

## 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?

The diagram shows the exponential function formula  $A(t) = a(1 \pm r)^t$  with four labels and arrows pointing to the corresponding parts of the formula:

- Initial amount** (green text, arrow pointing to  $a$ )
- Number of time periods** (blue text, arrow pointing to  $t$ )
- Final amount** (purple text, arrow pointing to  $A(t)$ )
- Rate of increase** (red text, arrow pointing to  $r$ )

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  $y$ ?

Lesson 24-2

Example #1:

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

Example #2:

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

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