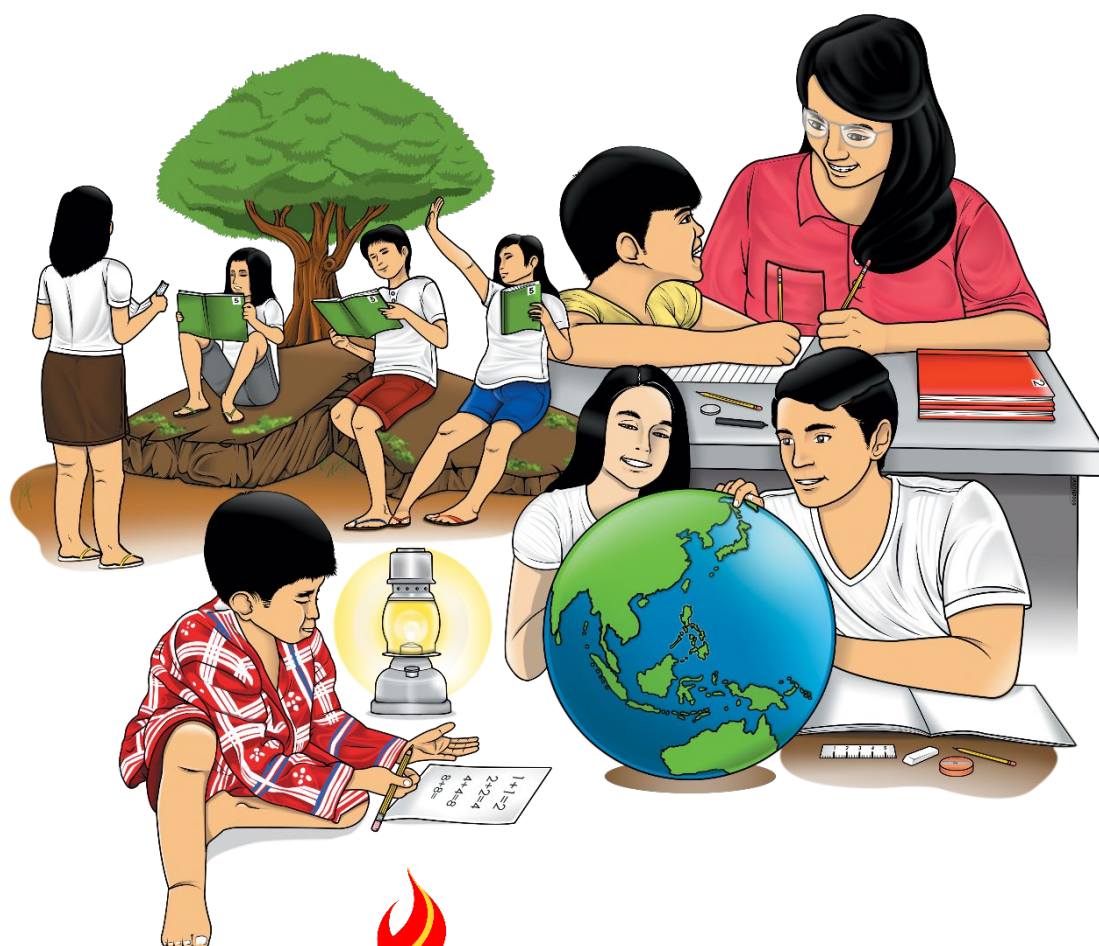


General Mathematics

Quarter 1 – Module 10: Solving Real-Life Problems Involving Rational Functions, Equations, and Inequalities



General Mathematics
Alternative Delivery Mode
Quarter 1 – Module 10: Solving Real-Life Problems Involving Rational Functions,
Equations, and Inequalities
First Edition, 2021

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General Mathematics

Quarter 1 – Module 10:

Solving Real-Life Problems Involving Rational Functions, Equations, and Inequalities

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.



What I Need to Know

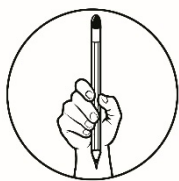
This module is written to help you solve real-life problems involving rational functions, equations, and inequalities. You will be introduced to different types of word problems and situations. These problems can be transformed into rational functions, equations, and inequalities. Your focus, patience, and determination will play an important role in dealing with these real-life problems. Moreover, you will also realize that rational functions, equations, and inequalities can be applied in real-life strengthening your problem-solving and modeling experience.

In this module, you will learn how to solve real-life problems involving rational functions, equations, and inequalities. Your acquired skills in solving rational equations and inequalities will be of great help in dealing with this module. Furthermore, your knowledge of representation and problem solving will greatly contribute to accomplishing this module.

After going through this module, you are expected to:

1. solve real-life problems involving rational functions, equations, and inequalities;
2. carefully analyze and understand word problems before solving them; and
3. create real-life word problems about rational functions, equations and inequalities.

In this part, let us see how much you know about the lesson by answering the questions in pre-assessment below. If you obtain 100% or a perfect score, skip the module and immediately move to the next module. While in the event you missed a point, please proceed on the module as it will enrich your knowledge in finding the intercepts, zeroes, and asymptotes of rational functions. Let's get started!



What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Mayor Rodriguez received 5000 sacks of rice to be distributed among the families in his municipality during the lockdown. If the municipality has x families, write the function which represents the relationship of the allotted sack of rice per family(y -variable) versus the total number of families.

a. $y = \frac{x}{5000}$
b. $y = \frac{5000}{x}$
c. $y = \frac{5000x}{x}$
d. $y = \frac{x}{5000+x}$

2. To beat the heat of summer, Mang Berto built a rectangular swimming pool that has a perimeter of 200 meters. Write the function which represents the width(y) of the swimming pool as a function of the length(x).

a. $y = \frac{200}{x}$
b. $y = \frac{x}{200}$
c. $y = \frac{200}{x+1}$
d. $y = 100 - x$

3. It takes Brad 2 hours to mow his rice field. It takes Kris 3 hours to mow the same rice field. At the same pace, how long would it take them to mow the rice field if they do the job together?

a. $2 \frac{1}{2}$ hours
b. $1 \frac{1}{5}$ hours
c. $1 \frac{1}{6}$ hours
d. $\frac{5}{6}$ hours

4. Anne and Maria play tennis almost every weekend. So far, Anne has won **12** out of **20** matches. a. How many matches will Anne have to win in a row to improve her winning percentage to **75%**?

a. 15
b. 12
c. 9
d. 6

5. In a basket, there are 12 apples and 32 oranges. A buyer requires having a basket of apples and oranges with the ratio greater than or equal to 3:4 respectively. How many apples must be added to the basket to satisfy the buyer's request?
- 10 apples
 - 15 or more apples
 - 12 or more apples
 - 8 apples
6. Mario was given 3 hours to practice driving his motorcycle. He plans to travel 100 kilometers at an average speed of 40 kilometers per hour. He wants to maximize his time in driving his motorcycle. How many kilometers more does he need to travel to spend at most 3 hours?
- less than or equal 20 kilometers
 - greater than or equal 20 kilometers
 - exactly 30 kilometers
 - less than or equal 30 kilometers
7. Jessie works as a salesman. He earns a daily wage of 250 pesos and an additional 10 pesos for every 3 pieces of cell phone sold. If x represents the number of cell phones sold, write the function for his daily earning (y) as a function of the number of cell phones sold (x).
- $y = \frac{250}{10x}$
 - $y = 250 + 10\left(\frac{x}{3}\right)$
 - $y = 250 + \frac{3}{x} + 10$
 - $y = \frac{2500}{3x}$
8. Using the problem in number 7, if Jessie sold 48 cell phones in a day, how much money did he earn for that day?
- 410 pesos
 - 250 pesos
 - 500 pesos
 - 480 pesos
9. Melissa walks 3 miles to the house of a friend and returns home on a bike. She averages 4 miles per hour faster when cycling than when walking, and the total time for both trips is two hours. Find her walking speed.
- 1 mph
 - 2 mph
 - 3 mph
 - 4 mph

10. You have **10** liters of a juice blend that is **60%** juice. How many liters of pure juice needs to be added to make a blend that is **75%** juice?
- 10 liters
 - 8 liters
 - 6 liters
 - 4 liters
11. If the sum of a number (x) and 3 is divided by 5, the result is greater than 2. What are the possible values for the given number (x)?
- $x > 5$
 - $x > 7$
 - $x < 5$
 - $x < 7$
12. During a pandemic, Brgy. Captain Gerry was given 1,000,000 pesos to support 500 households in his barangay. He plans to give at least 3,000 pesos for every household. How much money does he need to solicit to realize his plan?
- at least 300,000
 - at least 400,000
 - at least 500,000
 - at least 100,000
13. Coronavirus infection is spreading fast worldwide. The number of people infected by the virus each day is given by the function $P(x) = \frac{100x}{x+3}, 0 \leq x \leq 10$ where x is the number of days, and $P(x)$ is the number of people infected (in thousands). How many people are infected on the first day?
- 25
 - 25,000
 - 50,000
 - 75,000
14. Sir Paco is thrice as old as his son Javy. 10 years from now, the ratio of their ages will be 2:1 respectively. How old is Javy?
- 5
 - 15
 - 12
 - 10
15. As part of his exercise routine, Jerson runs 20 kilometers at an average speed of 3 kilometers per hour. If he decided to run at most 2 hours on a specific day, how may kilometers less does he need to run?
- at least 14 km
 - at most 14 km
 - exactly 14 km
 - less than 14 km

Lesson**1****Problems Involving Rational Functions, Equations, and Inequalities**

To be able to solve problems involving rational functions, equations, and inequalities, it is necessary to know the basics of algebra. Solving rational equations and inequalities is very essential in solving word problems. Real-life problems like mixture, work, distance, number, and other related problems might interest you. If you are fond of observing your speed while driving, estimating your time while walking, analyzing your income while selling, determining price increases and decreases, identifying rational relationships and solving real-life problems, then, this module is definitely for you to enjoy!

***What's In***

Before you proceed to the new lesson, let us recall first what you have learned from the previous lessons so that you will be ready to solve real-life problems involving rational function, rational equation, and rational inequality.

MATCH AND SOLVE!

A. Study the data inside the box and write it in the appropriate column on the next page.

$$f(x) = \frac{x^2 - 2x + 4}{x}$$

$$-1 < x < 5$$

$$\frac{4}{x} - \frac{x-1}{5} = \frac{14}{15}$$

$$\frac{4}{x-2} > 2$$

$$3$$

$$\frac{x+1}{x-5} \leq 0$$

$$\frac{4}{x} = \frac{x+3}{10}$$

$$5$$

$$-2 < x < 0$$

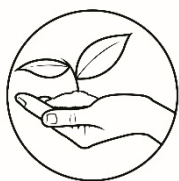
$$y = \frac{1000 + x}{20}$$

Rational Equation	Solution to Rational Equations	Rational Functions	Rational Inequalities	Solution to Rational Inequalities

Recall your skill in solving a rational equation and rational inequalities to match the correct data in the appropriate column. This skill is a prerequisite in this module because you cannot solve real-life problems involving rational functions, equation, and rational inequalities if you do not master your previous skill. In that case, let me help you.

On the given, you observed that $f(x) = \frac{x^2-2x+4}{x}$ and $y = \frac{1000+x}{20}$ are written in the form $f(x) = \frac{p(x)}{q(x)}$ where $p(x)$ and $q(x)$ are both polynomial functions, therefore these are examples of rational functionals provided that $q(x)$ is not equal to zero. While $\frac{4}{x} = \frac{x+3}{10}$ and $\frac{4}{x} - \frac{x-1}{5} = \frac{14}{15}$ are both rational equations because they involve rational expressions. Intuitively, you may think that 3 and 5 are the solutions but you need to solve it for you to see the result. On the other hand, $\frac{x+1}{x-5} \leq 0$ and $\frac{4}{x-2} > 2$ are rational inequalities because they are inequalities that involve rational expressions. If you master the skills in solving them, I am sure you got the correct data on the appropriate column.

If you think you are not confident that you are correct, review first your previous lesson before you proceed to take this module, But I am sure, you will do your part because you are willing to learn.

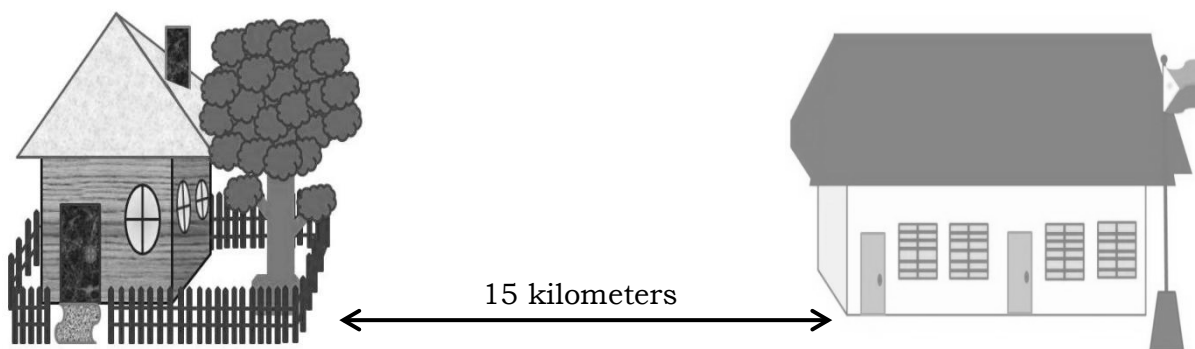


What's New

Speed Me Up!

Read and analyze each situation below and answer the questions that follow.

Mario rides his motorcycle in going to school. He drives at an average speed of 30 kilometers per hour. The distance between his house and the school is 15 kilometers. Every time he sees his best friend Jessica walking on the road, he invites her for a ride and lowers his speed. On the other hand, he increases his speed when he wakes up late for school.



Questions:

a. How long does it take Mario to reach school considering his average speed?

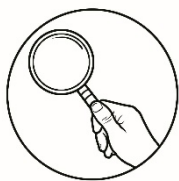
b. If x represents the time it takes Mario to drive to school with the given distance of 15 kilometers, how will you represent the relationship of his speed (y) versus the time (x)?

c. Mario's average speed is 30 kilometers per hour. Suppose Mario lowers his speed by 10 kilometers per hour, how long will he reach the school given the same distance?

d. Suppose Mario's speed is unknown and represented by (x), he lowers his speed by 10 kilometers per hour at a distance of 15 kilometers and reaches school at $\frac{3}{4}$ hours, how will you write the equation to find his average speed (x)?

e. Mario's average speed was 30 kilometers per hour. He plans to drive for another 30 kilometers from school, how long will it take him to cover the whole distance (house to school to 30 kilometers from school)?

f. If Mario drives another (x) kilometers from his school at an average speed of 30 kilometers per hour and he plans to drive in at most 2 hours, how will you write the inequality to find the additional distance?



What is It

The Speed Me Up Activity is an example of the real-situation involving rational equation and inequality, and to be able to answer the questions given above, it is very important to know the distance-speed-time relationship. The following illustrates these relationships.

$$\text{Distance} = \text{Speed} \times \text{Time}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

The relationships above, were emphasized when you are in junior high school in the lesson solving distance problem. I am sure that these are familiar to you.

To answer question number 1, you need to consider that the word “how long” pertains to time. Thus, by dividing the distance by the speed, $t = \frac{D}{s}$, you get the time:

$$\text{Time} = \frac{15}{30} \text{ or } \frac{1}{2} \text{ hours (30 minutes).}$$

Question number 2 requires you to represent the given situation into a functional relationship between speed (y) and time (x) considering a distance of 15 kilometers. Since $s = \frac{D}{t}$, we were able to write $y = \frac{15}{x}$, where $x \neq 0$.

The process of answering question number 3 also considers the distance-speed-time relationship. Since Mario lowers his speed by 10 kilometers per hour, it will take him longer to reach his destination. Thus, we use the formula $t = \frac{D}{s}$.

$$t = \frac{15}{30 - 10}$$

$$t = \frac{15}{20} \text{ or } \frac{3}{4} \text{ hours (45 minutes)}$$

Question number 4 asks you to write the equation in case Mario’s speed is unknown or missing. Since x represents Mario’s speed, lowering his speed by 10 kilometers per hour will be written as “x – 10”. Again, considering the distance-speed-time relationship, we arrive at the equation:

$$t = \frac{D}{s}$$

$$\frac{3}{4} = \frac{15}{x - 10}$$

Solving this equation will give you 30 as his average speed.

To answer question number 5, you need to understand that there is an additional distance of 30 kilometers. The total distance is now 45 kilometers. (Adding 15 and 30). Since the speed remains at 30 kilometers per hour, and we are looking for time, we arrive at the equation:

$$t = \frac{D}{s}$$

$$t = \frac{45}{30} \text{ or } 1.5 \text{ hours (1 hour and 30 minutes)}$$

Question number 6 requires you to write rational inequality to be able to find the additional distance. Additional distance will be represented by x and the total distance will be “15 + x ”. Since his speed remains at 30 kilometers per hour and the time that will require him to cover the distance is at most 2 hours (less than or equal to 2), we write the inequality:

$$\frac{D}{s} \leq t$$

$$\frac{15 + x}{30} \leq 2$$

Solving this inequality will give $x \leq 45$. Mario needs to travel an additional distance of not more than 45 kilometers to spend at most 2 hours.

The idea of riding a motorcycle seems very enjoyable. But, always bear in mind that accidents may happen. So, be cautious and consider safe driving by following street rules. Just like analyzing Math problems, little by little, we would arrive at answers if we only know how to follow rules.

Another skill that you will learn in this module is solving real-life problems involving rational function. Consider the examples below:

Example 1

Bamban National High School is preparing for its 25th founding anniversary. The chairperson of the activity allocated ₱90,000.00 from different stakeholders to be divided among various committees of the celebration. Construct a function $C(n)$ which would give the amount of money each of the n numbers of committees would receive. If there are six committees, how much would each committee have?

Solution:

The function $C(n) = \frac{90000}{n}$ would give the amount of money each of the n numbers of committees since the allocated budget is ₱90,000.00 and it will be divided equally to the n number of committees.

If there are six committees, then you need to solve for $C(6)$, thus

$$C(6) = \frac{90000}{6} = 15000$$

Therefore, each committee will receive ₱15,000.00.

Example 2

Barangay Masaya allocated a budget amounting to ₱100,000.00 to provide relief goods for each family in the barangay due to the Covid-19 pandemic situation. The amount is to be allotted equally among all the families in the barangay. At the same time a philanthropist wants to supplement this budget and he allotted an additional ₱500.00 to be received by each family. Write an equation representing the relationship of the allotted amount per family (y-variable) versus the total number of families (x-variable). How much will be the amount of each relief packs if there are 200 families in the barangay?

Solution:

The amount to be received by each family is equal to the allotted (₱100,000.00), divided by the number of families plus the amount to be given by the philanthropist. Thus the rational function is described as $y = \frac{100000}{x} + 500$. The amount of each relief packs can be computed by finding the value of y when $x = 50$, since there are 50 families in the barangay. Thus,

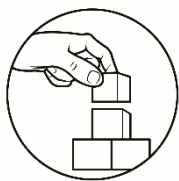
$$y = \frac{100000}{200} + 500 = 1000$$

Therefore, the amount of each relief packs to be distributed to each family worth ₱1,000.00.



Notes to the Teacher

Remind students that they must: (a) read and analyze the problem carefully, (b) paraphrase and summarize the problem in their own words, (c) find an equation that models the situation, and (d) say how it represents the quantities involved and (e) check to make sure that they understand the problem before they begin trying to solve it.



What's More

Read each problem carefully. Answer them and write your answers on a separate sheet of paper.

Practice Activity 1

A Garden Plot

Vincent is a farmer. He loves to plant vegetables. He found that the area of his rectangular garden is 200 square meters. Let x represent the width of his garden in meters, express the length of the garden L as a function of width x .

Complete the following to solve the problem.

- The formula in finding the area of a rectangle is _____.
- Given an area (A) and width (x), the formula in finding length (L) of a rectangle is _____.
- Using the formula, we may express the length of the garden (L) as a function of width (x) as:

$$L(x) = \underline{\hspace{2cm}}$$

Independent Assessment 1

Triangular Kite

Marco has a triangular kite. The area of the kite is 320 square centimetres. Let x represent the height of the kite in centimetres, express the base of the kite (B) as a function of height x .

Practice Activity 2

Do it Together

Rodalyn can do a job in 5 days while Apple can do the same job in 3 days. How long will it take them to do the job if they work together?

Complete the following to solve the problem.

- The part of the job accomplished by Rodalyn on the first day is $\frac{1}{5}$. So, the part of the job accomplished by Apple on the first day is _____.
- If x represents the time it will take them to do the job together, the part of the job accomplished on the first day of working together is _____.
- Looking at the relationship, we arrive at the equation:

$$\frac{1}{5} + \frac{1}{3} = \frac{1}{x}$$
- Solving the rational equation, the value of x is _____. Working together, they can finish the job in ____ day and ____ hours.

Independent Assessment 2

Paint my Wall

Analiza can paint a room in 3 hours. Leoben can do it in 2 hours. Walter can do the painting job in 5 hours. If all of them worked together, how long will it take them to paint the room?

Practice Activity 3

Mix mix mix!

How many liters of pure alcohol must be added to 30 liters of 20 % alcohol solution to make a 25% alcohol solution.

- Complete table to understand the relationship.

	Original	Added	Result
Concentration	$20\% = \frac{20}{100}$	$100\% = 1$	$25\% = \frac{25}{100}$
Amount	30 liters	x	$30 + x$
Multiply	$\frac{20}{100}(30)$	$1(x)$	?

Note: We use 100% or 1 because pure alcohol was added.

b. Use the relationship to make an equation.

$$\frac{20}{100}(30) + 1(x) = \frac{25}{100}(30 + x)$$

c. Solve the equation by finding the value of x . Multiply the whole equation by LCM which is 100.

$$600 + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}(30 + x)$$

$$600 + 100x = 750 + 25x$$

$$75x = 150$$

$$x = \underline{\hspace{2cm}}.$$

Independent Assessment 3

Salt solution

Joey has 40 liters of 10% salt solution. How much salt should be added to make it a 20% salt solution?

Practice Activity 4

Volume of a Box

A box with a square base has a volume of 27 cubic inches. If x is the length of its edge and h is the height of the box. What are the possible measurement of its edge if the height should be longer than the edge?

Complete the following to solve the problem.

a. The formula to find the volume of the box is _____.

b. The equation relating to find the value of h is _____.

Since the height is greater than the length of the edge, the inequality can be described as

$$\frac{27}{x^2} - x > 0$$

c. The possible value of x should be _____.

(Hint: Solve for x in the inequality $\frac{27}{x^2} - x > 0$.)

Independent Assessment 4

Who am I?

I am thinking of a number, the sum of twice a number and 8 divided by 12 is greater than or equal to 4. Find the number/numbers.

Independent Assessment 5

Growing Bacteria

Suppose the amount of bacteria growing in a petri dish is represented by the function $B(t) = \frac{100t}{t+2}$ for $0 < t < 15$ where t is in hours and B is in millions. How many bacteria will there be after 10 hours?



What I Have Learned

A. Complete the following statements by writing the correct word or words and formulas.

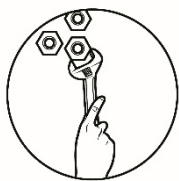
1. _____ is any function which can be defined by a rational fraction, an algebraic fraction such that both the numerator and the denominator are polynomials.

2. An inequality which contains a rational expression is _____.

3. An equation containing at least one fraction whose numerator and denominator are polynomials is called _____.

4. The three formulas which show the relationship among distance, time and speed are: _____, _____ and _____.

B. In your own words, write the different steps to solve real-life problems involving rational functions, equations, and inequalities.



What I Can Do

I Believe I Can Apply!

Observe the surroundings and try to create 3-word problems involving rational functions, equations, and inequalities and show also the solutions to the problems that you created

Here are some of the suggested topics in creating real-life problems:

- Daily sales of your crops
- Number of relief goods in your barangay
- Distance-time-speed relationship in traveling from your place to the town proper
- Rice production
- Areas of your rice fields
- Wage/salary of workers
- Population in your place
- Demand and supply of agricultural products
- Area/Perimeter of a place/structure
- Mixing of brands of rice/sugar

Rubric for the task:

<u>Categories</u>	<u>Excellent</u> (4)	<u>Satisfactory</u> (3)	<u>Developing</u> (2)	<u>Beginning</u> (1)
Representation	Shows a complete understanding of the concept of rational functions, equations, and inequalities.	Shows a partial understanding of the concept of rational functions, equations, and inequalities.	Shows limited understanding of the concept of rational functions, equations, and inequalities.	Not evident
Computation and Solution	Computation is correct and leads to the correct answer	Computation is correct but does not lead to the correct answer	Computation is incorrect and does not relate to the task.	Not evident
Communication	Explained the steps clearly and accurately.	Explained the steps clearly.	Explained the steps, but there are some parts which are not clear.	Not evident



Assessment

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Gov. Suarez bought 1000 units of television to be given to disabled persons in Quezon province. If the province has chosen x , disabled persons, write the function which represents the relationship of the allotted unit of television per disabled person(y -variable) versus the total number of disabled persons.

a. $y = \frac{1000}{x}$
b. $y = \frac{x}{1000}$
c. $y = \frac{1000x}{x}$
d. $y = \frac{x}{1000+x}$

2. Aling Nena cuts a rectangular cloth with a perimeter of 150 meters. Write the function which represents the width(y) of the cloth as a function of the length(x).

a. $y = \frac{150}{x}$
b. $y = \frac{x}{150}$
c. $y = \frac{150}{x+1}$
d. $y = 75 - x$

3. Maryjoy can bake a cake in 2 hours. Clarissa can do it in 4 hours. How long will it take them to bake a cake if they joined together?

a. 2 hours
b. $1 \frac{1}{3}$ hours
c. $1 \frac{1}{6}$ hours
d. $\frac{5}{3}$ hours

4. James and Tony play billiard every weekend. So far, James has won 8 out of 14 matches. How many matches will James have to win in a row to improve his winning percentage to 80%?

a. 16
b. 15
c. 14
d. 12

5. In a jar, there are 10 blue marbles and 15 red marbles. A buyer wants to buy a jar of blue marbles and red marbles with the ratio greater than or equal to 4:5 respectively. How many blue marbles must be added in the jar in order to sell the marbles?
- 8
 - 6
 - at least 1
 - at least 2
6. Nerissa was given 2 hours to walk for her morning exercise. She plans to walk 5 kilometers at an average speed of 3 kilometers per hour. How many kilometers more does she need to walk to spend at most 2 hours?
- less than or equal 2 kilometers
 - greater than or equal 2 kilometers
 - exactly 3 kilometers
 - less than or equal to 1 kilometer
7. Nimby works as a vendor. He earns a daily wage of 100 pesos and an additional 5 pesos for every 2 pieces of mangoes sold. If x represents the number of mangoes sold, write the function for his daily earning (y) as a function of the number of mangoes sold (x).
- $y = \frac{100}{x}$
 - $y = 100 + 5\left(\frac{2}{x}\right)$
 - $y = 100 + 5\left(\frac{x}{2}\right)$
 - $y = \frac{1500}{2x}$
8. Using the problem in number 7, if Nimby sold 20 mangoes in a day, how much money did he earn for that day?
- 120 pesos
 - 150 pesos
 - 200 pesos
 - 130 pesos
9. A boy traveled by train which moved at the speed of 30 mph. He then boarded a bus that moved at the speed of 40 mph and reached his destination. The entire distance covered was 100 miles and the entire duration of the journey was 3 hours. Find the distance he traveled by bus.
- 50 miles
 - 40 miles
 - 30 miles
 - 20 miles

10. Sterling Silver is 92.5% pure silver. How many grams of Sterling Silver must be mixed to a 90% Silver alloy to obtain a 500g of a 91% Silver alloy?
- 200 grams
 - 400 grams
 - 300 grams
 - 100 grams
11. Seven divided by the sum of a number and two is equal to half the difference of the number and three. Find all such numbers.
- 5 and 4
 - 10 and -2
 - 5 and -4
 - 10 and 2
12. Mayor Eleazar solicited 500, 000 pesos to be given to families affected by typhoon Ambo. If he plans to give at least 10,000 pesos for each of the 100 families, how much more money does he need to solicit?
- at least 500,000
 - at least 400,000
 - at least 300,000
 - at least 200,000
13. A box with a square base and no top is to be constructed so that it has a volume of 1000 cubic centimeters. Let x denote the width of the box, in centimeters. Express the height h in centimeters as a function of the width x .
- $h(x) = \frac{1000}{x^2}$
 - $h(x) = \frac{1000}{x^3}$
 - $h(x) = \frac{1000}{x}$
 - $h(x) = 1000x$
14. Yen-yen got an average grade of 91 on her 4 subjects. What must be her grade on the fifth subject to get an average of 92?
- 94
 - 95
 - 96
 - 97
15. The area of a rectangle is $x^2 + 3x - 10$. If it has a side length of $2x - 4$, then the width can be represented by the expression
- $\frac{x-5}{2}$
 - $\frac{2}{x-5}$
 - $\frac{x+5}{2}$
 - $\frac{2}{x+5}$



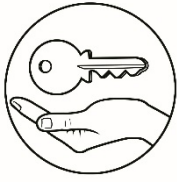
Additional Activities

A. Think about this!

A boat that can travel fifteen miles per hour in still water can travel thirty-six miles downstream in the same amount of time that it can travel twenty-four miles upstream. Find the speed of the current in the river.

B. Visit the following links for more lectures and activities about word problems involving rational functions, equations and inequalities.

- <https://www.youtube.com/watch?v=09byllGu88Q>
- <https://www.youtube.com/watch?v=rX8ZBP3nXvI>
- <https://www.youtube.com/watch?v=gD7A1LA4jO8>
- <https://www.youtube.com/watch?v=4-a6tkwHZEM>
- <https://www.youtube.com/watch?v=QLhvLEeS08A>



Answer Key

What I Know

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

- What's More**
- Practice Activity 1**
- a. The formula in finding the area of a rectangle is $A = L \times W$.
 - b. Given an area (A) and width (x), the formula in finding length of a rectangle is $L = \frac{A}{x}$.
 - c. Using the formula, we may express the length of the garden (L) as a function of width (x) as:

$$L(x) = \frac{x}{200}$$
- Independent Assessment 1**
- a. The formula in finding the area of a triangle is $A = \frac{1}{2}(b)(h)$.
 - d. Given an area (A) and height (x), the formula in finding base of a triangle is

$$b = \frac{2A}{x}$$
 - e. Using the formula, we may express the base of the triangle (B) as a function of height (x) as:

$$B(x) = \frac{x}{640}$$
- Practice Activity 2**
- a. The part of the job accomplished by Rodalyn on the first day is $\frac{1}{5}$.
 - b. The part of the job accomplished by Apple on the first day is $\frac{1}{5}$.
 - c. If x represents the time it will take them to do the job together, the part of the job accomplished on the first day of working together is $\frac{1}{x}$.
 - d. Looking at the relationship, we arrive at the equation:

$$\frac{1}{1} + \frac{3}{3} = \frac{5}{x}$$
 - e. Solving the rational equation, the value of x is $\frac{8}{15}$ or 1 day and 21 hours. Working together, they can finish the job in 1 day and 21 hours.
- Independent Assessment 2**
- a. The part of the job accomplished by Analiza on the first day is $\frac{1}{3}$.
 - b. The part of the job accomplished by Leoben on the first day is $\frac{1}{2}$.
 - c. The part of the job accomplished by Walter on the first day is $\frac{1}{5}$.
 - d. If x represents the time it will take them to do the job together, the part of the job accomplished on the first day of working together is $\frac{1}{x}$.
 - e. Looking at the relationship, we arrive at the equation:

$$\frac{1}{1} + \frac{3}{3} = \frac{5}{x}$$
- a. The part of the job accomplished by Analiza on the first day is $\frac{1}{3}$.
 - b. The part of the job accomplished by Leoben on the first day is $\frac{1}{2}$.
 - c. The part of the job accomplished by Walter on the first day is $\frac{1}{5}$.
 - d. If x represents the time it will take them to do the job together, the part of the job accomplished on the first day of working together is $\frac{1}{x}$.
 - e. Solving the rational equation, the value of x is $\frac{8}{15}$ or 1 day and 21 hours. Working together, they can finish the job in 1 day and 21 hours.
- Independent Assessment 2**
- a. The part of the job accomplished by Analiza on the first day is $\frac{1}{3}$.
 - b. The part of the job accomplished by Leoben on the first day is $\frac{1}{2}$.
 - c. The part of the job accomplished by Walter on the first day is $\frac{1}{5}$.
 - d. If x represents the time it will take them to do the job together, the part of the job accomplished on the first day of working together is $\frac{1}{x}$.
 - e. Looking at the relationship, we arrive at the equation:

$$\frac{1}{1} + \frac{3}{3} = \frac{5}{x}$$
 - f. Solving the rational equation, the value of x is $\frac{30}{31}$ or 23 hours. Working together, they can finish the job in 23 hours.

What's More Continuation

Practice Activity 3

a. Complete table to understand the relationship.

Result	Added	100% = $\frac{25}{100}$	30 + x
Concentration	20% = $\frac{100}{20}$	100% = 1	x
Amount	30 liters	$\frac{20}{100}(30)$	1(x)
Multiply	$\frac{20}{100}(30)$	$\frac{25}{100}(30 + x)$	

Note: We use 100% or 1 because pure alcohol was added.

b. Use the relationship to make an equation.

$$\frac{20}{100}(30) + 1(x) = \frac{25}{100}(30 + x)$$

c. Solve the equation by finding the value of x. Multiply the whole equation by LCM which is 100.

$$600 + 100x = 25(30 + x)$$

$$600 + 100x = 750 + 25x$$

$$75x = 150$$

$$x = 2 \text{ liters}$$

Independent Assessment 3

a. Complete table to understand the relationship.

Result	Added	100% = $\frac{20}{100}$	40 + x
Concentration	10% = $\frac{10}{100}$	100% = 1	x
Amount	40 liters	$\frac{10}{100}(40)$	1(x)
Multiply	$\frac{10}{100}(40)$	$\frac{20}{100}(40 + x)$	

Note: We use 100% or 1 because pure salt was added.

b. Use the relationship to make an equation.

$$\frac{10}{100}(40) + 1(x) = \frac{20}{100}(40 + x)$$

c. Solve the equation by finding the value of x. Multiply the whole equation by LCM which is 100.

$$400 + 100x = 20(40 + x)$$

$$400 + 100x = 800 + 20x$$

$$80x = 400$$

$$x = 5 \text{ liters}$$

Practice Activity 4

Complete the following to solve the problem.

a. The formula to find the volume of the box is $V = (x)(x)(h)$.

b. The equation relating to find the value of h is $h = \frac{x}{V}$.

Since the height is greater than the length of the edge, the inequality can be described as

$$\frac{27}{x^2} - x > 0$$

c. The possible value of x should be $x < 3$.

Independent Activity 4

a. The sum of twice a number (x) and can be written as $2x + 8$.

b. The sum of twice a number (x) and 8 divided by 12 can be written as $\frac{2x+8}{12}$.

c. Lastly the whole equation can be written as $\frac{2x+8}{12} \geq 4$.

d. In solving the inequality, we make use of cross multiplication. Then, we solve for the value of x.

e. Finally, the answer is $x \geq 20$.

Assessment

- A
- D
- B
- A
- D
- D
- C
- B
- B
- A
- C
- A
- C
- C

Independent Assessment 4

The amount of bacteria growing in a petri dish is given by the function $B(t) = \frac{100t}{t+2}$ for $0 < t < 15$ where t is in hours and B is in millions.

Substituting $t = 10$, we have:

$$B(10) = \frac{100(10)}{10+2}$$

$$B(10) = 83.33$$

The amount of bacteria growing in a petri dish after 10 hours is 83,333,333.33.

References

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Tan-Faylogna, Ferlie B., Lasic-Calamiong, Lanilyn., Cruz-Reyes, Rowena., *General Mathematics*. Sta. Ana, Manila: Vicarish Publications and Trading, Inc. 2019
General Mathematics Learner's Material. First Edition. 2016. pp. 25-32

*DepED Material: General Mathematics Learner's Material

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