

Solve Exponential Growth and Decay Applications**Exponential Growth**

$$y = P(1+r)^t$$

Exponential Decay

$$y = P(1-r)^t$$

$y =$ <u>end amount</u>	
$P =$ <u>Initial amount</u>	
$t =$ <u>time (years, months, etc)</u>	
$r =$ <u>rate (as a decimal)</u>	$r =$ <u>rate (as a decimal)</u>
$1+r =$ <u>growth factor</u>	$1-r =$ <u>decay factor</u>

In 2000, the cost of tuition at a state university was \$4300. During the next 8 years, the tuition rose 4% each year.

- Write a model that gives the tuition y (in dollars) t years after 2000.

$$y = 4300(1 + .04)^t$$

- What is the growth factor?

Growth factor is 1.04

- How much would it cost to attend college in 2010? In 2015?

Step 1 Identify variables:

$y =$ unknown

$r = 4\% = .04$ as a decimal

$t = 10$ years (from 2000 to 2010).

Step 2: substitute variables into the formula.

$$y = 4300(1 + .04)^{10}$$

Step 3: plug the numbers into the calculator to solve.

$y = \$6354.05$ (round to the nearest hundredth when talking about money).

Step 1 Identify variables:

$y =$ unknown

$r = 4\% = .04$ as a decimal

$t = 15$ years (from 2000 to 2015)

Step 2: substitute variables into the formula.

$$y = 4300(1 + .04)^{15}$$

Step 3: plug the numbers into the calculator to solve.

$y = \$7744.06$ (round to the nearest hundredth when talking about money).

Solve Exponential Growth and Decay Applications

4. How long it will take for tuition to reach \$9000?

Step 1: Label variables

$$y = \$9000$$

$r = 4\% = .04$ as a decimal

$t = \text{unknown}$

Step 2: Substitute variables into the growth formula.

$$9000 = 4300(1 + .04)^t$$

Step 3: You will have to do a guess and check method by plugging in different numbers for t .

Step 4: The tuition reaches \$9000 between the years 18 and 19.

A 2010 Honda Accord, depreciates at a rate of 11% per year. The car was purchased for \$25,000.

5. Write a model the gives the value of the car y (in dollars) t years after

Step 1: Label variables ^{2010.}

$$y = \$25000$$

$r = 11\% = .11$ as a decimal

$t = \text{unknown}$

Step 2: Substitute variables into the growth formula.

$$y = 25000(1 - .11)^t$$

6. What is the decay factor?

The decay factor is .89

7. How much is the car worth now? In 2020?

Step 1: Label variables

$$y = \$25000$$

$r = 11\% = .11$ as a decimal

$t = 10$ years (2010 to 2020)

Step 2: Substitute variables into the growth formula.

$$y = 25000(1 - .11)^{10}$$

Step 3: plug the numbers into the calculator to solve.

$y = \$7795.43$ (round to the nearest hundredth when talking about money).

8. How long did it take for the car to be worth half?

Step 1: Label variables

$$y = \$25000$$

$r = 11\% = .11$ as a decimal.

$t = 10$ years (2010 to 2020)

Step 2: Substitute variables into the growth formula.

$$y = 25000(1 - .11)^t$$

Step 3: You will have to do a guess and check method by plugging in different numbers for t .

The worth would be half between 5 and 6 years.

9. Given the equation $y = 25(0.73)^x$

a.) Is this a growth or decay function? Growth (if the number in the parenthesis has a decimal and is less than 1 it is a decay function due to $(1 - r)$).

b.) What is the growth or decay rate? The decay rate is 27%

c.) What is the initial value? The initial value is 25

d.) Evaluate when $x = 3$. $y = 25(0.73)^3$ This comes out to be 9.73