

Mathematics

Quarter 1- Module 4: Solving Problems Involving Quadratic Equations and Rational Algebraic Equations



AIRs - LM

MATHEMATICS 9
Alternative Delivery Mode
Quarter 1 - Module 4: Solving Problems Involving Quadratic Equations and Rational Algebraic Equations
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Development Team of the Module

Author: Cleofe M. Lacbao
Editor: SDO La Union, Learning Resource Quality Assurance Team
Content Reviewers: Philip R. Navarette and Jocelyn G. Lopez
Language Reviewers: Teresa A. Villanueva and Cleofe M. Lacbao
Illustrator: Ernesto F. Ramos Jr. and Christian Bautista
Design and Layout: Dana Kate J. Pulido

Management Team:

Atty. Donato D. Balderas Jr.
Schools Division Superintendent
Vivian Luz S. Pagatpatan, Ph D
Assistant Schools Division Superintendent
German E. Flora, Ph D, *CID Chief*
Virgilio C. Boado, Ph D, *EPS in Charge of LRMS*
Erlinda M. Dela Peña, Ph D, *EPS in Charge of Mathematics*
Michael Jason D. Morales, *PDO II*
Claire P. Toluyen, *Librarian II*

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Department of Education – SDO La Union

Office Address: Flores St. Catbangan, San Fernando City, La Union
Telefax: 072 – 205 – 0046
Email Address: launion@deped.gov.ph

Mathematics

Quarter 1- Module 4: Solving Problems Involving Quadratic Equations and Rational Algebraic Equations

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

Your goal in this module is to see the application of quadratic equations in real-life situation. There are many ways to apply your understanding in Quadratic Equations and Rational Algebraic Equations with the application of mathematics principles and concepts. In this module, you will learn how to solve word problems involving Quadratic Equations and Rational Algebraic Equations. You will discover the significance of having mastery on the various methods of solving quadratic equations as applied in real life situations.

After going through this module, you are expected to attain the following objectives:

Learning Competency

- Solve problems involving quadratic equations and rational algebraic equations. **(M9AL-1e-1)**

Subtasks

1. Enumerate the different ways of solving quadratic equations.
2. Differentiate quadratic equations from rational algebraic equations.
3. Translate a verbal phrase into mathematical phrase.
4. Apply the steps in solving word problems involving quadratic equations and rational algebraic equations.

Before you start doing the activities in this lesson, find out how much you already know about this module. Answer the pretest on the next page in a separate sheet of paper. Write the letter that corresponds to the best answer.

Pre-Assessment

Directions: Read and analyze the following questions carefully. Choose the letter of the correct answer and write it on your answer sheets.

1. What is the product of the roots of the quadratic equation $x^2 + 5x + 4 = 0$?
 - A. -4
 - B. $-5/4$
 - C. 4
 - D. $5/4$
2. What is the other solution of the quadratic equation $6x^2 + 11x + 3 = 0$ is $-1/3$?
 - A. $-3/2$
 - B. $3/2$
 - C. $-2/3$
 - D. $2/3$

3. What are the roots of $3x^2 + 10x + 8 = 0$?
 - A. $\{-4/3, -8\}$
 - B. $\{4/3, 2\}$
 - C. $\{4/3, 8\}$
 - D. $\{-4/3, -2\}$
4. If the sum and product of roots of a quadratic equation are -5 and 4 respectively, what is the quadratic equation?
 - A. $x^2 + 4x + 5 = 0$
 - B. $x^2 - 4x - 5 = 0$
 - C. $x^2 + 5x + 4 = 0$
 - D. $x^2 - 5x + 4 = 0$
5. Which of the following is **NOT** a quadratic equation?
 - A. $x(x+7) = 2$
 - B. $x + 3x^2 = 0$
 - C. $x^3 + 6x + 9 = 0$
 - D. $2x - 4 = x^2$
6. Which of the following is the correct translation of the statement, "the sum of two consecutive integers is 13"?
 - A. $x + 2x = 13$
 - B. $x + (x+1) = 13$
 - C. $x(x+1) = 13$
 - D. $x + (2x+1) = 13$
7. Which of the following quadratic equations maybe solved appropriately by factoring?
 - A. $x^2 + 3x - 5 = 0$
 - B. $x^2 + 5x + 4 = 0$
 - C. $2x^2 + 7 = 0$
 - D. $x^2 + 4x + 5 = 0$
8. What is the sum of the roots of the quadratic equation $2x^2 + 3x + 1 = 0$?
 - A. $-3/2$
 - B. $3/2$
 - C. $1/3$
 - D. $-1/3$
9. What are the roots of the quadratic equation $5x^2 + 15x - 20 = 0$?
 - A. 1 and 4
 - B. 1 and -4
 - C. 4 and 5
 - D. 5 and -4
10. Which of the following quadratic equations can be solved easily by extracting square roots?
 - A. $6s^2 - 9s + 12 = 0$
 - B. $m^2 - 81 = 0$
 - C. $5y^2 + 7y - 51 = 0$
 - D. $t^2 - 3t - 10 = 0$

11. The length of a garden is 9 m longer than its width and the area is 36m^2 . How long is the garden?
- A. 12
 - B. 6
 - C. 9
 - D. 3
12. The sum of a number and its reciprocal is $10/3$. What are the two numbers?
- A. $-3/5$ or $-5/3$
 - B. $3/5$ or $5/3$
 - C. 3 or $1/3$
 - D. -3 or $-1/3$
13. If one root of the rational algebraic equation $x + \frac{8}{x-2} = 1 + \frac{4x}{x-2}$ is 5, what is the other root?
- A. -2
 - B. 5
 - C. 2
 - D. 7
14. The denominator of a fraction is 2 more than the numerator. If one is subtracted from both numerator and denominator, the resulting fraction has a value of $\frac{1}{2}$. Which of the following equations best represent the given statement?
- A. $\frac{x-1}{x+1} = \frac{1}{2}$
 - B. $\frac{x}{x-1} = \frac{1}{2}$
 - C. $\frac{x+1}{x-1} = \frac{1}{2}$
 - D. $\frac{x-2}{x-1} = \frac{1}{2}$
15. The product of two consecutive odd integers is 63. If one of the integers is -7, what is the other integer?
- A. -7
 - B. 7
 - C. -9
 - D. 9

How was your performance in the pre-assessment? Were you able to answer all the problems? Did you find difficulties in answering them? Are there questions familiar to you? Keep yourself on track as we learned new concepts in this module.

In this module, the lesson starts with assessing your prior knowledge of the diverse mathematics principles and concepts studied previously and enhancing your skills in performing mathematical operations. All these skills and knowledge may help you in applying the solutions and processes to real-life problems involving Quadratic Equations and Rational Algebraic Equations.



Jumpstart

Were you able to apply correctly the different methods, mathematical concepts or principles in finding the solutions of the quadratic equations? Why is there a need to perform and master the different methods and perform such mathematical tasks? You will find this out as you go through this module.

Activity 1: Where's My Match

Directions: This activity will enable you to translate each verbal sentence into a mathematical equation and vice versa. Represent each of the following algebraically by finding its match on the box below.

Let w represent the width of a rectangle. The length is 7 more than the width.

- Four times the length is 49
- One-fourth of the length equals 49
- 7 cm less than twice the width is 49
- 7 times the sum of the width and 4 cm is 49
- Twice the width plus twice the length is 49
- The product of the width and the length is equal to 49

w



$4w-2=49$

$4w+2=49$

$w(w+7)=49$

$2w-7=49$

$4w+7=49$

$\frac{w+4}{2} = 49$

$7(w+4)=49$

$\frac{w+7}{4}=49$

$\frac{2w+4}{2}=4$

$4(w+7)=49$

$2w+2(w+7)=49$

Process Questions:

- How do you classify the mathematical equations?
- How will you describe a quadratic equation? A rational equation?
- What are the common terms used to represent the “=” sign?
- Use the phrase “is equal” to in your own sentence.

Activity 2: Translate Me!

Directions: Use variable x to represent the unknown quantity, write an equation from the given information.

- The product of two consecutive integers is 33.
- If a number is added to its reciprocal the sum is $25/12$.
- The length of a rectangle is 3cm more than twice the width. The area is 152 square cm.
- Jeffrey is 5 years older than Fe. Find their present ages if the product of Jeffrey’s age 4 years from now and Fe’s age 5 years ago is 51.
- The sum of twice a number and seven is 15.

Were you able to represent each situation by an equation? If YES, then you are ready to perform the next activity.



Discover

Quadratic equations refer to **equations** with at least one squared variable, with the most standard form being $ax^2 + bx + c = 0$.

A **rational equation** is a type of **equation** where it involves at least one **rational** expression, a fancy name for a fraction. Rational expressions typically contain a variable in the denominator. For this reason, we will take care to ensure that the denominator is not 0 by making note of restrictions and checking our solutions. The best approach to address this type of equation is to eliminate all the denominators using the idea of LCD (least common denominator).

To systematically solve a given problem, some steps are to be considered.

Step 1: **READ** the problem. To solve a verbal problem, read the problem carefully and explore what the problem is about. Identify the given, know what is asked, and choose a variable to represent the unknown.

Step 2: **PLAN** the solution. Create an equation from the statement in the problem.

Choose the method that best applies to the problem.

- | | |
|-------------------------------|-----------------------------|
| a. Extracting the square root | c. Completing square method |
| b. Factoring | d. Quadratic formula |

Step 3: **SOLVE** the problem. Remember the rules and properties in simplifying.

Step 4: **EXAMINE** the solution. Use the solution of the equation to write a statement that settles the problem. Check that the conclusion agrees with the problem situation, otherwise you have to rework the problem.

Let us try to solve word problems applying the concepts of quadratic and rational algebraic equations. This example will help us integrate problem solving in real life situations.

Example 1: The sum of two numbers is 5 and their product is -84. Find these two numbers.

Solution 1:

Step 1: Let $x =$ be the number

Remember that if the sum and the product of the roots of a quadratic equation are given, the roots can be determined. This can be done by inspection or by using the equation $x^2 + \frac{-b}{a}x + \frac{c}{a} = 0$ where $\frac{-b}{a}$ is the sum of the roots and $\frac{c}{a}$ is the product.

Step 2: Equation: $x^2 - 5x - 84 = 0$

Step 3: Solution: Let us try using the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{5 \pm \sqrt{25 + 336}}{2} = \frac{5 \pm \sqrt{361}}{2} = \frac{5 \pm 19}{2} =$$

$$x_1 = \frac{24}{2} = 12$$

$$x_2 = \frac{-14}{2} = -7$$

Step 4: Since the given are sum and product, we can use the formula

$x_1 + x_2 =$ sum of roots

$x_1 \cdot x_2 =$ product of roots

When $x = 12$

$x = -7$

$$12 + (-7) \stackrel{?}{=} 5$$

$$12 \cdot (-7) \stackrel{?}{=} -84$$

$$\begin{array}{c} \checkmark \\ 5=5 \end{array}$$

$$\begin{array}{c} \checkmark \\ -84 = -84 \end{array}$$

The solutions are **$x=12$** and **$= -7$**

Solution 2:

Another method of finding the roots is to use the equation $x^2 + \frac{b}{a}x + \frac{c}{a} = 0$.
 Let $-\frac{b}{a} = 5$ and $\frac{c}{a} = -84$. Then substitute these values in the equation.

$$x^2 + \frac{-b}{a}x + \frac{c}{a} = 0 \quad \longrightarrow \quad x^2 - (5)x + (-84) = 0$$

$$\longrightarrow \quad x^2 - 5x - 84 = 0$$

Solve the resulting equation $x^2 - 12x + 27 = 0$ using any of the methods of solving quadratic equation. Try factoring.

$$x^2 - 5x - 84 = 0$$

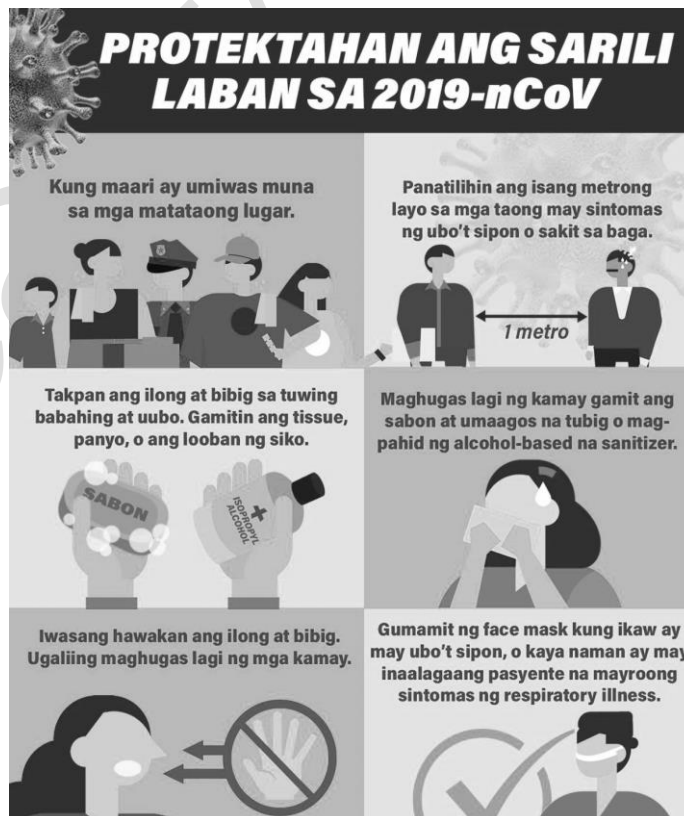
$$(x + 7)(x - 12) = 0$$

$$x + 7 = 0 \quad \left| \quad x - 12 = 0 \right.$$

$$x = -7 \quad \left| \quad x = 12 \right.$$

With the obtained roots of the quadratic equation, the numbers are -7 and 12, respectively.

Example 2. The Local Government of La Union wants to place a new rectangular billboard to inform and give awareness to the residents on how to protect themselves from the spread of COVID19. Suppose the length of the billboard to be placed is 6m longer than its width and the area is 112 m². What will be the length and the width of the billboard?



Source:
 "ProtectiveMeasures7",
 Supreme Court of the
 Philippines, accessed
 September 24, 2020,
<https://sc.judiciary.gov.ph/protectivemeasures7/>.

Step 1: Let x = represent the width of the billboard in meters
 $x + 6$ = represent the length.
 Since the area of the billboard is 112 m^2 , then $(x)(x+6) = 112$.

Step 2: The equation $(x)(x+4) = 96$ is a quadratic equation that can be written in the form $ax^2 + bx + c = 0$.

$$\begin{array}{ll} (x)(x+6) = 112 & \longrightarrow x^2 + 6x = 112 \\ & \longrightarrow x^2 + 6x - 112 = 0 \end{array}$$

Step 3: Solve the resulting equation (by factoring)

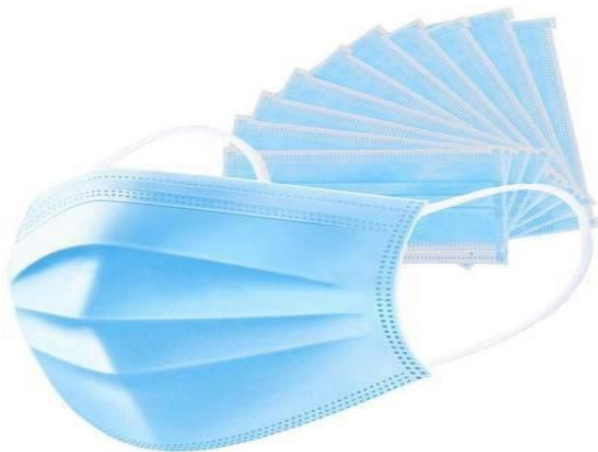
$$\begin{array}{l} x^2 + 6x - 112 = 0 \\ (x - 8)(x + 14) = 0 \\ x - 8 = 0 \qquad \left| \begin{array}{l} x + 14 = 0 \\ x = -14 \end{array} \right. \\ x = 8 \end{array}$$

Step 4: Substitute $x = 8$ $x^2 + 6x - 96 = 0$
 $8^2 + 4(8) - 96 = 0$
 $64 + 32 - 96 = 0$
 \checkmark
 $0 = 0$

The equation $x^2 + 6x - 112 = 0$ has two solutions: $x = 8$ or $x = -14$.

However, we only consider the positive value of x since the situation involves measure of length. Hence, the width of the billboard is 8m and its length is 14m.

Example 3. Kelly is a workaholic mom and she finds it so timely to sell face mask around the city. She charges 20 pesos per face mask for 60 face masks sold. If Kelly decreases her price for each face mask, 5 more face masks would be sold. What is the price that will maximize her revenue?



Source: "Disposablefacemask",
 accessed September 24,2020,
<https://www.flipkart.com/celwark-kn95-n95-kn95-v-5-layer-reusable-mask-respirator-valve-disposal-use-throw-good-health/p/itm5490e3d5b37f0>

Step 1: Let n denotes the decrease in price
 $20 - n$ is the maximize price
 Revenue $R = \text{price} \times \text{no. of face masks sold}$

Step 2:

$$\begin{aligned} R &= (20 - n)(60 + 5n) \\ R &= 1200 - 60n + 100n - 5n^2 \\ R &= -5n^2 + 40n + 1200 \end{aligned}$$

Step 3: Now we have to maximize R .
 Above is a quadratic equation in n with coefficient of n^2 , its maximum value will be

$$\begin{aligned} -\frac{b}{2a} &= -\frac{40}{2(-5)} \\ -\frac{b}{2a} &= 4 \end{aligned}$$

Thus, 4 pesos is the decrease in price. At $n = 4$,

$$\begin{aligned} R &= -5n^2 + 40n + 1200 \\ &= -5(4)^2 + 40(4) + 1200 \\ &= -5(16) + 160 + 1200 \\ &= -80 + 160 + 1200 \\ R &= 1280 \end{aligned}$$

Step 4:

$$\begin{aligned} R &= -5n^2 + 40n + 1200 \\ 1280 &= -5(4)^2 + 40(4) + 1200 \\ 1280 &= -5(16) + 160 + 1200 \\ 1280 &= -80 + 1360 \\ 1280 &= 1280 \end{aligned}$$

Since $20 - n = \text{maximize price}$, $20 - 4 = 16$

Therefore, the price that will maximize her revenue is 16 pesos

Example 4. The sum of a number and its reciprocal is $\frac{29}{10}$. Find the number.

Step 1: Translating the words in the problem:

Let $x = \text{the number}$, then $\frac{1}{x} = \text{it's reciprocal}$

The sum of a number and its reciprocal is $\frac{29}{10}$

$$\begin{array}{c} \downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow \\ x \qquad \qquad + \qquad \qquad \frac{1}{x} \qquad = \frac{29}{10} \\ \uparrow \end{array}$$

Step 2: Thus, the equation is $x + \frac{1}{x} = \frac{29}{10}$

Step 3 : LCD = 10x

$$10x \left[x + \frac{1}{x} = \frac{29}{10} \right] 10x \quad \text{multiply both sides by the LCD}$$

$$10x(x) + 10x\left(\frac{1}{x}\right) = 10x\left(\frac{29}{10}\right) \quad \text{by distributive property}$$

$$10x^2 + 10x\left(\frac{1}{x}\right) = 10x\left(\frac{29}{10}\right)$$

$$10x^2 + 10 = 29x \quad \text{write equation in standard form}$$

$$10x^2 - 29x + 10 = 0 \quad \text{the factoring method works}$$

$$(5x - 2)(2x - 5) = 0$$

$$5x - 2 = 0 \quad \text{or} \quad 2x - 5 = 0$$

$$x = \frac{2}{5} \quad \text{or} \quad x = \frac{5}{2}$$

Notice, that the two solutions are reciprocals of each other.

Step 4: Check that both solutions satisfy the statement of the problem.

$$\begin{array}{l} x + \frac{1}{x} = \frac{29}{10} \\ x = \frac{2}{5} \quad \text{or} \quad x = \frac{5}{2} \\ \text{LCD} = 10 \end{array} \quad \begin{array}{l} \frac{2}{5} + 1 \cdot \frac{5}{2} = \frac{29}{10} \quad \left| \quad \frac{5}{2} + 1 \cdot \frac{2}{5} = \frac{29}{10} \right. \\ 10 \left[\frac{2}{5} + \frac{5}{2} = \frac{29}{10} \right] 10 \quad \left| \quad 10 \left[\frac{5}{2} + \frac{2}{5} = \frac{29}{10} \right] 10 \right. \\ 4 + 25 \stackrel{?}{=} 29 \quad \left| \quad 4 + 25 \stackrel{?}{=} 29 \right. \\ 29 \stackrel{\checkmark}{=} 29 \quad \left| \quad 29 \stackrel{\checkmark}{=} 29 \right. \end{array}$$

Example 5. In driving to Manila, a distance of 540 km, a motorist discovered that he could make the trip via the expressway in 2 hours less time by increasing his speed by 9 km per hour. What was his original speed?

Step 1: Let x = the original speed

	Distance	Rate	Time
Ordinary road	540 km	x	$\frac{540}{x}$
Expressway	540 km	$x+9$	$\frac{540}{x+9}$

Step 2: Equation: $\frac{540}{x} - 2 = \frac{540}{x+9}$

Step 3: LCD = $x(x+9)$

$$\begin{aligned} 540(x+9) - 2(x)(x+9) &= 540x \\ 540x + 4860 - 2x^2 - 18x &= 540x \\ 2x^2 + 18x - 4860 &= 0 \\ x^2 + 9x - 2430 &= 0 \\ (x + 54)(x - 45) &= 0 \\ x = -54 \text{ or } x = 45 \end{aligned}$$

Here, we only consider the positive value since there is no negative distance.

Step 4: Substitute 45 in the equation

$$\begin{aligned} \frac{540}{x} - 2 &= \frac{540}{x+9} \\ \frac{540}{45} - 2 &= \frac{540}{45+9} \\ 12 - 2 &= \frac{540}{54} \end{aligned}$$

Therefore, the original speed is 45 km per hour.

$$10 \overset{\checkmark}{=} 10$$

Example 6: Bobby can clean the yard alone in four hours. It takes Peter five hours to clean the same yard alone. If they work together, how long will it take them to plow the field?

Step 1: Let t = be the amount of time spent for work

	Work Rate	Time	Work Done
Bobby	$\frac{1}{4}$	t	$\frac{1}{4}t$
Peter	$\frac{1}{5}$	t	$\frac{1}{5}t$

Step 2: Equation

$$\begin{array}{ccccc} \frac{1}{4}t & + & \frac{1}{5}t & = & 1 \\ \downarrow & & \downarrow & & \downarrow \\ \text{Part of work} & & \text{Part of work} & & \text{Work done} \\ \text{done by Bobby} & & \text{done by Peter} & & \text{Together} \end{array}$$

Step 3: LCD = 20

$$\begin{aligned} \frac{1}{4}t + \frac{1}{5}t &= 1 \\ 20\left(\frac{t}{4} + \frac{t}{5}\right) &= 20(1) \quad \text{multiply both sides by the LCD} \\ 20\left(\frac{t}{4}\right) + 20\left(\frac{t}{5}\right) &= 20(1) \quad \text{by distributive property} \end{aligned}$$

$$5t + 4t = 20 \quad \text{combine similar terms}$$

$$9t = 20 \quad \text{simplify}$$

$$t = \frac{20}{9} \text{ or } 2\frac{2}{9} \text{ hours}$$

Step 4: Substitute $\frac{20}{9}$ in the equation

$$\frac{1}{4}t + \frac{1}{5}t = 1$$

$$\frac{1}{4}\left(\frac{20}{9}\right) + \frac{1}{5}\left(\frac{20}{9}\right) = 1$$

$$\frac{5}{9} + \frac{4}{9} = 1$$

$$\frac{9}{9} \stackrel{?}{=} 1$$

$$\checkmark$$

$$1 = 1$$

The next activity will enhance your skills and enrich the concepts and principles of quadratic equations. You will be tasked to write Quadratic equations that would represent real life situations. You will also compare and discuss problems involving quadratic equations that will give you the opportunity to assess your skills and examine errors if there are any.



Explore

Now that you know the important ideas about quadratic and rational algebraic equations and their application in real-life, let's go deeper and have some enrichment activities for you to work on to master the basic concepts you have learned from this lesson.

Activity 3: Find Those Missing!

Directions: Solve each problem algebraically on a separate sheet of paper and identify what method did you use.

1. The sum of the number and its reciprocal is $13/6$. Find the number.
2. The sum of two numbers is 20, and their product is 96. Find the two numbers.
3. One number is 5 more than 3 times a second number. If the reciprocal is -2, what are the numbers?

4. The length of a rectangle is three more than twice its width, and its area is 90 square meters. Find its dimensions.
5. The width of a rectangle is one - third its length. If the area of the rectangle is 20 square inches, what are the dimensions of the rectangle?

In this section, the discussion was about solving problems involving quadratic and rational algebraic equations in real-life. You were given the opportunities to see the real-life application of quadratic equations. What new insights do you have from this lesson? How would you connect this in your daily life? How will you use this in making decisions? Your understanding of this lesson and other previously learned concepts and principles will facilitate your understanding of the succeeding lessons.



Deepen

Performance Task

Directions: Make a comic strip using a situation in real life where the concepts of quadratic or rational algebraic equation is applied. Formulate and solve problems out of these situations.

Rubric for Real-Life Situation Involving Quadratic/Rational Equation

RATING	4	3	2	1
COMIC STRIP WITH EQUATIONS FORMULATED AND SOLVED	The situation is clearly drawn, similar to a real-life situation and the use of quadratic/ rational equation and other mathematical concepts are properly illustrated.	The situation is clearly drawn but the use of quadratic/ rational equation and other mathematics concepts are not properly illustrated.	The situation is not so clearly drawn, and the use of quadratic/ rational equation is not illustrated.	The situation is not clearly drawn, and the use of quadratic/ rational equation is not illustrated.



Gauge

Post Assessment

Directions: Read and analyze the following questions carefully. Choose the letter of the correct answer. Write it on your answer sheet.

1. Which of the following is a **NOT** method in solving problems on quadratic equations?
 - A. Factoring
 - B. Quadratic Formula
 - C. Extracting the Square Root
 - D. Completing the blanks
2. What is the correct equation of the statement "A number added to 5 times its reciprocal is -6"?
 - A. $x + \frac{5}{x} = -6$
 - B. $x + \frac{5}{x} = 6$
 - C. $x + \frac{1}{5x} = -6$
 - D. $x + 5x = -6$
3. What is the least common denominator of $\frac{3x}{x+1} + \frac{2}{x-1} = 4$?
 - A. $(x+1)$
 - B. $(x-1)$
 - C. $(x+1)(x-1)$
 - D. $4(x+1)(-1)$
4. The length of a rectangle is three less than twice the width and its area is equal to 44 square centimeters. How is the length represented here if x is the width?
 - A. $2x - 3$
 - B. $3x - 2$
 - C. $2x - 44$
 - D. $3 - 2x$
5. Which of the following method is best used when the value of b is zero?
 - A. Factoring
 - B. Quadratic Formula
 - C. Extracting the Square Root
 - D. Completing the Square
6. What are the roots of the quadratic equation $x^2 - 144 = 0$?
 - A. 12 and -12
 - B. 11 and - 11
 - C. -12 and -12
 - D. 11 and 144

7. What are the solutions of the quadratic equation $x^2 - 15x + 56 = 0$?
- 7 and 8
 - 7 and -8
 - 7 and 8
 - 7 and -8
8. Which of the following problems is an application of rational algebraic equations?
- Find two numbers whose sum is 13 and whose product is 40.
 - The product of two numbers is 18 and their sum is 9. Find the numbers.
 - The area of a rectangular field is 162 sq. m and its length is twice its width. Find the dimensions of the field.
 - Allen and Ram can finish cleaning the house in 2 hours. If it takes Allen working alone 3 hours longer than it take Ram working alone. How many hours will each boy finish the work alone.
9. The length of a garden is 2 m more than twice its width and its area is 24 m². Which of the following equations represents the given equation?
- $x^2 + x = 12$
 - $x^2 + x = 24$
 - $x^2 + 2x = 12$
 - $x^2 + 2x = 24$
10. What is the length of a garden in problem number 9?
- 3
 - 6
 - 4
 - 8
11. What is the measure of the legs of a right triangle if the area is 48 and one leg is 4 less than twice the other leg?
- 4 and 6
 - 8 and 10
 - 6 and 10
 - 8 and 12
12. What is the least common denominator of the rational algebraic equation $x + \frac{1}{x} = \frac{34}{15}$?
- x
 - 15x
 - 15
 - 15x²

13. What is the arrangement of the steps in solving problems involving quadratic/rational algebraic equations?

- I. **PLAN** the solution and choose the method that best applies to the problem.
- II. **EXAMINE** the solution. Check that the conclusion agrees with the problem situation.
- III. **READ** the problem carefully. Identify the given, know what is asked, and choose a variable to represent the unknown.
- IV. **SOLVE** the problem. Remember the rules and properties in simplifying.

- A. I, II, III, IV
- B. III, I, II, IV
- C. II, I, IV, III
- D. III, I IV, II

14. The department of education wants to place a rectangular tarpaulin in each school to inform the teachers, students' parents, and visitors of the safety measure as they enter the school. Suppose the length of the tarpaulin is 4 m longer than its width and the area is 96m^2 . What will be its length and width?

- A. 8m and 12m
- B. 12m and 16m
- C. 10m and 14m
- D. 14m and 18m

15. Your classmate answered that quadratic equations are equations with at least one squared variable while rational equations involve at least one rational expression, is her answer correct?

- A. Yes, because quadratic equation can also be fractions.
- B. No, because rational algebraic equations are fractions.
- C. No, because quadratic equation can have more than two quadratics variable.
- D. Yes, because rational expressions typically contain a variable in the denominator.

Great job! You made it. Congratulations!

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For inquiries or feedback, please write or call:

Department of Education – SDO La Union
Curriculum Implementation Division
Learning Resource Management Section
Flores St. Catbangan, San Fernando City La Union 2500
Telephone: (072) 607 - 8127
Telefax: (072) 205 - 0046
Email Address:
launion@deped.gov.ph
lrm.launion@deped.gov.ph