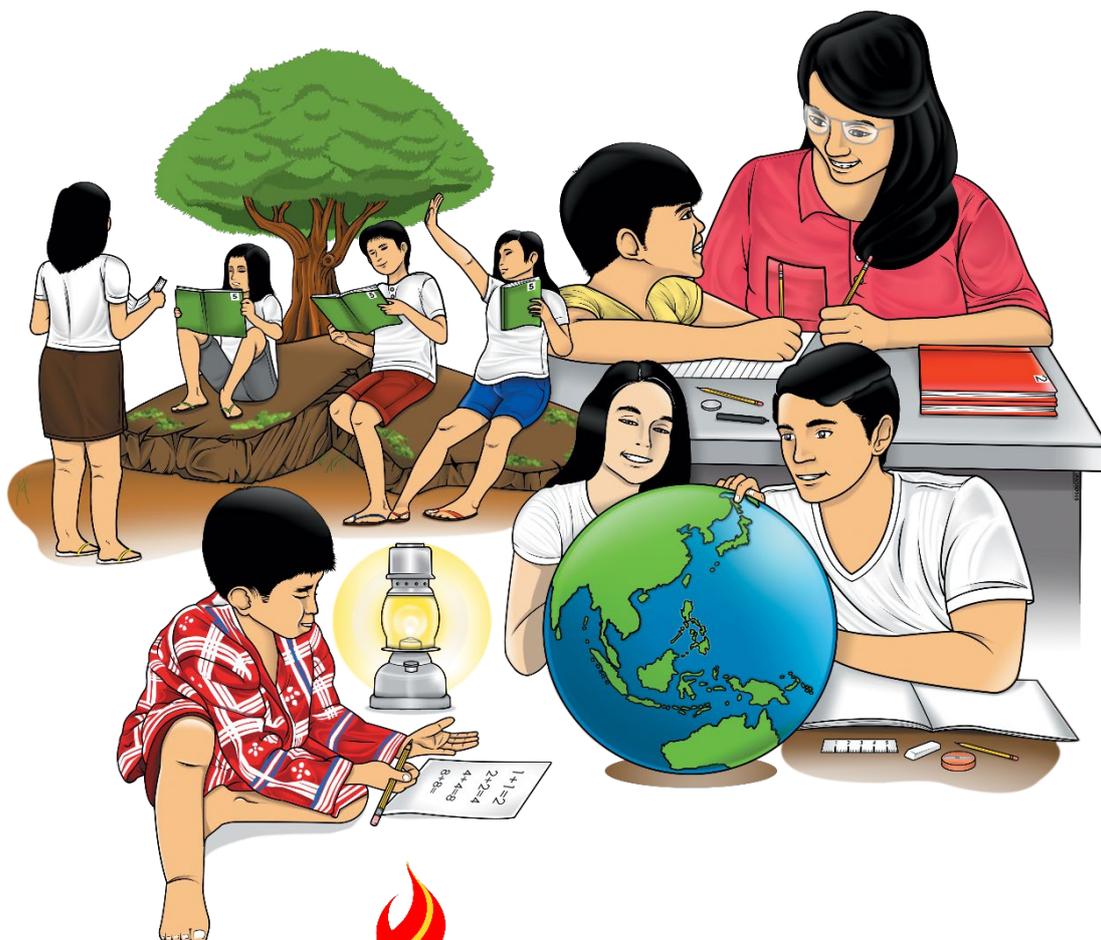


Senior High School

General Mathematics

Quarter 1 – Module 15:

Solving Real-life Problems Involving Inverse Functions



General Mathematics
Alternative Delivery Mode
Quarter 1 – Module 15: Solving Real-Life Problems Involving Inverse Functions
First Edition, 2021

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Senior High School

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Quarter 1 – Module 15:

Solving Real-life Problems

Involving Inverse Functions

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.



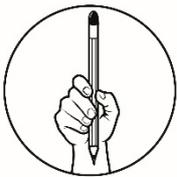
What I Need to Know

This module was intended and written to guide and help you apply inverse functions to real-life situations such as finding the original number, conversion of currency, converting units of temperature from degree Celsius to degree Fahrenheit and a lot more.

Likewise, you will learn how to evaluate inverse functions and interpret results. The knowledge and skills you have learned from the previous lessons are significant for you to solve real-life problems involving inverse functions.

After going through this module, you are expected to:

1. recall how to finding the inverse of the functions;
2. solve problems involving inverse functions; and
3. evaluate inverse functions and interpret results.



What I Know

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

1. Which of the following is the inverse $f(x) = 3x^2 + 5$?

a. $f^{-1}(x) = \sqrt{\frac{x-5}{3}}$

c. $f^{-1}(x) = \sqrt{\frac{x-3}{5}}$

b. $f^{-1}(x) = \sqrt{\frac{x+5}{3}}$

d. $f^{-1}(x) = \sqrt{\frac{x+3}{5}}$

2. Which of the following is the inverse $f(x) = 5x - 2$?

a. $f^{-1}(x) = \frac{x+5}{2}$

c. $f^{-1}(x) = \frac{x-2}{5}$

b. $f^{-1}(x) = \frac{x+5}{2}$

d. $f^{-1}(x) = \frac{x+2}{5}$

3. A study found that the relationship between the students' exam scores (x) and the number of hours they spent in studying $f(x)$ is given by the equation of function $f(x) = \frac{x-55}{10}$. Using this information, what will be the estimated number of hours that the student spent studying if he scored 85 on the test?

a. 4 hours

c. 2 hours

b. 3 hours

d. 1 hour

10. Find the angle t in degrees when x is equal to 150 meters.
- a. 25.6
 - b. 26.6
 - c. 27
 - d. 28

11. Find the angle t in degrees when x is equal to 300 meters.
- a. 48
 - b. 47
 - c. 46
 - d. 45

For items number 12-13, refer to the following:

The function defined by $g(x) = 5.3x$ converts a volume of x gallons into $g(x)$ liters.

12. Which of the following is the inverse of $g(x)$?

- a. $g^{-1}(x) = \frac{x}{5.3}$
- b. $g^{-1}(x) = \frac{x}{5x+3}$
- c. $g^{-1}(x) = \frac{5.3x}{5.3+x}$
- d. $g^{-1}(x) = \frac{3x}{5.3}$

13. Find the equivalent volume in gallons of a 40 – liter cooking oil.

- a. 9.5
- b. 8.5
- c. 7.5
- d. 6.5

For items number 14-15, refer to the following:

Joshua resides in a certain city, but he starts a new job in the neighbor city. Every Monday, he drives his new car 90 kilometers from his residence to the office and spends the week in a company apartment. He drives back home every Friday. After 4 weeks of this routinary activity, his car’s odometer shows that he has travelled 870 kilometers since he bought the car.

14. If the mathematical model that gives the distance y covered by the car as a function of x number of weeks is $y = 180x + 150$. Find its inverse.

- a. $f^{-1}(x) = \frac{x-150}{180}$
- b. $f^{-1}(x) = \frac{x-180}{90}$
- c. $f^{-1}(x) = \frac{x+510}{90}$
- d. $f^{-1}(x) = \frac{x+90}{150}$

15. If he travelled 1590 kilometers how many weeks he drives his car?

- a. 10
- b. 8
- c. 6
- d. 4

Lesson**1****Solving Real-life Problems
Involving Inverse Functions**

You have learned from your previous modules the representations inverse functions through its table of values, graphs, and equations. You also learned how to find its domain and range which are important in the study of solving real-life problems involving inverse functions. This module will help you solve real-life problems involving inverse functions.

***What's In***

Let us start your journey by recalling the previous lessons you already learned about inverse functions. Here is the list of functions and its inverse, match column B to column A by finding the inverse of the items in column A. Write the letter of the answer in the box below that will reveal a “word” or the name of the “building” that you are looking for.

The United Arab Emirates was given the title of “The Tallest Building in the World” on January 4, 2010. What is the name of the building?

Column A

1. $g(x) = x^5 - 3$
2. $f(x) = 7x + 10$
3. $h(x) = \frac{4x+1}{9x-5}$
4. $k = \frac{5}{9}(t - 32) + 273.15$
5. $w(x) = 2x + 9$
6. $t(x) = \frac{x+2}{3x-5}$
7. $r(x) = |5x|$
8. $s(x) = 2x^3 - 7$
9. $q(x) = 3x - 5$
10. $n(x) = 5x + 11$
11. $z(x) = 3t$

Column B

- R. $y = \frac{5x+1}{9x-4}$
- A. $y = \frac{t}{3}$
- A. $y = \pm\sqrt{\frac{x^2}{5}}$
- J. $y = \frac{9}{5}(k - 273.15) + 32$
- L. $y = \sqrt[3]{\frac{x+7}{2}}$
- K. $y = \frac{x-9}{2}$
- B. $y = \sqrt[5]{x+3}$
- H. $y = \frac{5x+2}{3x-1}$
- F. $y = \frac{x-11}{5}$
- I. $y = \frac{x+5}{3}$
- R. $y = \sqrt[3]{\frac{x-2}{7}}$
- U. $y = \frac{x-10}{7}$

--	--	--	--

1 2 3 4

--	--	--	--	--	--	--	--

5 6 7 8 9 10 11



What's New

Now, that you already know how to find the inverse of the function, and how to evaluate inverse functions, as well as finding the domain and range. I am confident that you are now ready for the new lesson.

Exchange Rate!

Anna's mother works in South Carolina USA as a domestic helper for a living. She sends off money in the Philippines each month. Recently the exchange was \$ 1.00 to ₱50.85.

- (a) Complete the table by converting U.S. dollar to peso

\$	1	5	25	50	100
₱	50.85				

- (b) Describe how did you convert US dollar to peso.

- (c) Write an equation that converts dollar into peso.

- (d) Write an equation that converts peso into dollar using the equation in (c).

- (e) Sketch and describe the graphs of the original function and its inverse.
Write your answer on a separate sheet of paper.

- (f) If Anna needs to buy a new laptop for her online classes, how much dollars should her mother give her if it costs ₱17,000.00?

- (g) How important the conversion of currency in real-life situations?



What is It

In the previous activity, first you need to write a model that would represent the situation. To represent the equation of converting Philippine Peso to US dollar, you need to think about the value of the US dollar as the input and the equivalent amount in peso as the output. Since the exchange rate is ₱50.85 per US dollar, then the function can be described as $\text{₱} = 50.85\text{\$}$ and its inverse as $\text{\$} = \frac{\text{₱}}{50.85}$ where ₱ and $\text{\$}$ as are the amount in peso and dollar respectively. For you to complete the table of values, you need to evaluate the function. After completing the table of values you can now sketch the graph of the function and its inverse. Remember, that the domain of the original function is the range of the inverse function and the range of the original function is the domain of its inverse. Take note, that the graph of the inverse function is the reflection of the graph of the original function about the line $y = x$.

Going back to the situation, if Anna needs to buy a new laptop for her studies, how much dollars should her mother give her if it costs ₱17,000.00? Anna's mother should consider giving her 334.32\$.

How important the knowledge of conversion of currency in real-life situations? If you are aware of the exchange rate, it is an advantage for you to choose the right institution or establishment for your money. You can calculate the amount you will receive as the less or high value after the currency is converted depending on the current exchange rates.

The inverse function is a function that switches the input and the output. But, not all functions have inverse functions. The reverse process performed by any function $f(x)$ is called inverse of $f(x)$. It means that the domain of the original function is the range of the inverse function and that the range of the original function is the domain of the inverse function.

The graph of the inverse is the reflection of the graph of the original function. The axis of symmetry is the line $y = x$.

Steps in finding the inverse of a function is given below.

To find $f^{-1}(x)$:

1. Replace $f(x)$ with y .
2. Interchange x and y .
3. Solve for the new y from the equation in Step 2.
4. Replace the new y with $f^{-1}(x)$ if the inverse is a function

For better understanding, study the examples below and reflect on the different steps to solve real-life problems involving inverse function.

Example 1

Andreau and his friend are playing a number - guessing game. Andreau asks his friend to think a positive number, then add four to the number. Next, square the resulting number, and multiply the result by 3. Finally, divide the result by 2. If you are his friend and you get a result of 50, (a) write an inverse function that will give you the original number and (b) determine the original number.

Solutions:

(a) To find the inverse, you need first to represent a model for the situation

Let x be the number that you think of

$x + 4$ represents the statement "add four to the number"

$(x + 4)^2$ represents the statement "square the resulting number"

$3(x + 4)^2$ represents the statement "multiply the result by 3"

$\frac{3(x + 4)^2}{2}$ represents the statement "divide the result by 2"

Therefore, the model for the situation is $f(x) = \frac{3(x + 4)^2}{2}$

To find the inverse.

$y = \frac{3(x + 4)^2}{2}$ Write $f(x)$ as y

$x = \frac{3(y + 4)^2}{2}$ Interchange x and y

$2x = 4(y + 3)^2$ Multiply both sides by 2

$\frac{2x}{4} = (y + 3)^2$ Multiply both sides by $\frac{1}{4}$

$\sqrt{\frac{2x}{4}} = \sqrt{(y + 3)^2}$ Get the square root of both sides

$\sqrt{\frac{2x}{4}} = y + 3$

$\sqrt{\frac{x}{2}} - 3 = y$ Apply the addition property of equality

Therefore, the inverse of the function is $f^{-1}(x) = \sqrt{\frac{x}{2}} - 3$.

(b) To find the original number, use the inverse of the function $f^{-1}(x) = \sqrt{\frac{x}{2}} - 3$, and evaluate $f^{-1}(50)$.

$$f^{-1}(50) = \sqrt{\frac{50}{2}} - 3$$

$$f^{-1}(50) = \sqrt{25} - 3$$

$$f^{-1}(50) = 5 - 3$$

$$f^{-1}(50) = 2$$

Therefore, the original number is 2.

Example 2

To convert from degrees Fahrenheit to Kelvin, the function is

$k(t) = \frac{5}{9}(t - 32) + 273.15$, where t is the temperature in Fahrenheit (Kelvin is the SI unit of temperature). Find the inverse function converting the temperature in Kelvin to degrees Fahrenheit

Solution:

The equation of the function is: $k = \frac{5}{9}(t - 32) + 273.15$

We do not interchange the variables k and t because it refers to the temperatures in Kelvin and Fahrenheit respectively.

Solve for t in terms of k :

Use the given formula

$$k = \frac{5}{9}(t - 32) + 273.15$$

$$k - 273.15 = \frac{5}{9}(t - 32)$$

Apply the addition property of equality

$$\left(\frac{9}{5}\right)k - 273.15 = \frac{5}{9}(t - 32) \left(\frac{9}{5}\right)$$

Multiply both sides by $\frac{9}{5}$

$$\left(\frac{9}{5}\right)k - 273.15 = (t - 32)$$

$$\frac{9}{5}(k - 273.15) + 32 = t$$

Apply the addition property of equality

Therefore, the inverse function is $t(k) = \frac{9}{5}(k - 273.15) + 32$ where k is the temperature in Kelvin

Example 3

The SSG officers of Camohaguin National High School are planning for a JS Prom. The allocated budget for decorations, sounds, and other miscellaneous expenses is ₱10,000.00 and an additional ₱150.00 for meal expenses for each guest. The organization received an amount of ₱40,000.00 from its external stakeholders.

- Write the total allocated budget as a function of the number of guests.
- Find the inverse of the function.
- State the domain and range for this situation.
- Find the possible number of guest for a budget of ₱40,000.00

Solutions:

(a) Let x be number of guest

$f(x)$ be the allocated budget as a function of the number of guests.

Thus, $f(x) = 10000 + 150x$

(b) To find the inverse

$$y = 10,000 + 150x$$

$$x = 10,000 + 150y$$

$$x - 10,000 = 150y$$

$$\frac{x-10,000}{150} = \frac{150y}{150}$$

$$\frac{x-10,000}{150} = y$$

Write $f(x)$ in terms of y

Interchange x and y and solve for y

Apply the addition property of equality

Divide both sides by 150

Therefore, the inverse of the function is $f^{-1}(x) = \frac{x-10,000}{150}$

(c) Use the inverse of the function to find the domain and range of the situation.

$$f^{-1}(x) = \frac{x-10,000}{150}$$

$$f^{-1}(40,000) = \frac{40,000-10,000}{150}$$

$$f^{-1}(40,000) = 200$$

Domain : $\{x \in \mathbf{N} \mid 0 \leq x \leq 200\}$

Range : $\{y \in \mathbf{R} \mid 0 \leq y \leq 40,000\}$

(d) Therefore, for a budget of ₱40,000.00, two hundred (200) students may attend the JS prom. If there are more than 200 students, the organization needs to think of other means to raise additional funds for the prom.

Example 4

A Google Play Music allows member to download songs for ₱203.40 pesos each after paying a monthly service charge of ₱762.75. The total monthly cost $C(x)$ of the service in peso is $C(x) = 762.75 + 203.40x$, where x is the number of songs downloaded.

(a) Find the inverse function

(b) What do x and $C^{-1}(x)$ represent in the context of the inverse function?

(c) How many songs were downloaded if a member's monthly bill is ₱3813.75?

Solutions:

(a) Use the given equation to find the inverse of the function.

$$C(x) = 762.75 + 203.40x$$

$$y = 762.75 + 203.40x \quad \text{Write } C(x) \text{ in terms of } y$$

$$x = 762.75 + 203.40y \quad \text{Interchange } x \text{ and } y \text{ and solve for } y$$

$$x - 762.75 = 203.40y \quad \text{Apply the addition property of equality}$$

$$\frac{x-762.75}{203.40} = \frac{203.40y}{203.40} \quad \text{Divide both sides by } 203.40$$

$$\frac{x-762.75}{203.40} = y$$

Therefore, the inverse of the function is $C^{-1}(x) = \frac{x-762.75}{203.40}$

(b) x is the total monthly cost of the service, and $C^{-1}(x)$ is the number of songs downloaded.

(c) 15 songs downloaded if a member's monthly bill is ₱3,813.75

Example 5

Maria wants to buy a particular breed of *bangus*. And she is aware that the weight W (in kilograms) of a particular breed of *bangus* is related to its length L (in centimeter). Given this function $W = (5.32 \times 10^{-3})L^2$, find its inverse and determine the approximate length of a *bangus* that weighs 0.769 kilogram

Solutions:

(a) To find the inverse

$$W = (5.32 \times 10^{-3})L^2$$

$$\frac{W}{5.32 \times 10^{-3}} = \frac{(5.32 \times 10^{-3})}{5.32 \times 10^{-3}} L^2 \quad \text{Divide both sides by } (5.32 \times 10^{-3}).$$

$$\frac{W}{5.32 \times 10^{-3}} = L^2$$

$$\sqrt{\frac{W}{5.32 \times 10^{-3}}} = \sqrt{L^2} \quad \text{Get the square root of both sides}$$

$$\sqrt{\frac{W}{5.32 \times 10^{-3}}} = L$$

Therefore, the inverse of the function is $L = \sqrt{\frac{W}{5.32 \times 10^{-3}}}$

(b) To determine the approximate length of a *bangus* that weighs 0.769 kilogram, evaluate the inverse $f^{-1}(L) = \sqrt{\frac{W}{5.32 \times 10^{-3}}}$ when $W=0.769$ kilograms

$$L = \sqrt{\frac{W}{5.32 \times 10^{-3}}}$$

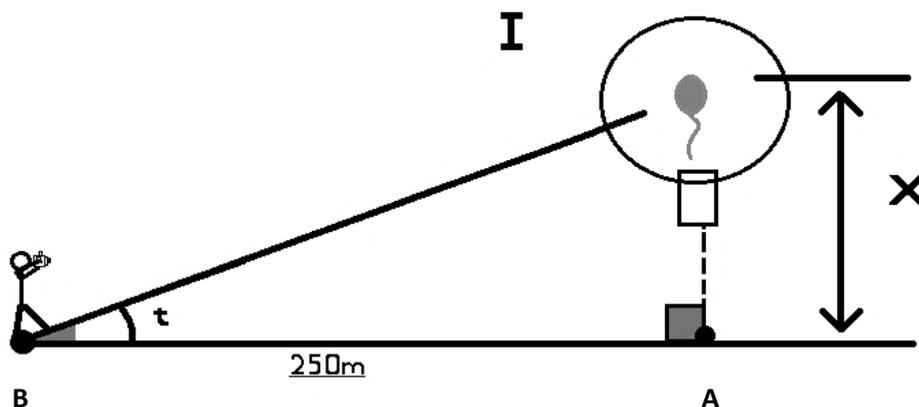
$$L = \sqrt{\frac{0.769}{5.32 \times 10^{-3}}}$$

$$L \approx 12.02$$

Therefore, the length of a particular breed of *bangus* is approximately equal to 12.02 cm.

Example 6

The balloon is rising vertically and Dennis wants to take a series of photographs. The distance between Dennis at (B) and the launching point of the balloon (A) is 250 meters. The angle of elevation must change with the height x of the balloon.



- Find the angle t as a function of the height x
- Find the angle t in degrees when x is equal to 125, 250, 500 and 1000 meters (approximate your answer to 1 decimal place)
- Graph t as a function of x .

Solutions:

- The opposite and adjacent sides to angle t are x and 250 meters.

$$\tan(t) = \frac{x}{250}$$

Use the property of the tangent function and its inverse.

$$\tan^{-1}(\tan(t)) = x$$

Rewrite the equation $\tan(t) = \frac{x}{250}$

$$\tan^{-1}(\tan(t)) = \tan^{-1}\left(\frac{x}{250}\right)$$

Simplify the left side of the equation to obtain $t = \tan^{-1}\left(\frac{x}{250}\right)$

$$\tan^{-1}(\tan(t)) = \tan^{-1}\left(\frac{x}{250}\right)$$

$$\frac{1}{\tan}(\tan(t)) = \tan^{-1}\left(\frac{x}{250}\right)$$

$$\frac{\tan \tan(t)}{\tan} = \tan^{-1}\left(\frac{x}{250}\right)$$

$$\mathbf{t = \tan^{-1}\left(\frac{x}{250}\right)}$$

Therefore, the angle t as a function of the height x is $\mathbf{t = \tan^{-1}\left(\frac{x}{250}\right)}$

- Use your calculator to find the values of 125, 250, 500, and 1000.

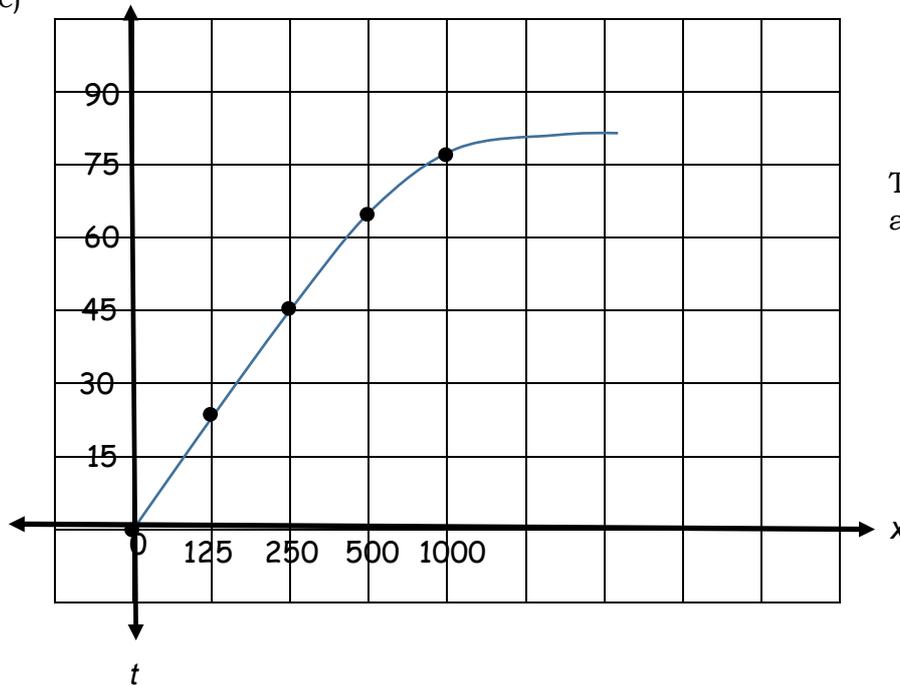
$$t(125) = \tan^{-1}\left(\frac{125}{250}\right) \quad t(250) = \tan^{-1}\left(\frac{250}{250}\right) \quad t(500) = \tan^{-1}\left(\frac{500}{250}\right) \quad t(1000) = \tan^{-1}\left(\frac{1000}{250}\right)$$

$$\mathbf{t(125) = 26.6^\circ} \quad \mathbf{t(250) = 45^\circ} \quad \mathbf{t(500) = 63.4^\circ} \quad \mathbf{t(1000) = 76^\circ}$$

Table of values

x	0	125	250	500	1000
t	0	26.6°	45°	63.4°	76°

(c)



The graph of t as a function of x



What's More

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

Activity 1.1

The ABS CBN News reports foreign exchange rate are closed on March 13, 2020 at ₱51.25. Therefore, the formula that gives Philippine Peso in terms of US dollars on that day is:

$$P = 51.25D$$

Where D represents US dollar and P represents Philippine Peso.

(a) Complete the table by converting U.S. dollar to Peso

\$	1	25	50	100	200
₱					

(b) Describe how did you convert US dollars to Peso.

(c) Find the inverse of the function to determine the value of a United States dollar in terms of Philippine Peso on March 13, 2020.

(d) Interpret and evaluate $P(1000)$ and $P^{-1}(1000)$.

Activity 1.2

The cost of producing laptops by a JOB Company is given by $C(x) = 1300x + 5500$ (in pesos) where x is the number of produced laptops.

(a) Find the inverse of the function.

(b) How many laptops will produce if the cost is ₱12,000.00?

Activity 1.3

The formula for converting Celsius to Fahrenheit is given by $F = \frac{9}{5}C + 32$ where C is the temperature in degree Celsius and F is the temperature in degree Fahrenheit.

- (a) Write the inverse of the function which converts temperature from degree Celsius to degree Fahrenheit.

- (b) Find the equivalent temperatures in degree Fahrenheit of the following 20°C , 10°C , 5°C , and 0°C .

- (c) Graph the inverse function.

Activity 1.4

Juan is making a collage, and he planned to form a circle by putting together various pieces of construction paper. Given the formula of the area of the circle $A = \pi r^2$.

- (a) Find the inverse of the area in terms of radius.

- (b) Use the inverse to find the radius of a circle with an area of 48 cm^2 .

Activity 1.5

Engineers have determined that the maximum force t in tons that a particular bridge can carry is related the distance d in meters between its supports by the following function: $t(d) = \left(\frac{12.5}{d}\right)^3$

(a) How far should the supports be if the bridge is to support 6.5 tons?

(b) Construct an inverse function to determine the result.

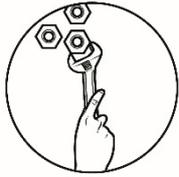


What I Have Learned

A. Fill in the blanks with the correct term or phrase to complete the sentence.

1. The domain of the original function is the _____ of the inverse functions.
2. The range of the original function is the _____ of the inverse functions.
3. The graph of the inverse is the _____ of the graph of the original function about the line $y = x$?

B. In your own words, how important is your knowledge of solving real-life problems involving inverse functions?



What I Can Do

Read and understand the situation below, and make a complete plan to solve Mang Jose's problem.

Paint My House!

Mang Jose wants to paint the exterior of his house. He needs to know how many gallons of paint he would need. So, he asks his friend Juan to help him, according to Juan one (1) gallon of paint can cover an area of 250 square feet. Help Mang Jose prepare a budget for his project if his house exterior is 2700 square feet. Do a research on the different prices of one (1) gallon of paint depending on its brand name and choice of colors. Make a proposal budget for three (3) different colors of paint with its corresponding brand name.

Your output will be graded using this rubric.

CRITERIA	EXCELLENT 4 points	SATISFACTORY 3 points	DEVELOPING 2 points	BEGINNING 1point
Accuracy of the Solution	Shows accurate solution and estimation of the possible expenses.	Shows solution and estimation of the possible expenses with minimal errors.	Shows solution and estimation of the possible expenses with plenty of errors.	The solution and estimation of the possible expenses are all erroneous.
Mathematical Concept	Shows excellent understanding of the concept of solving real-life problems involving inverse functions and other concepts related to the problem.	Shows clear understanding of the concept of solving real-life problems involving inverse functions.	Shows limited understanding of the concept of solving real-life problems involving inverse functions.	Did not apply the concept of solving real-life problems involving inverse functions.



Assessment

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

- Which of the following is the inverse $f(x) = \sqrt{\frac{x+3}{7}}$?
 - $f^{-1}(x) = 7x^2 + 3$
 - $f^{-1}(x) = 7x^2 - 3$
 - $f^{-1}(x) = 3x^2 + 7$
 - $f^{-1}(x) = 3x^2 - 7$
- Which of the following is the inverse $f(x) = 6x + 5$?
 - $f^{-1}(x) = \frac{x-5}{6}$
 - $f^{-1}(x) = \frac{x+5}{6}$
 - $f^{-1}(x) = \frac{x-2}{5}$
 - $f^{-1}(x) = \frac{x+2}{5}$
- A study found that the relationship between the number of hours (x) and the student's exam scores $f(x)$ is given by the equation of function $f(x) = 10x + 55$. Using this information, what will be the estimated number of scores of the student if he spent 4 hours in studying?
 - 95
 - 85
 - 75
 - 65
- The relationship between temperatures in degree Celsius ($^{\circ}C$) and in degree Fahrenheit ($^{\circ}F$) is given by $^{\circ}C = \frac{5}{9}(^{\circ}F - 32)$. What is the corresponding value in degree Fahrenheit of $37.78^{\circ}C$?
 - $80^{\circ}F$
 - $90^{\circ}F$
 - $100^{\circ}F$
 - $110^{\circ}F$

For items number 5-7, refer to the following:

Cath and Arvin are planning for their wedding. Cath suggested that she wants Casa de Aurora to cater their reception. The reception hall rental fee starts at a flat rate of ₱3,500.00 and an additional rental fee of ₱60.00 per guest. If their budget is limited at ₱20,000.00.

5. Which of the following represents the total rental fee as a function of the number of guests?

- a. $y = 3500 + 60x$
- b. $y = 3500 - 60x$
- c. $y = 60 + 3500x$
- d. $y = 60 - 3500x$

6. Which of the following is the inverse function in item 5?

- a. $f^{-1}(x) = \frac{x - 60}{2000}$
- b. $f^{-1}(x) = \frac{x + 50}{3500}$
- c. $f^{-1}(x) = \frac{x + 35000}{50}$
- d. $f^{-1}(x) = \frac{x - 3500}{60}$

7. What is the domain and range of the inverse?

- a. $D = \{x \in \mathbb{N} \mid 0 \leq x \leq 275\}$
 $R = \{y \in \mathbb{R} \mid 0 \leq y \leq 20,000\}$
- b. $D = \{x \in \mathbb{N} \mid 0 \leq x \leq 2000\}$
 $R = \{y \in \mathbb{R} \mid 0 \leq y \leq 10,000\}$
- c. $D = \{x \in \mathbb{N} \mid 0 \leq x \leq 160\}$
 $R = \{y \in \mathbb{R} \mid 0 \leq y \leq 20,000\}$
- d. $D = \{x \in \mathbb{N} \mid 0 \leq x \leq 10,000\}$
 $R = \{y \in \mathbb{R} \mid 0 \leq y \leq 2000\}$

8. Suppose I am travelling at 30 miles per hour, and I want to know how I have gone in x hours. Then, this could be represented by the function $f(x) = 30x$. Find the inverse of the function.

- a. $f^{-1}(x) = \frac{x}{10}$
- b. $f^{-1}(x) = \frac{x}{20}$
- c. $f^{-1}(x) = \frac{x}{30}$
- d. $f^{-1}(x) = \frac{x}{100}$

For items number 9-11, refer to the following:

Marx is standing on the ground to take a series of photographs of a kite rising vertically. The distance between Luis at (B) and the launching point of the kite (A) is 800 meters. Luis must keep the kite on sight and therefore its angle of elevation must change with height x of the kite.

9. Find the angle t as a function of the height x .

- a. $t = \tan^{-1}\left(\frac{x}{800}\right)$
- b. $t = \tan^{-1}\left(\frac{500x}{300}\right)$
- c. $t = \tan^{-1}\left(\frac{800x}{500}\right)$
- d. $t = \tan^{-1}(800)$

10. Find the angle t in degrees when x is equal to 150 meters
- 31.6
 - 21.6
 - 11.6
 - 10.6

11. Find the angle t in degrees when x is equal to 300 meters.
- 20.6
 - 21.6
 - 22.6
 - 23.6

For items number 12-13, refer to the following:

The function defined by $g(x) = \frac{x}{5.3}$ converts a volume of x liters into $g(x)$ gallons.

12. Which of the following is the inverse of $g(x)$?

- $g^{-1}(x) = 5.3x$
- $g^{-1}(x) = \frac{x}{5x+3}$
- $g^{-1}(x) = \frac{5.3x}{5.3+x}$
- $g^{-1}(x) = \frac{3x}{5.3}$

13. Find the equivalent volume in liters of a 7.5 – gallon cooking oil.

- 43
- 40
- 42
- 50

For items number 14-15, refer to the following:

Mark resides in a Quezon City, but he starts a new job in the neighbor city. Every Monday, he drives his new car 80 kilometers from his residence to the office and spends the week in a company apartment. He drives back home every Friday. After 5 weeks of this routinary activity, his car's odometer shows that he has travelled 1000 kilometers since he bought the car. (Note: He only use his car for his job.)

14. If the mathematical model that gives the distance y covered by the car as a function of x number of weeks is $y = 160x + 200$. Find its inverse.

- $f^{-1}(x) = \frac{x+150}{80}$
- $f^{-1}(x) = \frac{x-180}{90}$
- $f^{-1}(x) = \frac{x-510}{90}$
- $f^{-1}(x) = \frac{x-200}{160}$

15. If he travelled 1640 kilometers how many weeks he drives his car?
- a. 10
 - b. 9
 - c. 6
 - d. 4

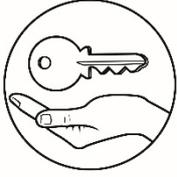


Additional Activities

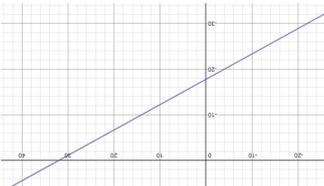
Now, that you have gained skills in representing and solving real-life situations involving inverse functions, try to sharpen your skills by working on the task below.

John pays an amount ₱12.00 per hour for using the internet at Cyber Cafe. During Saturdays and Sundays, he enjoys and spends most of his time playing online games with his friends. The maximum number of hours he spends at Cyber Café ever weekend is 4 hours.

- (a) How much will John pay for using the internet for 1 hour? 2 hours? 3 hours? 4 hours?
- (b) Make a table of values.
- (c) Write a function that relates that amount spend and the time consumed.
- (d) Find the inverse of the function in item 2.
- (e) If John has decided not to play the game in the internet café this weekend, what is the maximum amount that he would have saved?



Answer Key

<p style="text-align: center;">Assessment</p> <p>1. b 2. a 3. a 4. c 5. b 6. d 7. a 8. c 9. a 10. d 11. a 12. a 13. c 14. d 15. b</p>	<p style="text-align: center;">What's More</p> <p>1. 1 (a) answers may vary (b) Multiply the US dollars to the given exchange rate at 51.25 to obtain the amount in peso. (c) \$ = (d) P (1000) = 51,250 P⁻¹(1000) = 19.51 1.2. (a) F⁻¹(x) (b) 5 1.3. (a) F = + 32 (b) 68, 50, 41, 32 © 1.4. (a) $r = \sqrt{\frac{A}{\pi}}$ (b) 3.91 cm 1.5 (a) 6.70 meters (b) $d(t) = \frac{\sqrt{t}}{12.5}$</p> 	<p style="text-align: center;">What's In</p> <p>1. b 2. u 3. r 4. j 5. k 5. h 6. a 7. 1 8. i 9. f 10. a</p>	<p style="text-align: center;">What I Know</p> <p>1. a 2. d 3. b 4. a 5. a 6. c 7. c 8. b 9. c 10. b 11. d 12. a 13. c 14. a 15. a</p>
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