Senior High School

DepED
DEPARTMENT OF EDUCATION

General Mathematics

Quarter 1 – Module 5:
Rational Functions, Equations and Inequalities

ALTERNATIVE DELIVERY MODE
ADM

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Quarter 1 – Module 5: Rational Functions, Equations and Inequalities
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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.

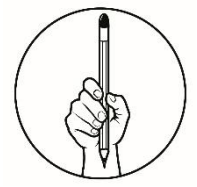
What I Need to Know

This module was designed to help learners gain understanding about rational functions. It is composed of two lessons. The first lesson tackles about representing real life situations using rational functions, and the second lesson will delve about distinguishing rational function, rational equation and rational inequality. It is assumed that the learners already grasp full understanding with functions which was found on the previous modules.

The first part of this module covers varied situations that can be seen in real life such as budgeting distance and concentration of medicine in the blood while the second lesson will proceed to deeper portion or rational sentences. It is hoped that upon exploring this learning kit you will find the eagerness and enthusiasm in completing the task required. Best of luck!

After going through this module, you are expected to:

1. represent real – life situations using rational functions
2. distinguishes rational function, rational equation and rational inequality



What I Know

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

1. A truck that delivers essentials in remote areas can travel 85 kilometers. Which of the following expresses the velocity v as a function of travel time t in hours?
   a. $v(t) = \frac{85}{t}$
   b. $v(t) = \frac{t}{85}$
   c. $t(v) = \frac{85}{v}$
   d. $t(v) = \frac{v}{85}$

2. If the truck in problem no. 1 was delayed by 4 hours due to the checkpoints that it passed through what will be the time t as a function of velocity v in km/hr?
   a. $v(t) = \frac{85}{t}+4$
   b. $v(t) = \frac{t}{85}+4$
   c. $t(v) = \frac{85}{v} + 4$
   d. $t(v) = \frac{v}{85} + 4$

3. As a cure to the epidemic that spread in the whole country, the Department of Health (DOH) released a new drug that is subject for experimentation, supposed that $c(t) = \frac{2t}{t+2}$(in mg/mL)represents the concentration of a drug in a patient's blood stream in t hours, how concentrated is the drug after 2 hours of administration?
   a. 4mg/mL
   b. 3mg/mL
   c. 2mg/mL
   d. 1mg/mL

4. If the distance from Manila to Lucena is approximately 140 kilometers, which of the following pertains to the function *(s)*, where s is the speed of travel that describes the time it takes to drive from Manila to Baguio?
   a. $t(s) = \frac{140}{s}$
   b. $t(s) = \frac{s}{140}$
   c. $s(t) = \frac{140}{t}$
   d. $s(t) = \frac{t}{140}$

For numbers 5-6 use the problem below:

Due to the Enhanced Community Quarantine, Banawe Footspa temporarily stopped its operation and to help the employees the owner decided to split evenly its total revenue of ₱65,000.00

5. If the number of employees is represented by x, which function represents the amount each received?
   a. $f(x) = 65000x$
   b. $f(x) = x + 65000$
   c. $f(x) = \frac{65000}{x}$
   d. $f(x) = x - 65000$

6. If the owner held a fund raising activity that aimed to help the employees and collected ₱5000.00 per employee, which of the following represents the total amount an employee will receive?

a. $f(x) = 65000x + 5000$
b. $f(x) = x + 65000 + 5000$
c. $f(x) = \frac{65000}{x} + 5000$
d. $f(x) = x - 65000 + 5000$

For numbers 7-8, refer to problem below:

Due to the inclement weather the plane slows down the regular flying rate which results to additional 2 hours in covering a 4000-km distance to its regular time.

7. Write a function that expresses the time t as a function of regular rate r in travelling.
   a. $t(r) = \frac{4000}{r}$
   b. $t(r) = \frac{r}{4000}$
   c. $t(r) = \frac{4000+2}{r}$
   d. $t(r) = \frac{4000}{r+2}$

8. What function expresses the time as a function of rate during inclement weather in travelling?
   a. $t(r) = \frac{4000}{r}+2$
   b. $t(r) = \frac{r}{4000}+2$
   c. $t(r) = \frac{4000+2}{r}$
   d. $t(r) = \frac{4000}{r+2}$

9. Which of the following is a rational function?
   a. $f(x) = 2x^2 - 7$
   b. $f(x) = \frac{4x-10}{x-1}$
   c. $x + 2 \geq \frac{x+3}{x-2}$
   d. $\frac{x-8}{2x} = 12$

10. How will you classify $y = \frac{x^2-9}{x+3}$?
    a. Rational Equation
    b. Rational Inequality
    c. Rational Function
    d. Rational Expression

11. What symbol must be placed in the blank to make the sentence rational equation:
    ___ $= \frac{x+4}{3}$
    a. *f(x)*
    b. y
    c. $\leq$
    d. 6

12. Which of the following is considered rational inequality?
    a. $x + \sqrt{3} \leq 5$
    b. $f(x) = \frac{x+5}{4}$
    c. $5 \geq \frac{x+5}{4}$
    d. $x + 2 \approx \frac{x+5}{4}$

13. Which of the following is considered rational equation?
    a. $4 + 5 = 9$
    b. $\frac{x^2+5}{x+1}$
    c. $2 = \frac{\sqrt{3x}+1}{x+2}$
    d. $2 = \frac{3x+1}{x+2}$

14. In the equation: $\frac{x+3}{x+2} = x + 5$, what symbol must be replaced with 5 to make the equation a rational function?
    a. y
    b. $\sqrt{5}$
    c. $\leq$
    d. 5x

15. What symbol is present in the equation $y = \frac{\sqrt{x^2+3}}{x+2}$ for not considering it as rational function?
    a. y
    b. =
    c. $x+2$
    d. $\sqrt{x^2+3}$

Lesson 1 Representing Real – life Situations Using Rational Functions

Rational functions can model a number of real-life situations. One particular example is the help that is extended by the government to the citizen during the time of pandemic. Majority of our fellow citizens experienced hardship and required help coming from the government. As a response, they provided a particular amount to a certain percentage of the population that can be represented as rational function to determine how much either in cash or kind an individual may receive. However, it is not enough that only the government will take part to solve this crisis everyone can be part of the solution if we played our role properly. Real-life situations that involve rational functions is mostly seen in economics and science however other disciplines also incorporate this concept. If you wonder how rational function can help, you can explore this module.

What's In

ADMISSION CARD

Listed below are the skills and competencies you should possess before proceeding to this lesson. Read the statements and assess yourself about your level of understanding by answering yes if you agree and no if otherwise.

Statement	Yes	No
1. I can represent real-life situations using function		
3. I can recognize polynomial functions		

- If your answer to all the items is yes then you are confident to proceed to the next lesson.
- If you answered no to any of the statements there is a need for you to have a quick review on the following:

Functions are used to model real life situations and in representing real – life situations the quantity of one variable depends or corresponds to or mapped onto another quantity.

Consider the examples below and reflect if you are confident enough to proceed.

1. Write a function *C* that represent the cost of buying alcohol *a*, if an alcohol costs ₱155.00

$$C(a) = 155a$$

2. A commuter pays ₱20.00 for a tricycle ride for the first 5 km and an additional ₱ 0.75 for every succeeding distance *d* in kilometer. Represent the situation as function

$$F(d) = 20, \text{ if } 0<d\leq 5$$
$$F(d) = 20 + 0.75(d), \text{ if } d>5$$

Let n be a nonnegative integer, and let $a_n, a_{n-1}, \ldots, a_2, a_1, a_0$ be real numbers with $a_n \neq 0$. The function $f(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots + a_2 x^2 + a_1 x + a_0$ is called a polynomial function of x with degree n. The coefficient a_n is called the leading coefficient, and a_0 is the constant.

Here are the examples of polynomial functions of particular degree together with their names:

Polynomial	Degree	Special Name
$f(x) = 3$	0	Constant Function
$f(x) = -2x + 1$	1	Linear Function
$f(x) = 3x^2 - 5x + 2$	2	Quadratic Function
$f(x) = 4x^3 + 2x - 7$	3	Cubic Function

At this point you may now proceed to the next section of this module!

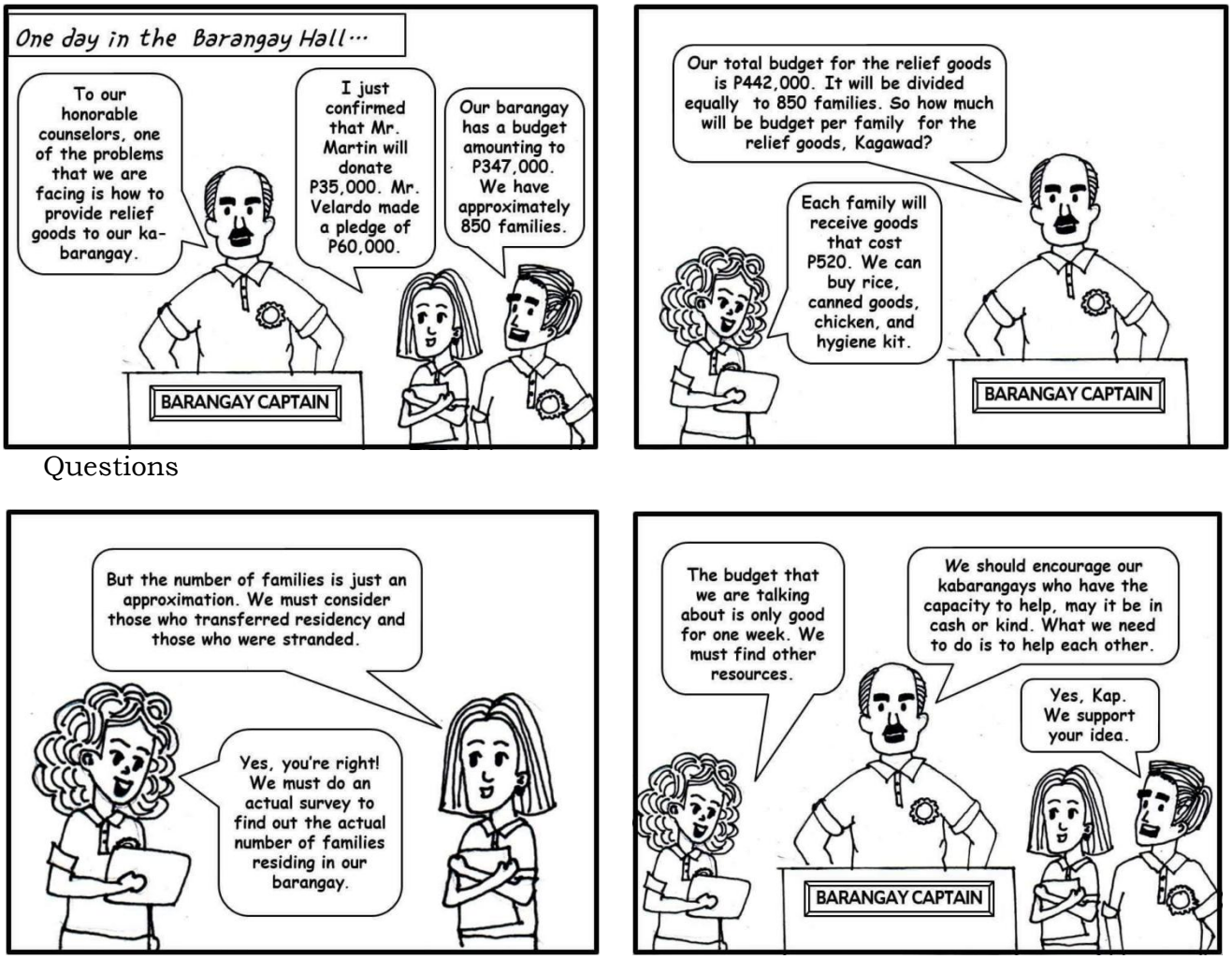
Notes to the Teacher

The teacher may reiterate the formula in finding the distance which is $d = rt$ and the other relationships derived from this formula such $r = \frac{d}{t}$ and $t = \frac{d}{r}$. These relationships will be helpful in meeting the expected outcome of this module.

What's New

Read and analyze the comics below.

LOVE IN TIMES OF COVID?



Questions

1. How much is the total amount of money the barangay can use for its relief operations?_____

2. What is the concern of one the Barangay Kagawad regarding the total number of families who will benefit with the relief? Do you think it is valid? Why?
   _____
   _____

3. Suppose the officials conducted a survey for 4 days to determine the actual number of families residing in the barangay and the secretary constructed a table to keep track of the data. Complete the table below:

Day	0	1	2	3	4
Number of Families	850	855	882	910	931
Amount of relief each family will receive	₱520.00				

4. Create a model or equation that will represent to the amount of relief each family will receive bearing in mind that the number of families will vary.

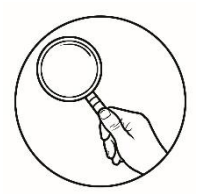
   _____

5. After resolving the amount of relief each family may receive, what other problem may arise in the current situation?

   _____

6. If you are one of the residents of that barangay what will be your participation to help the officials?

   _____



What is It

In the previous activity we see a real-life scenario, which can be analyzed mathematically. To be able to determine the amount of relief that will be distributed to 850 families we first add the donations and the total budget of the barangay. The total donations obtained is ₱95,000 while the budget of the barangay is ₱347,000 which gives a total of ₱442,000. This amount will be divided by 850 families to obtain ₱520.00 However there are cases that one quantity varies that in this case it is the total number of families. Due to unavoidable circumstances such as being stranded and change of residency we cannot control that variable. As a result, another computation was made. After the first day of survey it was determined that there are 855 families living in the barangay, then the amount of relief each family will receive will be ₱516.96. After the second day it was determined that there were 882 families living in the barangay then the amount of relief will be changed to ₱501.13. After the third day the amount of the relief will be ₱485.71 and after the fourth day it will become ₱474.76. However, we can also use a model that will represent real-life situations. In this module you will learn how to represent real-life situations using rational functions.

Definition of Rational Function

A rational function, *r(x)* is a function of the form

$$r(x) = \frac{p(x)}{q(x)}$$

where *p(x)* and *q(x)* are polynomial functions and $q(x) \neq 0$

The domain of *r(x)* is a set of real numbers such that *q(x)* is not zero.

The following are examples of rational functions:

1. $r(x) = \frac{x^3-1}{x+1}, x \neq 1$; Both numerator and denominator are polynomial functions, denominator has restriction because it should not be equal to zero

2. $f(x) = \frac{1}{x}, x \neq 0$; The numerator 1 is a polynomial function with a degree 0, the denominator is a polynomial function and it must not be equal to 0

There are different scenarios or real-world relationships that can be modeled by rational functions, let us take the following examples:

1. The Local Government Unit allotted a budget of ₱100,000.00 for the feeding program in the Day Care Center. The amount will be divided equally to all the pupils in the Day Care Center. Write an equation showing the relationship of the allotted amount per pupil represented by *f(x)* versus the total number of children represented by x

   Showing the relationship in tabular form we will arrived at

No. of children (x)	10	20	50	100	200
Allocated amount per child	₱10,000	₱5000	₱2000	₱1000	₱500

   Notice that as the number of children increase the amount allocated per child decrease.

   In writing a representation we will arrived at $f(x) = \frac{100000}{x}$

2. Suppose a benefactor wants to supplement the budget allotted for each child by donating additional ₱650.00 per child. If h(x) represents the new amount allotted per child, construct a function representing the relationship.
   Using the table we used earlier:

No. of children (x)	10	20	50	100	200
Allocated amount per child	₱10,000.00 +₱650.00	₱5000.00 +₱650.00	₱2000.00 +₱650.00	₱1000.00 +₱650.00	₱500.00 +₱650.00

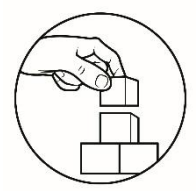
   Thus, the representation of the rational function is $g(x) = \frac{100000}{x} + 650$

3. A car is to travel a distance of 70 kilometers. Express the velocity (v) as a function of travel time (t) in hours.

Let us first show the relationship using a table. Remember that as time increases in travelling the velocity or the speed of a car will decrease

Time (hours)	1	2	3	5	10
Velocity (km/hr)	70	35	23.33	14	7

Thus, the function $v(t) = \frac{70}{t}$ can represent v as a function of t



What's More

Read each situation carefully to solve each problem. Write your answer on a separate sheet of your paper.

Independent Practice 1

School is Cool

During the first quarter of the school year the officers –elect of the Supreme Student Government decided to divide their budget evenly to the different committees. If their budget is ₱35,000 construct a function M which would give the amount of money each of the n number of committees would receive.

a. You may construct a table to aid you in determining the relationships between quantities

Number of Committees	2	4	6	8
Amount allocated for each committee				

b. Write the rational function that represents the situation

_____

Independent Assessment 1

Pastry Corner

Manuel has 10 cups of flour to be used in baking cakes, he wanted to split it evenly among the containers that he will use so that he can adjust the measurements of other ingredients. Construct a function C which would give the number of cups of flour each of the number of containers n will have.

Independent Practice 2

Medicine Dosage

Let $C(t) = \frac{3t}{t+6}$ be the function that describes the concentration of a certain medication in the bloodstream overtime *t*. If 4 hours have passed after the medicine was intake, how concentrated is it in the blood?

a. What is the rational function that serves as the model?
_____

b. How are you going to determine the concentration of the medicine given the rational function and the number of hours?
_____
_____

Independent Assessment 2

How Long

The distance between the school and your home is 5 kilometers. Express velocity (*v)* as a function of travel time *(t)* in hours

What I Have Learned

3-2-1 Action

What are the three things that help you in representing real –life situations to rational function?

1. _____

2. _____

3. _____

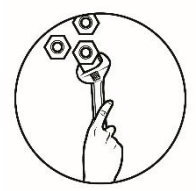
What are the two questions that you want to ask to clarify the process of translating real – life situations to rational functions

1._____

2. _____

Share one tip or suggestion on how others can represent real-life situations using rational functions

1. _____



What I Can Do

You conducted an outreach activity to help the needy in your community and have solicited ₱52,000.00. You wanted to propose a plan on how to equally divide the money and the possible relief goods that will be included. If you will make a proposal what plan will you do? Show your plan by filling up the form below:

OUTREACH PROPOSAL

Total amount Solicited: _____

Rational Function Model:_____

Possible number of beneficiaries, amount allocated and relief included

	Option 1	Option 2	Option 3
Number of Beneficiaries			
Amount allocated per beneficiary			
Relief Goods included and breakdown cost of each goods			

Rubrics for the Task

Categories	Excellent 3	Fair 2	Poor 1
Budgeting	Excellent understanding in creating a plan for spending the money	Some understanding in creating a plan for spending the money	Little to no understanding in creating a plan for spending the money
Planning	The goal set is achievable and realistic	The goal set is hard to achieve	The goal set is not achievable and not realistic
Accuracy of Solution	The computation in obtaining the desired profit using the profit function is correct	The computation in obtaining the desired profit using the profit function has flaws	There is no attempt in computing the desired profit using the profit function

Lesson 2 Rational Functions, Equations and Inequalities

It was defined in the previous lesson that rational functions are expressed as a ratio of two polynomials *P* and *Q*. The value of rational functions is defined for all real numbers *x,* except for the value of *x* that makes the denominator zero. There are different relationships between rational expressions. It may involve inequality, equality and functions and that is what we are going to dig deeper in this lesson

What's In

Admission Card

Listed below are the skills and competencies you should possess before proceeding to this lesson. Read the statements and assess yourself about your level of understanding by answering yes if you agree and no if otherwise.

Statement	Yes	No
1. I can describe a rational expression		
2. I can distinguish whether an expression is rational or not		

- If your answer to all the items is yes then you are confident to proceed to the next lesson.
- If you answered no to any of the statements, there is a need for you to have a quick review on the following:

  A rational expression can be described as a ratio or quotient of two polynomials. Let us look at the examples:

Consider the following algebraic expressions, determine whether they are rational or not and state the reason.

1. $\frac{3x^2-5x+2}{x+1}$; Rational expression because it is a ratio of two polynomials
2. $\frac{2}{x-5}$; Rational expression because 1 and *x-5* are polynomials
3. $\frac{\sqrt{x-4}}{2x+1}$; Not a rational expression since the numerator is not a polynomial
4. $x+5$; Rational expression because the numerator *x+5* and denominator 1 are polynomials

What's New

Read and analyze the advertisement below

Wanted!!!

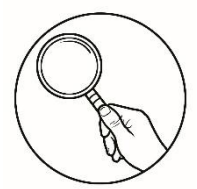
Call for Applicants for Contract of Service Workers

For the purpose of 2020 census of population and housing, Philippine Statistics Authority is hiring enumerators.

Any male or female
Age - at least 18 years old and at most 45 years old
Educational Attainment – at least SHS graduate
Salary - ₱700.00 per day
Physically fit for field work
Interested applicants must submit application letter and Personal Data Sheet (PDS) to PSA- Quezon

Questions

1. What is the advertisement all about?
   _____
2. What job is offered by PSA? _____
3. Who can apply for the position?
   _____
   _____
4. How will you translate the required age mathematically?
   _____
5. Represent the salary *(S)* that will be received as a function of number of days used for work *(n).*
   _____
6. What are the mathematical symbols that you used in answering questions numbers 4 and 5?
   _____
7. Do you think the age requirement for the job is fair enough or is there a bias? Why do you say so?
   _____
8. Why do you think having a census is important?
   _____



What is It

The job advertisement shows the need to conduct a census. Census is important because it will serve as the basis for planning for the future such as public safety, infrastructures like hospital and schools and improving homes in the neighborhood. This also serves as the basis in predicting the number of people who need help in times of crisis. However, in finding enumerators who will conduct the census, there are different qualifications needed and some of those are the age requirement and educational attainment, to represent it mathematically the use of inequality symbol was employed. However, the salary was also mentioned and to be able to represent it, equality symbol is used. At this section we will compare rational expressions using equality and inequality symbols, thus we will further classify the differences among rational equation, rational inequality and rational function.

To determine the difference among rational function, rational equation and rational inequality study the table below:

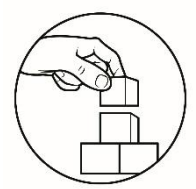
	Rational Equation	Rational Inequality	Rational Function
Definition	An equation involving rational expression	An inequality involving rational expressions	A function of the form $f(x) = \frac{p(x)}{q(x)}$ where *p(x)* and *q(x)* are polynomial functions and *q(x)* is not the zero function
Example	$\frac{x+4}{x-1} = \frac{1}{5}$	$\frac{x-2}{5} > 3$	$f(x) = \frac{x^2+6x+8}{x+4}$

Additional examples:

Determine whether the given sentence is a rational equation, a rational function, a rational inequality or none of these.

1. $\frac{x+5}{x-1} = y$; This is an example of rational function because the symbol y is also a representation of function of x or *f(x)*

2. $\frac{\sqrt{2}}{x+1} \leq 3$; None of these because $\frac{\sqrt{2}}{x+1}$ is not a rational expression



What's More

Independent Practice 1

Determine whether the given is a rational function, rational equation, rational inequality or none of these.

1. $\frac{1+x}{x-2} = 4$ _____

2. $5x \geq \frac{2}{2x-1}$ _____

3. $f(x) = \frac{x^2-7}{x+2} - 3$ _____

4. $\frac{x+2}{x-2} = y + 3$; **Hint y is represented by *f(x)*** _____

5. $\frac{x+1}{2} < \sqrt{x+3}$ _____

Independent Assessment 1

Determine whether the given is a rational function, a rational equation, a rational inequality or none of these

1. $y = 3x^2 - x - 1$
2. $\frac{3}{x} - 3 = \frac{2x}{2x+1}$
3. $\sqrt{x+5} = 2$
4. $\frac{x+5}{x-5} = x^2$
5. $6x - \frac{x}{3} \leq 2$

Independent Practice 2

Read the statements carefully and choose the letter that corresponds to the correct answer.

1. How do you classify $\frac{x+3}{x-3} = 3y$?

    a. Rational Equation

    b. Rational Function

    c. Rational Inequality

    d. None of these

2. Which of the following is an example of rational function?

a. $\frac{2x}{x^2} - 3 = \frac{22}{x+1}$

b. $\sqrt{x+2} = f(x)$

c. $\frac{2x}{x^2} - 3 > \frac{22}{x+1}$

d. $y = 2x + 3$

3. What symbol will be replaced with the equal sign in the equation $\frac{2x+5}{3x-5} = 2x^2$ to make it an inequality?

a. ~

b. ≈

c.>

d. ≡

Independent Assessment 2

Read the statements carefully and choose the letter that corresponds to the correct answer.

1. How do you classify $\frac{3x^2}{3x} \approx 3y$?

a. Rational Equation

b. Rational Function

c. Rational Inequality

d. None of these

2. Which of the following is an example of rational function?

a. $5x^3 = \frac{2}{x+4}$

b. $\sqrt{2x^2} = f(x)$

c. $\frac{2x}{x^2} - 3 > \frac{22}{x+1}$

d. $x + y = 2x + 3$

3. What symbol will be replaced with the " ≤ " sign in $\frac{2x+5}{3x-5} \leq 2x^2$ to make it a rational equation?

a. ~ c.=

b. ≈ d. ≡

What I Have Learned

3-2-1 Action

What are the distinct features of rational function, rational equation and rational inequality?

1. Rational Function

_____

_____

2. Rational Equation

_____

_____

3. Rational Inequality

_____

_____

What are the differences of the following:

1. Rational Function and Rational Equation

_____

_____

2. Rational Equation and Rational Inequalities

_____

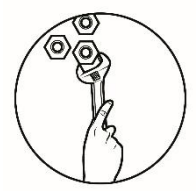
_____

Share one tip or suggestion on how to identify whether the given is a rational function, rational equation or rational inequality

1. _____

_____

_____



What I Can Do

You are analyzing your bills in MERALCO for the consecutive months. Using your bill at home express the amount per kwh *(A)* as a function of kilowatt per hour *(k)* consumed for the last two consecutive months. Then create austerity plan for the next month. (austerity- measures taken to reduce spending)

Austerity Plan

Bill for the last two consecutive months:

_____

_____

Create a rational inequality showing the relationship between the bill in the last consecutive months:

_____

List down the austerity measures to be undertaken to reduce the electricity consumption:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Rubrics for the Task

Categories	Excellent 3	Fair 2	Poor 1
Solution Process	Complete and appropriate solution process	An appropriate solution process that is partially complete	Needed extensive guidance to work on the problem
Planning	The goal set is achievable and realistic	The goal set is hard to achieve	The goal set is not achievable and not realistic
Accuracy of Solution	The computation in obtaining the desired profit using the profit function is correct	The computation in obtaining the desired profit using the profit function has flaws	There is no attempt in computing the desired profit using the profit function

Assessment

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

For numbers 1-2 refer to problem below:

Due to Typhoon Rosing the bus slows down the regular trip rate which results to additional 2 hours in covering a 140-km distance to its regular time.

1. Write a function that expresses the time t as a function of regular rate r in travelling.
   a. $t(r) = \frac{140}{r}$
   b. $t(r) = \frac{r}{140}$
   c. $t(r) = \frac{140+2}{r}$
   d. $t(r) = \frac{140}{r+2}$

2. What function expresses the time as a function of rate during the typhoon?
   a. $t(r) = \frac{140}{r}+2$
   b. $t(r) = \frac{r}{140}+2$
   c. $t(r) = \frac{140+2}{r}$
   d. $t(r) = \frac{140}{r+2}$

3. Which of the following is a rational function?
   a. $f(x) = \sqrt{5}$
   b. $f(x) = \frac{2x-5}{x-1}$
   c. $x + 4 \geq \frac{x+2}{x-1}$
   d. $\frac{x-8}{4x} = 20$

4. How will you classify $y = \frac{x^2-16}{x+4}$?
   a. Rational Equation
   b. Rational Inequality
   c. Rational Function
   d. Rational Expression

5. What symbol must be placed in the blank to make the sentence rational equation: ____ $= \frac{2x+5}{8}$
   a. *f(x)*
   b. y
   c. $\leq$
   d. 3

6. Which of the following is considered rational inequality
   a. $\sqrt{5} \leq 5$
   b. $y = \frac{x+15}{3}$
   c. $8 \geq \frac{2x+15}{14}$
   d. $x + 2 \approx \frac{x+5}{4}$

7. Which of the following is considered rational equation?
   a. 5x+ 8
   b. $\frac{x^2+25}{x+5}$
   c. $6 = \frac{\sqrt{3x}+1}{x+2}$
   d. $3 = \frac{4x+1}{2x+2}$

8. In the equation: $\frac{2x+3}{2x+2} = x + 8$, what symbol must be replaced with 8 to make the equation rational function?
   a. y
   b. $\sqrt{5}$
   c. $\leq$
   d. 5x

9. What symbol is present in the equation $y = \frac{\sqrt{3x^2+3}}{2x+2}$ for not considering it as rational function?
   a. y
   b. =
   c. $2x+2$
   d. $\sqrt{3x^2 + 3}$

10. A delivery track that will bring cargo will travel 80 kilometers. Which of the following expresses the velocity v as a function of travel time t in hours?
    a. $v(t) = \frac{80}{t}$
    b. $v(t) = \frac{t}{80}$
    c. $t(v) = \frac{80}{v}$
    d. $t(v) = \frac{v}{80}$

11. If the truck in problem no. 1 was delayed by 4 hours due to the checkpoints that it passed through what will be the time t as a function of velocity v in km/hr?
    a. $v(t) = \frac{80}{t}$+4
    b. $v(t) = \frac{t}{80}$+4
    c. $t(v) = \frac{80}{v}$+4
    d. $t(v) = \frac{v}{80} + 4$

12. As a cure to the epidemic that spread in the whole country the Department of Health (DOH) released a new drug that is subject for experimentation, supposed that $c(t) = \frac{2t}{t+2}$(in mg/mL)represents the concentration of a drug in a patient's blood stream in t hours, how concentrated is the drug after 4 hours of administration?
    a. 4.67mg/mL
    b. 3.33mg/mL
    c. 2.67mg/mL
    d. 1.33mg/mL

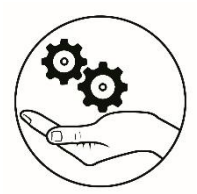
13. If the distance from Manila to Batangas is approximately 109 kilometers, which of the following pertains to the function *(s)*, where s is the speed of travel that describes the time it takes to drive from Manila to Batangas?
    a. $t(s) = \frac{109}{s}$
    b. $t(s) = \frac{s}{109}$
    c. $s(t) = \frac{109}{t}$
    d. $s(t) = \frac{t}{109}$

For numbers 14-15 use the problem below:

Due to the Enhanced Community Quarantine, Toy's for Her and Him temporarily stopped its operation and to help the employees the owner decided to split evenly its total revenue of ₱45, 000.00

14. If the number of employees is represented by x , which function represents the amount each received?
    a. $f(x) = 45000x$
    b. $f(x) = x\ + 45000$
    c. $f(x) = \frac{45000}{x}$
    d. $f(x) = x - 45000$

15. If the owner held a fund-raising activity that aimed to help her employees and collected ₱1500.00 per employee, which of the following represents the total amount an employee will receive?
    a. $f(x) = 45000x + 1500$
    b. $f(x) = x\ + 45000 + 1500$
    c. $f(x) = \frac{45000}{x} + 1500$
    d. $f(x) = x - 45000 + 1500$



Additional Activities

To strengthen your skills in determining rational functions, rational equations and rational inequality, construct five examples of each category.

Rational Equation	Rational Function	Rational Inequality
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
5. _____	5. _____	5. _____

Answer Key

Assessment

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

What's More

Lesson 1

Independent Practice 1

a.

2	4	6	8
17500	8750	5833.33	4375

b. $M(n) = \frac{35000}{n}$

Independent Assessment 1

$$C(n) = \frac{10}{n}$$

Independent Practice 2

a. $C(t) = \frac{3t}{t+6}$

b. Substitute 4 to the function;
C(4)=1.2

Independent Assessment 2

$$v(t) = \frac{5}{t}$$

Lesson 2

Independent Practice 1

1. Rational Equation
2. Rational Inequality
3. Rational Function
4. Rational Function
5. None of These

Independent Assessment 1

1.Rational Function
2. Rational Equation
3. None of These
4. Rational Equation
5. Rational Inequality

Independent Practice 2

1. B 2. D 3. C

Independent Assessment 2

1. D 2. D 3. C

What I Know

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

References

Orines, Fernando B., Next Century Mathematics. (Quezon City, Phoenix Publishing House, 2016)

Orines, Fernando B, Espargo, Mirla S. Reyes, Nestor V., Advanced Algebra, Trigonometry and Statistics (Quezon City, Phoenix Publishing House Inc.,1999)

Santos, Durwin C. & Biason Ma. Garnet P., Math Activated: Engage Yourself and Our World General Math. (Makati City, Salesiana Books by Don Bosco Press, Inc., 2016)

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