Math 3 **6.3 Equations without Logs** Unit 6

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

**Solving equations with NO logs!**

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| **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:** 22x + 1 = 32x

**Example 2:** -5 + 53x – 9 = 120

**Example3:** Solve for x: $3^{2x}=27$$2^{x}=8$

**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!!

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| **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

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| One Log | **SWOOSH!**Use when a variable is attached to the logarithm. | Solve for x: log4(4x – 2) = 3 |
| **Change of Base**Use when the variable is not attached to the logarithm. | Solve for x: log245 = x |
| Two Logs | **Cancel the logs!**Do this if and only if there is one log per side. | Solve for x: log6 x = log6 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: $3log\_{2}x+log\_{2}5=7$ |
| 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. 2log4x = 12
2. Log 5x – log 7 = 2
3. log515 = 3x
4. $4^{3x}∙4^{2x}=1048576$