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.

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

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

Example #2: **Solve by creating the same base.**

$$4^{3x-1} = 8^{x+1}$$

You try: **Solve** $9^{8-x} = 27^{x-3}$

Example #3:

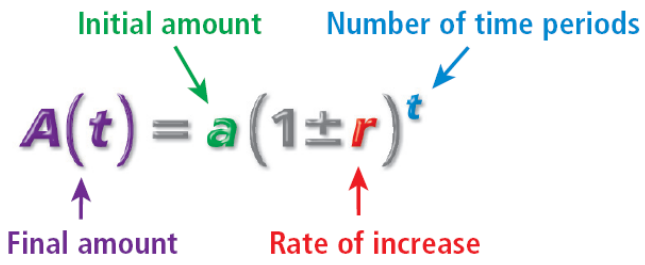
$4^{x-1} = 5$

You try: $3^{x+2} = 7$

Exponential Function Word Problems

Example #1:

An electric scooter purchased for $1000 depreciates at an annual rate of 15%. What will the scooter be worth after 6 years?



Example #2:

Caroline invests $5000 in an account that pays 6.25% interest per year.

A) After 8 years of investing, will she have $10,000 saved? Explain.

B) How many years will it take for her to have $11,000 saved?

You try: The value of Kimberly's $3000 computer decreases about 30% each year. Write a model to represent the value of her computer if Kimberly wants to sell it on Craig's List.

A) Use your model to predict the value after 4 years of owning it.

B) After how many years will her computer be worth $1500?

Solving Logarithmic Equations

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?

Example #1:

$\log_6(2x - 1) = -1$

Example #2:

$\log_{12}x + \log_{12}(x + 1) = 1$

You try: $\log_4 100 + \log_4(x + 1) = 1$