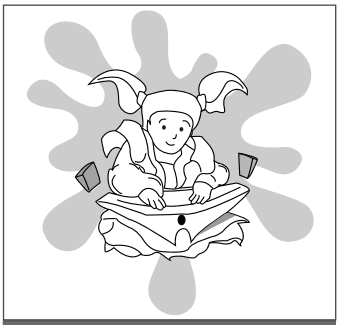
I. **Duration of Session:** 3 hours

II. **Key Understandings to be Developed**
- Multiplication and Division of Polynomials

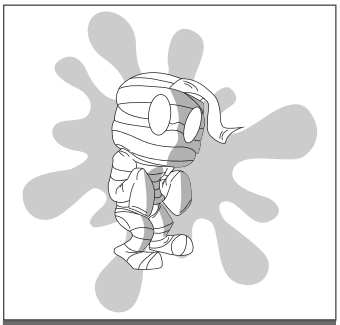
III. **Learning Objectives**
1. Perform operations on polynomials.
2. Multiply and divide polynomials.
3. Factor polynomials using common monomial factor.

IV. **Resources** (none)

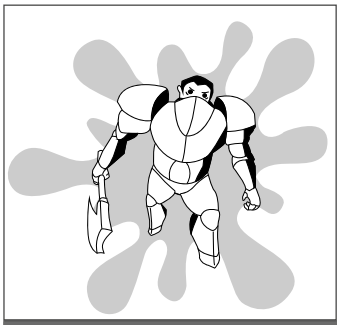
V. **Activity**
1. Ask the learners to imagine themselves playing a simple hero card game. In a simple card game, they must be familiar with the heroes/players and the effects of their items. *The activity uses simple card game as platform to capture their interest and show that mathematics is used heavily in such applications.*



CHRISTINE	
HP	12
DEFENSE	5
ATTACK	8
MANA	9
SS DAMAGE: 25	

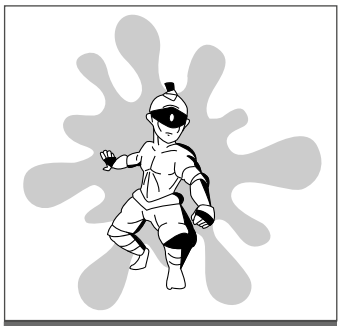


RUBEN	
HP	8
DEFENSE	9
ATTACK	15
MANA	13
SS DAMAGE: 30	



ANDRES	
HP	7
DEFENSE	11
ATTACK	17
MANA	12
SS DAMAGE: 27	

ROSE	
HP	10
DEFENSE	6
ATTACK	9
MANA	7
SS DAMAGE: 24	



DANIEL	
HP	9
DEFENSE	9
ATTACK	13
MANA	11
SS DAMAGE: 35	

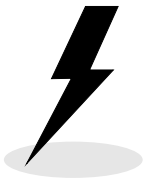
A. Read the effect of each item to a specific hero statistic. Calculate the resulting stat for all heroes when the item is applied. The first table serves as an example.

MULTIPLIES MANA BY 3		
	CHRISTINE:	9 × 3 = 27
	RUBEN:	13 × 3 = 39
	ANDRES:	12 × 3 = 36
	ROSE:	7 × 3 = 21
MEDICINE KIT	DANIEL:	11 × 3 = 33

MULTIPLIES HP BY 5		
	CHRISTINE:	
	RUBEN:	
	ANDRES:	
	ROSE:	
ENERGY BOOSTER	DANIEL:	

Continuation on the next page.

MULTIPLIES DEFENSE BY 6		
	CHRISTINE:	
	RUBEN:	
	ANDRES:	
	ROSE:	
SHIELD AND ARMOR	DANIEL:	

MULTIPLIES ATTACK BY 4		
	CHRISTINE:	
	RUBEN:	
	ANDRES:	
	ROSE:	
LIGHTNING BOLT	DANIEL:	

MULTIPLIES ATTACK BY 3		
	CHRISTINE:	
	RUBEN:	
	ANDRES:	
	ROSE:	
GOLD STAR ENABLER	DANIEL:	

B. How much damage will an enemy equally get from each hero when the hero uses his or her super skill (use SS damage)? Examples are given.

HEROES	NUMBER OF ENEMIES	SS DAMAGE ENEMY RECEIVES
Example: Ruben Rose	3 enemies	Ruben = 30 ÷ 3 = 10 Rose = 24 ÷ 3 = 8
1. Ruben	6 enemies	
2. Andres	9 enemies	
3. Rose	3 enemies	
4. Daniel	7 enemies	
5. Christine	5 enemies	

2. Ask learners to show their answers and explain how they came up with these answers.

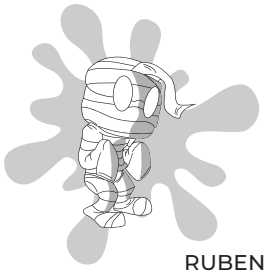
VI. Analysis

1. Based on the activity, ask the following questions: *How did the items work based on what you did in the activity? Which hero will be affected by using the items?*

ITEM	EFFECT	HERO	MANA	RESULT
 MEDICINE KIT	MULTIPLIES MANA BY 3	CHRISTINE:	9	27
		RUBEN:	13	39
		ANDRES:	12	36
		ROSE:	7	21
		DANIEL:	11	33

- Explain that using items increases the game stats of each hero. In other words, the effect of the item is **distributed to all** heroes. Each item targets a specific stat of the hero. This specific stat is then multiplied by the number indicated in the item card.

  "How were you able to compute the damage caused by each hero in the activity?" "What value did you use to divide the amount of Super Skill used by each of the heroes?"



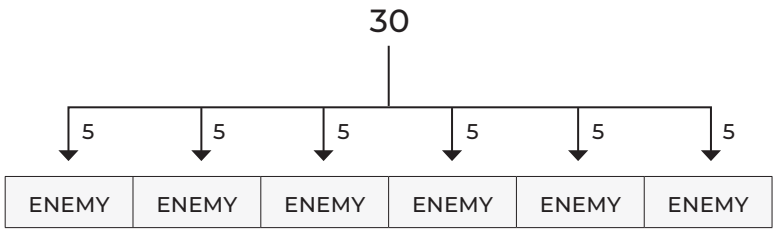
RUBEN

SS: 30

$$\frac{30}{6}$$

↓

5 damage per enemy



- Explain that the amount of damage caused by two or more heroes to each enemy is computed by dividing the damage done by each hero (**one by one**) with the number of enemies.

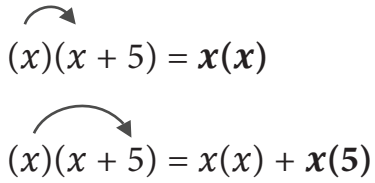
2. Emphasize the use of the word distribution. Shift to mathematics by explaining that expressions also use the process of distribution when performing multiplication between polynomials.
3. Explain that dividing a polynomial expression by a monomial also follows the same process of distribution.

VII. Abstraction/Generalization

1. Present the definition of terms and examples.
2. **Multiplying polynomials:**
   - Show a problem involving multiplication of a monomial and a binomial.

     Example:
     $x(x + 5)$

   - Ask the question: *How can we simplify this given multiplication following the process you used in the activity?* Demonstrate the distributive method by multiplying a monomial and a polynomial.
   - Use arrows to show **distribution** to help in visualizing which term is being multiplied to the monomial one at a time.

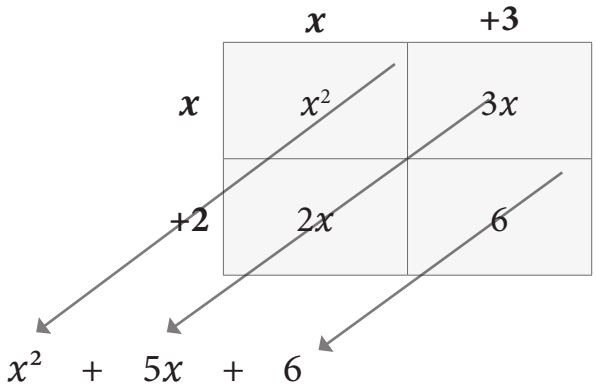


     Recall multiplication of algebraic expressions. Use item 9 from the pre-assessment as an example.

   - Point out similar terms that can be combined by encircling them to get the final product.
   - Proceed to multiplying a binomial by another binomial or a trinomial.

     Example:
     $(x + 3)(x + 2)$

- Demonstrate the distributive method again to show that it may become confusing when there are many terms involved.
- Introduce the box method. Show how to set up the box method correctly by putting one polynomial horizontally and the other vertically. Emphasize that each term must have its own allotted space.



- Show learners how to multiply pairs of terms one at a time by putting the correct answer on the box across both terms.
- Emphasize care in putting the proper sign for each product and combining like terms to get the final answer.
- Give other examples and ask the learners to try answering them on the board.

3. **Dividing polynomials by a monomial:**
   - Show a problem involving division of a binomial by a number.

     Example:
     $(6x + 8) \div 2$

   - Ask the question: *How can we simplify this given division following the process you used in the activity?*
   - Demonstrate distribution of the divisor to each term in the dividend. Then, proceed to division.

First, divide each term of the polynomial in the dividend by the divisor. In other words, both terms will share the same divisor.

$$\frac{6x+8}{2} \rightarrow \frac{6x}{2} + \frac{8}{2}$$

Then, simplify the quotient of each term.

$$\frac{6x}{2} = 3x \qquad \text{and} \qquad \frac{8}{2} = 4$$

Lastly, combine the terms by using the appropriate operation.

$$\frac{6x+8}{2} = 3x + 4$$

- Briefly discuss common monomial factor as a factoring technique.

  Example:
  $(21x^4 - 15x^3 - 9x^2 + 30x) \div 3x$

  First, find the greatest common factor (GCF) of the coefficients and variables (with exponents) in the dividend.

  The coefficients are 21, −15, −9, and 30. Regardless of the sign, the GCF of these numbers is 3.

  The variables (with exponents) are x^4, x^3, x^2, and x. The GCF is x.

  Combine the GCF of coefficients and variables to get the **common monomial factor.**

  The common monomial factor is $3x$.

  Factor out the common monomial factor from the dividend. That is, we divide each term of the dividend by the common monomial factor. Observe that it is the first step in the previous example.

$$21x^4 - 15x^3 - 9x^2 + 30x = 3x(7x^3 - 5x^2 - 3x + 10)$$

Lastly, divide the simplified factors by the divisor.

Here, we cancel out $3x$ because it appears in both numerator and denominator.

$$\frac{21x^4 - 15x^3 - 9x^2 + 30x}{3x} = \frac{\cancel{3x}(7x^3 - 5x^2 - 3x + 10)}{\cancel{3x}} = 7x^3 - 5x^2 - 3x + 10$$

- Review division of algebraic expressions using item 11 in the pre-assessment test.
- Recall that in dividing algebraic expressions with the same variables, we cancel the exponents.
- Emphasize care in following the rule of signs when dividing algebraic expressions.

4. **Dividing polynomials by another polynomial:**
   - Show a problem involving division of trinomial by a binomial.

     Example. Divide $(x^2 + 9x + 20)$ by $(x + 5)$.

   - Demonstrate the long division method.

Write the polynomial in descending order (from highest degree to lowest degree). Start the long division process in this form:	$x + 5 \overline{)\ x^2 + 9x + 20}$
Divide the first term of the dividend by the first term of the divisor. In this example, divide x^2 by x.	$\begin{array}{r} x \\ x + 5 \overline{)\ x^2 + 9x + 20} \end{array}$
Multiply (or distribute) the answer obtained in the previous step by the divisor. In this example, multiply x and x+5.	$\begin{array}{r} x \\ x + 5 \overline{)\ x^2 + 9x + 20} \\ x^2 + 5x \end{array}$
Subtract the product then bring down the next term.	$\begin{array}{r} x \\ x + 5 \overline{)\ x^2 + 9x + 20} \\ x^2 + 5x \\ \hline 4x + 20 \end{array}$
Divide the first term of the result from the previous step to the first term of the divisor. In this example, divide $4x$ by x.	$\begin{array}{r} x + 4 \\ x + 5 \overline{)\ x^2 + 9x + 20} \\ x^2 + 5x \\ \hline 4x + 20 \end{array}$
Multiply (or distribute) the answer obtained in the previous step by the divisor. In this example, multiply 4 and x + 5.	$\begin{array}{r} x + 4 \\ x + 5 \overline{)\ x^2 + 9x + 20} \\ x^2 + 5x \\ \hline 4x + 20 \\ 4x + 20 \end{array}$
Subtract the product. Observe that there are no terms left to bring down. The difference is the remainder. In this example, the remainder is 0.	$\begin{array}{r} x + 4 \\ x + 5 \overline{)\ x^2 + 9x + 20} \\ x^2 + 5x \\ \hline 4x + 20 \\ 4x + 20 \\ \hline 0 \end{array}$

The quotient when $(x^2 + 9x + 20)$ is divided by $x + 5$ is $x + 4$.

- Emphasize care in writing the dividend in descending order.
- Emphasize the importance of placeholder for a term with zero coefficient.
- Remind students to follow the rule of signs when dividing expressions.

VIII. Application

1. Ask the learners to discuss how to multiply and divide polynomials.
2. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments which aim to further develop skills on

   a. multiplying polynomials by distribution
   b. setting up the box method to multiply polynomials
   c. dividing polynomials by a given monomial
   d. using long division method to divide polynomials

3. Process the activity by allowing the learners to explain their answers.

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of multiplication and division of polynomials to real life.

FRACTIONS OF YOUR X
Session Guide No. 3

I. **Duration of Session:** 3 hours

II. **Key Understandings to Be Developed**
- Rational algebraic expression
- Addition and subtraction of rational algebraic expression

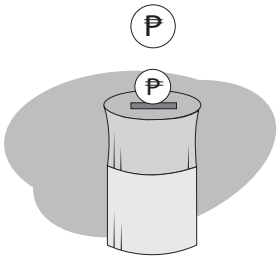
III. **Learning Objectives**
1. Illustrate rational algebraic expression.
2. Perform addition of rational algebraic expressions (both with the same and different denominators).
3. Perform subtraction of rational algebraic expressions (both with the same and different denominators).
4. Represent real-life situations using rational algebraic expressions (amount of work done per unit and speed per unit)

IV. **Resources** (none)

V. **Activity**
1. Ask the learners to imagine going around the barangay/community and think of scenarios like people depositing money in a bank, fishermen catching fishes, people painting a wall, runners competing in a race, etc.

   The activity focuses on identifying what value is unknown in a problem and representing it as variable (using the letter x). It also focuses on properly translating sentences into mathematical expressions to correctly set-up the solution to the problem.

   Represent each scenario with a mathematical expression using variables for the missing values. Item (a) serves as an example.



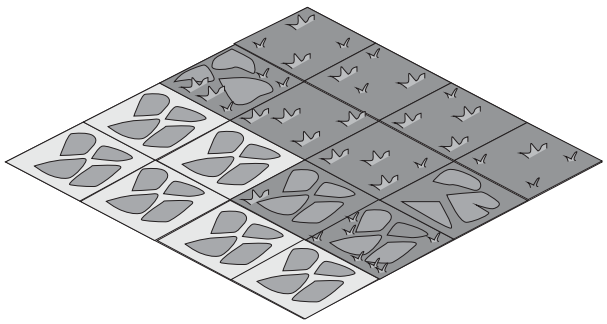
a. Your savings in a coin bank is increased by 10 and you shared it with your sister equally.

Let x = amount of savings
Mathematical Expression: $\frac{x + 10}{2}$

b. Five vendors shared the remaining fishes from the supplier after being subtracted with 7 pieces.

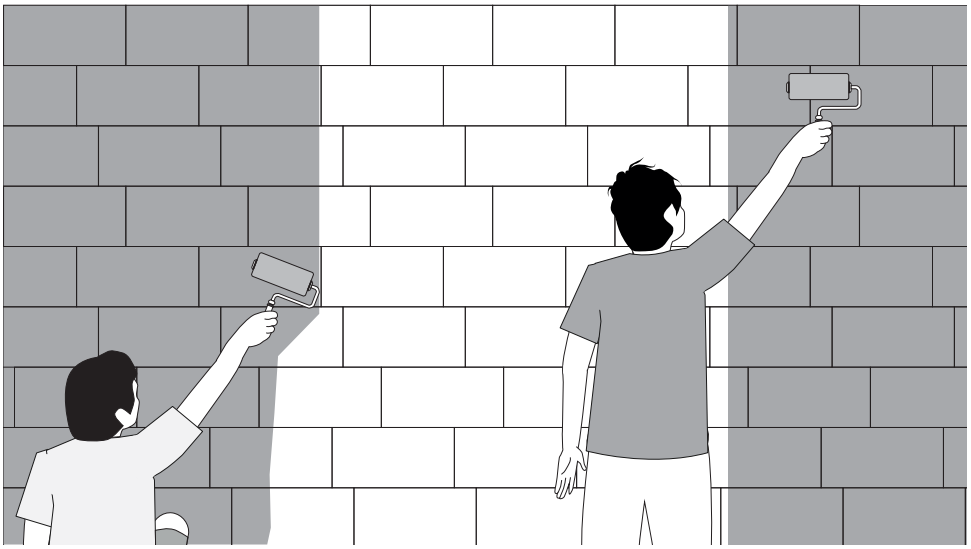
Let x = _____
Mathematical Expression: _____

c. Divide the area of a square land into 4 farmers.



Let x = _____
Mathematical Expression: _____

d. Pipoy finished painting a fifth of the wall, while Tikboy painted a third of the same wall. Combine the work they have finished together.



Let x = _____

Mathematical Expression: _____

e. Coach Rivo computed the difference of the speed of two runners. The first runner ran 1 meter more than the other. The first ran for 2 minutes while the second ran for 5 minutes. $\text{speed} = \frac{\text{distance}}{\text{time}}$

Let x = _____

Mathematical Expression: _____

2. Guide the students in translating the phrases into mathematical expressions.
3. Ask the learners to explain their answers in each item.

VI. Analysis

1. Based on the activity, ask the following questions: *What do you notice with the answers in the activity? What do these variables with fractions mean?*

    - The answers in the activity use variable x in conjunction with fractions. This means that we are taking fractional parts or dividing an unknown value.

2. Use the answers in the activity, where variables and fractions are combined, to introduce the concept of rational expressions.

VII. Abstraction/Generalization

1. Present the definition of terms and examples.
2. **Rational expressions:**
    - Define rational expressions as fractions that have polynomials in either numerator or denominator. Use visual aids for definitions.

These **numerators** are all polynomials

$$\frac{x+10}{2} \qquad \frac{x-7}{5} \qquad \frac{x^2}{4}$$

These **denominators** are all polynomials

- Emphasize that the denominator cannot be zero for rational expressions, otherwise, the expression is indeterminate.
- Learners may ask to clarify if expressions with just whole numbers as numerators or denominators are still rational expressions The answer is yes, as whole numbers are still considered monomials.
- Getting the lowest term of a fraction still holds for rational expression using cancellation of numbers with common factors or variables.

  Examples: $\frac{5x}{5} = x$ $\frac{6x}{3x} = 2$ $\frac{3x}{9} = \frac{x}{3}$

- Clarify that cancellation of numbers cannot be done if there is addition or subtraction between terms:

  Example: $\frac{4x - 12}{6x}$ 12 *and* $6x$ *cannot be cancelled out because* 12 *is part of the polynomial* $(4x - 12)$

3. **Addition/subtraction of similar rational algebraic expressions:**
   - Follow the process done in adding/subtracting fractions by adding/subtracting numerators and copying the denominators.

     Examples:

$$\frac{x+2}{x} + \frac{3x-5}{x} = \frac{x+2+3x-5}{x} = \frac{x+3x+2+(-5)}{x} = \frac{4x-3}{x}$$

$$\frac{5x+6}{x-2} - \frac{2x+1}{x-2} = \frac{(5x+6)-(2x+1)}{x-2} = \frac{5x-2x+6-1}{x-2} = \frac{3x+5}{x-2}$$

   - Remind learners to write answers in lowest terms whenever possible.

4. **Addition/subtraction of dissimilar rational algebraic expressions:**
   - Demonstrate the step-by-step process of transforming dissimilar rational expressions (as discussed in the Learner's Module) into similar rational expression using their least common denominator (LCD).

     Examples:

$$\frac{5}{2} + \frac{2x-6}{3x} = \frac{3x(5)}{6x} + \frac{2(2x-6)}{6x} = \frac{15x+4x-12}{6x} = \frac{19x-12}{6x}$$

   - Remind learners to write answers in lowest terms whenever possible.

VIII. Application

1. Ask the learners to define rational algebraic expressions.
2. Ask them how to add/subtract rational algebraic expressions.
3. Present the *Sharpening Your Skills* and *Treading the Road to Mastery* assessments which aim to further their skills on

   a. adding and subtracting similar rational expressions
   b. transforming rational expressions that are dissimilar fractions to similar fractions by determining the least common denominator (LCD) and applying the indicated operation (addition and/or subtraction) between rational expressions
   c. representing real-life situations using rational expressions

IX. Concluding Activity

End the session by reviewing the key understandings developed and relating the concepts of rational algebraic expressions in real-life scenario.

PRE-ASSESSMENT

PAGE 2

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

LESSON 1: TO COMBINE OR NOT TO COMBINE

TRYING THIS OUT

PAGE 5

ACTIVITY

	Lumpiang Toge consumed in each week	Coleslaw consumed in each week	Corn consumed in each week	Puto consumed in each week
WEEK 1	9 lumpiang toge	4 coleslaw	5 corn	
WEEK 2	11 lumpiang toge	3 coleslaw	7 corn	2 puto
WEEK 3	12 lumpiang toge			8 puto
WEEK 4	7 lumpiang toge	4 coleslaw		8 puto
TOTAL	39 lumpiang toge	11 coleslaw	12 corn	18 puto

Number of side dishes consumed

	Egg Sandwich consumed in each week	Tuna Sandwich consumed in each week	Tuna-cheese Sandwich consumed in each week	Egg-cheese Sandwich consumed in each week
WEEK 1	4 egg sandwiches	5 tuna sandwiches		2 egg-cheese sandwiches
WEEK 2		3 tuna sandwiches	2 tuna-cheese sandwiches	1 egg-cheese sandwich

WEEK 3	1 egg sandwich	2 tuna sandwiches	2 tuna-cheese sandwiches	4 egg-cheese sandwiches
WEEK 4	5 egg sandwich		1 tuna-cheese sandwiches	
TOTAL	10 egg sandwich	10 tuna sandwiches	5 tuna-cheese sandwiches	7 egg-cheese sandwiches

Number of sandwiches consumed

	Fried Chicken consumed in each week	Palabok consumed in each week	Boiled Egg consumed in each week	Pancit consumed in each week	Tortang Isda consumed in each week
WEEK 1	4 fried chickens	2 palabok		5 pancit	
WEEK 2	2 fried chickens	1 palabok	2 boiled eggs	3 pancit	7 tortang isda
WEEK 3	6 fried chickens	3 palabok	1 boiled eggs		2 tortang isda
WEEK 4	3 fried chickens	2 palabok	4 boiled eggs	4 pancit	1 tortang isda
TOTAL	15 fried chickens	8 palabok	7 boiled eggs	12 pancit	10 tortang isda

Number of meals consumed

	Gulaman consumed in each week	Soya Milk consumed in each week	Juice consumed in each week	Water consumed in each week
WEEK 1	5 gulamans	4 soya milks	3 juices	
WEEK 2	8 gulamans	7 soya milks		3 water
WEEK 3		11 soya milks	6 juices	
WEEK 4	6 gulamans	2 soya milks	13 juices	5 water
TOTAL	19 gulamans	24 soya milks	22 juices	8 water

Number of meals consumed

SHARPENING YOUR SKILLS

ACTIVITY I

PAGE 20

1. $-3x$, $7x$, $-5x$, $11x$
2. $4y$, $-y$, $3y$, $-15y$
3. $8z$, $-12z$, $17z$
4. $12w$, $-9w$, $21w$
5. $-3x^2$, $27x^2$
6. $-2y^2$, $13y^2$, $6y^2$
7. $6z^2$, $-19z^2$, $23z^2$
8. $2x^3$, $-6x^3$, $10x^3$
9. $-4y^3$, $2y^3$, $-2y^3$
10. $13z^3$, $-2z^3$

ACTIVITY II

PAGE 20

1. monomial
2. monomial
3. binomial
4. trinomial
5. binomial
6. multinomial
7. monomial
8. monomial
9. trinomial
10. binomial

ACTIVITY III

PAGE 21

1. 2
2. 3
3. 8
4. 3
5. 3
6. 4
7. 12
8. 0

ACTIVITY IV

PAGE 21

1. $5x + 3$
2. $-3x - 3$
3. $3x - 5$
4. $13x - 19$
5. $9x - 9$
6. $9x^2 + 3x - 1$
7. $x - 8$
8. $3x^3 + 7x^2 + 20x$

TREADING THE ROAD TO MASTERY

PAGE 22

1. $x3 + 3x^2 + 3x + 5$
2. $-x^4 + 8x^2 + 7x + 10$
3. $3x^7 - 2x^5 - 17x^4 + 3x^3 + 5x^2 - 5x$
4. $x^3 - x^2 - 11x + 12$
5. $-3x^3 + x^2 + 7x + 20$

LESSON 2: LET'S DISTRIBUTE AND SHARE

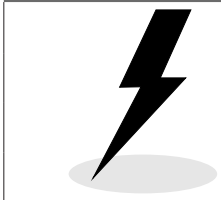
TRYING THIS OUT

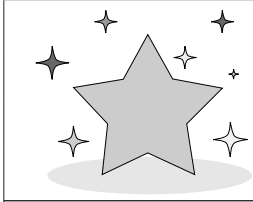
PAGE 24

ITEM	EFFECT	HERO	MANA	RESULT
	MULTIPLIES MANA BY 3	CHRISTINE:	9	27
		RUBEN:	13	39
		ANDRES:	12	36
		ROSE:	7	21
MEDICINE KIT		DANIEL:	11	33

ITEM	EFFECT	HERO	DEF	RESULT
	MULTIPLIES DEF BY 6	CHRISTINE:	5	30
		RUBEN:	9	54
		ANDRES:	11	66
		ROSE:	6	36
SHIELD & ARMOR		DANIEL:	9	54

ITEM	EFFECT	HERO	HP	RESULT
	MULTIPLIES HP BY 5	CHRISTINE:	12	60
		RUBEN:	8	40
		ANDRES:	7	35
		ROSE:	10	50
ENERGY BOOSTER		DANIEL:	9	45

ITEM	EFFECT	HERO	ATK	RESULT
	**MULTIPLIES ATK BY 4**	CHRISTINE:	8	32
		RUBEN:	15	60
		ANDRES:	17	68
		ROSE:	9	36
LIGHTNING BOLT		DANIEL:	13	42

ITEM	EFFECT	HERO	ATK	RESULT
	**MULTIPLIES ATK BY 3**	CHRISTINE:	8	24
		RUBEN:	15	45
		ANDRES:	17	51
		ROSE:	9	27
GOLD STAR ENABLER		DANIEL:	13	39

HEROES	NUMBER OF ENEMIES	SS DAMAGE ENEMY RECEIVES
Example: Ruben Rose	3 enemies	Ruben - 10 Rose - 8
1. Ruben	6 enemies	30 ÷ 6 = 5
2. Andres	9 enemies	27 ÷ 9 = 3
3. Rose	3 enemies	24 ÷ 3 = 8
4. Daniel	7 enemies	35 ÷ 7 = 5
5. Christine	5 enemies	25 ÷ 5 = 5

SHARPENING YOUR SKILLS

PAGE 41

ACTIVITY I

1. $x^3 - 2x^2$
2. $-6x^3 + 10x^2 - 14x$
3. $8y^4 + 20y^2 - 12y$
4. $x^3 + 2x^2 - 7x - 14$
5. $3z^3 + 7z^2 - 5z - 9$

ACTIVITY II

1. $x^2 - 3x$
2. $5x^4 + 7x^3 - 6x^2$
3. $x^6 - 5x^2 + 2x$
4. $3x^5 + 4x^4 - 5x^2 + 2$
5. $2x^2 - x - 4$

TREADING THE ROAD TO MASTERY

ACTIVITY I

PAGE 42

1. $x^3 - 5x^2 + x - 5$
2. $6y^2 + 17y - 14$
3. $-6x^5 - 24x^4 - 56x^3 - 8x^2 - 18x$
4. $-6x^3 - 37x^2 - 34x - 66$
5. $5x^4 + 16x^3 - x^2 + 36$

ACTIVITY II

PAGE 43

1. $x + 2$
2. $x + 1$
3. $2x + 7 + \frac{8}{x-2}$
4. $x^2 - 2x - 4 - \frac{7}{x-2}$
5. $-2x^2 + 6x - 15 + \frac{35}{x+3}$

LESSON 3: FRACTIONS OF YOUR X

TRYING THIS OUT

PAGE 45

a. If x = amount of savings in the bank, then we have $\frac{x+10}{2}$.

b. If x = number of fishes, then we have $\frac{x-7}{5}$.

c. If x = length of one side of a square, then its area is x^2. Thus, we have $\frac{x^2}{4}$.

d. If x = amount of wall to be painted, then Popoy's work done is $\frac{x}{5}$ and Tikboy's work done is $\frac{x}{3}$. Thus, $\frac{x}{5} + \frac{x}{3} = \frac{8}{15}x$ is the work done together.

e. If x = distance ran by the second runner and $x + 1$ = distance ran by the first runner, then

speed of the first runner = $\frac{x+1}{2}$ and speed of the second runner = $\frac{x}{5}$.

Hence, the difference in their speeds is represented by $\frac{x+1}{2} - \frac{x}{5} = \frac{3x+5}{10}$.

SHARPENING YOUR SKILLS

PAGE 53

ACTIVITY I

1. $\frac{x+6}{2x}$
2. $\frac{5x+27}{x-2}$
3. $\frac{2x^3-5x^2+7x}{5x+8}$
4. $\frac{-y^2+4}{3y-4}$
5. $\frac{10x^2-3x+7}{5x^2+7x}$

ACTIVITY II

1. $\frac{17x + 13}{21x}$
2. $\frac{-6x - 29}{10}$
3. $\frac{22x + 24}{6x^2 + 8x}$
4. $\frac{-5x^3 + 22x^2 - 2x - 4}{6x^2 - 13x + 2}$
5. $\frac{17x^2 - 9x - 5}{10x}$

TREADING THE ROAD TO MASTERY

PAGE 54

1. $\frac{x^2}{4} - \frac{x^2}{5} = \frac{x^2}{20}$

   Thus, the difference between the lands Mang Abdul gave his children is $\frac{x^2}{20}$

2. $\frac{x}{2} + \frac{x - 5}{3} = \frac{5x - 10}{6}$

   Totoy and Nene have $\frac{5x - 10}{6}$ of the original amount.

3. $\frac{x^2}{4}x - \frac{1}{4}x = \frac{13}{20}x$

   Apo Lilia and Manang Banak have finished $\frac{13}{20}$ of the fabric.

4. $\frac{x}{3} - \frac{x + 4}{5} = \frac{2x - 12}{15}$

   The difference between Pedro and Jose's speeds is $\frac{2x - 12}{15}$.

REACH THE TOP

PAGE 61

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

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