Integrated Math 3
Unit 8: Exponential & Logarithmic Functions
8.2

Name: ______________________

Date: ____________ Period: ______

Objective: To solve equations with uncommon bases and to convert between different forms

Warm Up

Simplify: $27^{x+1} * \left(\frac{1}{3}\right)^{x-2} * 9^x$

Solve: $4^{x+1} = 16^{2x-4}$

Simplifying and solving equations provide nice neat solutions in the questions above because the expressions can be written with a common base. If two random numbers are chosen, the chances are relatively small that they share a common base, though.

Let's Investigate!

Estimate the value of the variable to the nearest hundredth.

A.) $2^x = 5$

B.) $3^a = 25$

C.) $5^y = 15$

D.) $4^b = 3$

E.) $10^y = 500$

F.) $2 \cdot 3^x - 4 = 5$

The **logarithm** is the inverse operation to exponentiation. That means the **logarithm** of a number is the exponent to which another fixed value, the base, must be raised to produce that number.

$$b^x = a$$ is equivalent to: $$\log_b a = x$$

"a base to an exponent gives you an answer" "log with a base of an answer gives you an exponent"

This will provide you with a more efficient way of solving for the variables!!!

Example 1:
Rewrite each equation below in logarithmic notation.

A.) $2^x = 5$ B.) $3^a = 25$ C.) $5^y = 15$

D.) $4^b = 3$ E.) $10^y = 500$ F.) $2 \cdot 3^x - 4 = 5$

In order to solve for the variables, we will use something called the "change of base" formula:

Change of Base Formula:

(How to solve for an exponent when you do not common bases)

If given: $b^x = a$
Then: $\log_b a = x$
Which implies: $x = \frac{\log a}{\log b}$

Example 2:
Find the exact value for the variable to the nearest hundredth.

A.) $2^x = 5$ B.) $3^a = 25$ C.) $5^y = 15$

D.) $4^b = 3$ E.) $10^y = 500$ F.) $2 \cdot 3^x - 4 = 5$

Let's Practice!

Example 3:
Complete the table by switching back & forth between exponential form and logarithmic form.

Exponential Form	**Logarithmic Form**
$4^2 = 16$	
	$\log_1 1 = 99$
	$\log_2 256 = 8$
$3^0 = 1$	
	$\log 100 = 2$
$a^b = c$	

Example 4:
Rewrite the logarithmic form to exponential form & then evaluate/solve each one.

A.) $\log_3 9 = x$

B.) $\log_2 \frac{1}{16} = x$

C.) $\log_4 1 = x$

D.) $\log_2 x = -3$

E.) $\log_x 16 = 2$

F.) $\log_x \frac{1}{9} = -2$