Exponential and Logarithmic Equations

- Two methods for solving exponential equations:
  1. Try writing them so that the bases are all the same.
  2. Take the logarithm of both sides.

I Try:

Example #1: **Solve using both methods. Check your answer.**

$$\mathbf{3^{2x} = 27}$$

Example #2: Take Log to both sides

$$\mathbf{4^{x-1} = 5}$$

$$\log 4^{x-1} = \log 5$$

We Try:

Example #3: **Solve by creating the same base. Check.**

$$\mathbf{9^{8-x} = 27^{x-3}}$$

We Try:
Example #3: **Solve by taking log to both sides.**

$$\mathbf{5^{x-2} = 200}$$

You try with your partner:
Odd Talk, Even Write (Worth Participation points)
Solve $\mathbf{4^{3x-1} = 8^{x+1}}$

A **logarithmic equation** is an equation with a logarithmic expression that contains a variable.

- If $\log_b x = \log_b y$, what can we say about x and y? Explain!

I Try:
Example #4:
$\mathbf{\log_6(2x - 1) = -1}$

I Try:
Example #5:
$\mathbf{\log_{12} x + \log_{12}(x + 1) = 1}$

We Try:
Solve
$\log_3(x-5)=2$

We Try:
$\mathbf{Log\,45x - \log_3 = 1}$

You try with your partner:
Odd Write, Even Talk (Worth Participation points)

$\mathbf{\log_4 100 - \log_4(x+1) = 1}$

Decide if each problem can be solved using an exponential model. Explain why and what model you would use.

1. A single cell divides every 5 minutes. How long will it take for one cell to become more than 10,000 cells?

2. Mattie runs at a constant rate of 6mi/hr and she ran 10 miles. How long did it take her to run the 10 miles?

3. You receive one penny on the first day, and then triple that (3 cents) on the second day, and so on for a month. On what day would you receive at least a million dollars?

4. Suppose a bacteria culture doubles in size every hour. How many hours will it take for the number of bacteria to exceed 1,000,000?