Math 3

2.5 Equations without Logs

Unit 2

SWBAT solve equations initially without logarithms by using either similar bases or the properties of logs.

Solving equations with NO logs!

Method 1: Similar Bases

(Note: Does not work for every problem)

Step 1: Isolate the Base

Step 2: Write both sides of the equation as an exponential with like bases.

Step 3: Set exponents equal to each other.

Step 4: Solve for the unknown.

Example 1: $2^{2x+1} = 32^{x}$

Example 2: $-5 + 5^{3x-9} = 120$

Example3: Solve for x: $3^{2x} = 27$

You Try! Solve for x: $2^{x} = 8$

Why would you need to use a log? Because the variable is in the _____ and logs bring them down!!

Method 2: Properties of Logs

Step 1: Make sure the piece with the unknown exponent is _____ on one side.

Step 2: _____ the logarithm to each side.

Step 3: Use the _____ to bring down the exponent and solve!

Example 1: Solve for x: $5^{3x} = \frac{1}{125}$

You Try! Solve for x: $2^{5x+1} = 32$

Example 2: Solve for x: $3^{x} + 5 = 40$

You Try! Solve for x: $2(6^{2x}) = 20$

The Many Ways to Solve a Logarithmic Equation

One Log	**SWOOSH!** Use when a variable is attached to the logarithm.	Solve for x: $\log_4(4x - 2) = 3$
	Change of Base Use when the variable is <u>not</u> attached to the logarithm.	Solve for x: $\log_2 45 = x$
Two Logs	**Cancel the logs!** Do this if and only if there is <u>one</u> log per side.	Solve for x: $\log_6 x = \log_6 2x - 2$
	Condense the logs So that only one log appears per side. Then, decide whether to cancel, swoosh, or use change of base.	Solve for x: $3\log_2 x + \log_2 5 = 7$
No Logs	**Add a Log!** Use this if you cannot get similar bases.	Solve for x: $7^{x-3} + 5 = 30$
	Similar Bases! Break each base down so that they are the same, cancel the bases, and work only with the exponents!	Solve for x: $25^{2x} = 125$

Practice: Complete the following problems for extra practice using the above rules for solving logarithms.

1. $2\log_4 x = 12$
2. $\text{Log } 5x - \log 7 = 2$
3. $\log_5 15 = 3x$
4. $4^{3x} \cdot 4^{2x} = 1048576$