GENERAL MATHEMATICS 11

Name: ____________________ **Grade Level:** ____
Date: _____________________ **Score:** _________

Learning Activity Sheet
LOGARITHMIC FUNCTION

Background Information for Learners

In your previous lessons, you have studied about logarithmic functions, equations and inequalities. Today you will encounter some applications of these in real life situation. Problems involving compound interest are some of the many applications of logarithms.

Before the age of electronic calculators and digital computers, logarithms were used widely for difficult computations like finding the products, quotients, or powers of numbers represented by complicated decimal numerals.

In this activity sheet you will be able to learn about solving problems involving logarithmic functions, equations and inequalities. I believe this is not new to you since you already have background on functions, equations and inequalities plus you have also the ability to solve problems. Remember problems solved using exponential functions are computed more easily by logarithms.

This is a self-paced material for grade 11 where students can check and recheck their understanding and progress about the topic. It is an enjoyable material where 'learning is fun' can be experienced.

Let's get started!

Example 1: To find x in $3^x = 8$

$$\log 3^x = \log 8$$
$$x \log 3 = \log 8$$
$$x = \frac{\log 8}{\log 3}$$
$$= \frac{0.9031}{0.4771}$$
$$\text{so } x = 1.89$$

Easy, right? It is just an application of the different properties of logarithm.

Example 2: Find $\log_4(x+1) < \log_4 2x$

Ensure first that the logarithms are defined, this means x+1 > 0 and 2x > 0, which implies, x > - 1 and x > 0, or just simply x > -1.

$$\log_4 (x+1) < \log_4 2x$$

$$x + 1 < 2x$$
$$x - 2x < -1$$
$$-x < -1$$
$$x > 1$$

Therefore, the solution is $(1, +\infty)$

Example 3: To find the new principal after 8 years on an investment of P200.00 earning 8% interest compounded semi annually, use the formula $P = P_0 (1 + r/2)^{2t}$

Given $P = 200 (1 + 0.08/2)^{16}$ plugged-in the given in the problem to the formula

then, $\log P = \log [200 \times (1.04)^{16}]$
$= \log 200 + 16 \log 1.04$
$= 2.3010 + 0.2720$
$= 2.5730$

Therefore, $P = 374$

The new principal after 8 years would be Php 374, to nearest peso.

Example 4: A particular virus grows according to the formula $\mathbf{A = A_0e^{kt}}$, where A is the population of the virus after time t, and A_0 is the initial population at t = 0. Suppose there were 2000 viruses at the start of the experiment. After 3 hours, there were already 320 more that three times the initial number of viruses present. Determine the constant ***k***. Express to the nearest hundredths.

Solution: *After 3 hours, there were already 320 more than 3 times the initial number*
That is, 3 (2000) + 320 = **6320**. Use this value to solve for ***k*.**

$$6320 = 2000e^{3k}$$
$$e^{3k} = 3.16$$
$$\ln e^{3k} = \ln 3.16$$
$$3k = \ln 3.16$$
$$k = \frac{\ln 3.16}{3}$$
$$k = 0.38$$

Thus, the rate of growth of the virus is 0.38.

So, are you ready to take the activity?

Learning Competency 1: The learner solves problems involving logarithmic functions, equations and inequalities. (**M11GM-Ij-2)**

Activity 1: Take it Easy ☺

Directions: Find the value/s of x in the following equations.

1. $\log 2^x = \log 6$
2. $\log_x 121 = 2$
3. $\log_3 (x + 4) = \log_3 (2x – 4)$
4. $\log x^2 = 2$
5. $\log (3x - 2) = \log 2$

Activity 2: "Ensure it's defined!"

Directions: Find the solution in the following inequalities.

1. $\log_8 (3x - 5) < 2$
2. $\log_{x-2} (10- +3x) < 2$
3. $\log x (x^3 –x^2 – 2x) < 3$
4. $\log_5 (3x - 1) < 1$
5. $\log_4 x + 8 \geq 11$

Activity 3: "Solve me"

Directions: Solve the following problems.

1. If the interest were added yearly to the amount invested at 12%, every peso would grow to $(1.12)^n$ in ***n*** years. Find the amount to which P250.00 increases in 10 years if invested under the same conditions.

2. If the number (N), in thousands, of bacteria in a culture is given by the equation N = 3 x 8^t where t is measured in hours. After how many hours will the number of bacteria be 100 thousands?

3. The approximate population of a certain city in the Philippines was 460,000 in1970. In 1980, it was 630,000. Estimate the population this 2020.

4. In 2005, it was estimated that for the succeeding 20 years the population of a particular town was expected to be f(t) people t years from 2005, where f(t) = C * 10^{2t} , and C and k are constants. If the actual population in 2005 was 1000 and in 2010 was 4000, what is the expected population this 2020?

5. A radioactive substance is decaying according to the formula $y = Ae^{kx}$, where x is the time in years. The initial amount A = 10 grams, and 8 grams remain after 5 years. Estimate the amount remaining after 10 years.

Reflection

Evaluate your understanding about solving logarithmic functions, equations and inequalities. Which is easy? Difficult? Why?

Answer:

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References:

Conceptual Math and Beyond General Mathematics Philippine Copyright 2016 ISBN 978-621-8006-33-1

DIWA Senior High School Series Philippine Copyright 2016 ISBN 978-971-46-0782-8

General Mathematics LM, 2016 Functions for High School ISBN 971-101-050-X

Answer Key

ACTIVITY 1

1. 2.58
2. 11
3. 8
4. -10, 10
5. 3/4

ACTIVITY 2

1. (5/3, 23)
2. (-2,3) U (3, 10/3)
3. 3. (2, ∞)
4. (1/3, 2)
5. (-∞, 64)

ACTIVITY 3

1. 0.005
2. 1.69
3. 2,211,058
4. 64,000
5. 6.40 grams