GENERAL MATHEMATICS 11

Name of Learner: _____ Grade Level: _____

Section: _____ Date: _____

LEARNING ACTIVITY SHEET

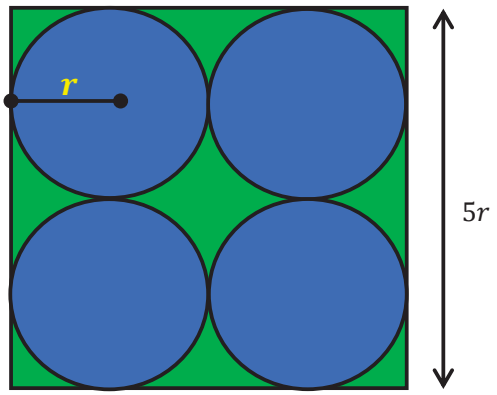
SOLVES PROBLEMS INVOLVING FUNCTIONS

Background Information for the Learners

In **solving** word **problems** involving **functions** is basically similar as evaluating a **function** for a given value.

Example 1.

The square garden below needs to be seeded around the four identical circular pools. Write a function for the area (A) that needs to be seeded in terms of the radius of the pools (r). Find the area if $\mathrm{r} = 2$.



Solution:

$Area = Area\ of\ the\ square - 4(Area\ of\ the\ circular\ pond)$

$A = (5r)^2 - 4(\pi r^2)$

$A = 25r^2 - 4\pi r^2$

If $r = 2$, then

$A = 25(2)^2 - 4\pi(2)^2$

$A = 100 - 16\pi$ square units

Note: Practice Personal Hygiene protocols at all times

Example 2.

Let f be a function defined by

$$f(x) = \begin{cases} 3x - 2 & , x < 2 \\ x^2 & , x \geq 2 \end{cases}$$

Determine the domain and range.

Solution:

The graph consists a portion of a line $y = 3x - 2$ for $x < 2$ and a portion of a parabola $y = x^2$ that opens upward for $x \geq 2$. Thus, the domain of f is all reals and range is also all reals.

Example 3.

Suppose that $P(x) = x$ shows the number of boxes delivered by a Shipping Company. The shipping fee for each box is presented by $R(x) = 250 - 10x$, for $0 < x \leq 15$. Assume further that the cost of producing x boxes is given by $W(x) = 150x$. Find:

a. $(P \bullet R)(x)$

b. $(P \bullet R - W)(x)$

Solution:

a. $(P \bullet R)(x) = x(250 - 10x) = 250x - 10x^2$, gross income for shipping x boxes

$b.(P \bullet R - W)(x) = 250x - 10x^2 - 150x = 100x - 10x^2$, net income from shipping x boxes

Example 4.

Given $h(x) = (2x^2 + 3)^3$, express h as the composition of the two functions f *and* g.

Solution:

We can write the function h as

$f(x) = x^3$ and $g(x) = 2x^2 + 3$

Since

$(f \circ g)(x) = f(g(x))$

$= f(2x^2 + 3)$

$= (2x^2 + 3)^3$

Another pair of functions holds true if:

$F(x) = (2x^2 + 3)^3$ and $G(x) = x^2$

Since

$(F \circ G)(x) = F(G(x))$

$= F(x^2)$

$= (2x^2 + 3)^3$

Learning Competency

Solves problems involving functions **(GM_M11GM-Ia-4)**

EXERCISE 1

Directions: Solve the function in the given condition. **[1 point each]**

Consider the function $f(x) = 4x - 1$, find:

1. $f(3)$
2. $f(-3)$
3. $f(0)$
4. $f(a + 1)$
5. $f(x + 1)$
6. $f(2x)$
7. $2f(x)$
8. $f(x + h)$
9. $f(x) + f(h)$
10. $\frac{f(x+h)-f(x)}{h}, h \neq 0$

EXERCISE 2

Directions: Solve the function in the given condition. Also, determine the domain of the composite function in each part **[2 points each]**

Given that $f \text{ and } g$ are defined by

$$f(x) = \sqrt{x} \text{ and } g(x) = x^2 - 4$$

1. $f \circ f$
2. $g \circ g$
3. $f \circ g$
4. $g \circ f$

Given $q(x) = \frac{1}{\sqrt{2x^3+5}}$, express q as the composition of two functions in two ways.

1. the function f contains the radical
2. the function g contains the radical

EXERCISE 3

Directions: Solve the given problems. **[3 points each]**

1. A fruit vendor charges P150. 00 per kilogram of grapes plus a fixed delivery fee of P15.00. How many kilograms of grapes can be delivered for P1000.00?

2. A bus travels along the national highway from station A to station B. It leaves station A at 10:00 am and travels at a constant speed of 70 miles per hour (mph). A car makes the same route, travelling 15 mph faster but leaving 10 minutes later. When does the car overtake the bus?

3. An open rectangular box is to be formed by cutting identical squares, each of side 2 in, one from each corner of a rectangular piece of cardboard, and then turning up the ends. If the area of the piece of cardboard is 216 in^2 and the box is to have volume 224 in^3, what should have been the dimensions of the cardboard used?

4. In Puerto Galera Island, a group of tourists decides to ride in a boat. The boat owner charges a boat ride of P1000.00 for 20 passengers only. However, for additional passengers a fee of P70.00 per head. Express the function using piecewise and how much will it cost if there are 25 passengers in all?

5. An online shop delivers soap items within and outside Isabela. An initial shipping fee of P80.00 is collected for orders amounting to P500.00 or less, an extra charge of P40.00 for items with total value between P500.00 and P1000.00 and a double initial shipping for orders costing to P1000.00 and up. Write a piecewise function representing the f amount of shipping fee for x total value of orders. How much is the shipping fee if the total amount of orders are P600.00 and P1350.00?

Reflection:

Please share your insights in this topic.

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References:

Verzosa, D.B, et.al (2016). *General Mathematics*. Quezon City, Manila
Alferez, G. S. (2014). *Introduction to Calculus*. Quezon City, Manila
Leithold, L. (1996). *The Calculus 7*. New York City.
Brown, R.G (1994*). Advanced Mathematics, Precalculus with Discrete Mathematics and Data Analysis*, Houghton Mifflin, Boston.
Rolando, M.A, et.al (2002). *Differential Calculus*. Philippines.

ANSWER KEY

EXERCISE 1

1. 11
2. -13
3. -1
4. $4a + 3$
5. $4x + 3$
6. $8x - 1$
7. $8x - 2$
8. $4x + 4h - 1$
9. $4x + 4h - 2$
10. 4

EXERCISE 2

1. $\sqrt[4]{x}$
2. $x^4 - 8x^2 + 12$
3. $\sqrt{x^2 - 4}$
4. $x - 4$

1. $f(x) = \frac{1}{\sqrt{2x+5}}$ and $g(x) = x^3$
2. $f(x) = \frac{1}{x}$ and $g(x) = \sqrt{2x^3 + 5}$

EXERCISE 3

1. 6. 57 kg

2. $t = 54\frac{2}{3}\ mins.$ The car overtakes the bus $54\frac{2}{3}\ mins.$ after the bus departure, i.e. $10{:}\,54\frac{2}{3}\ a.m.$

3. 8 in. by 14 in.

4.

$$f(x) = \begin{cases} 1000 & ,0 < x \leq 20 \\ 1000 + 70(x - 20) & ,x > 20 \end{cases}$$

At x = 25, the charge is P 1, 350.00

5.

$$f(x) = \begin{cases} 80 & ,0 < x \leq 500 \\ 80 + 40 & ,500 < x < 1000 \\ 2(80) & , x \geq 1000 \end{cases}$$

At x = 600, the shipping fee is P120.00 and at x = 1350, the fee is P160.00