

# 8-8 Exponential Growth and Decay

Remember for exponential functions, the general formula that we use is:

$$y = a \cdot b^x$$

Consider the following example:

1. Cassandra bought an antique dresser for \$500. If the value of her dresser increases 6% annually, what will be the value of Cassandra's dresser at the end of 3 years to the *nearest dollar*?

**For this example, the starting amount = \$500 and the time = 3 years, but what is the rate?**

Calculate these exponential expressions to determine which makes sense.

$$d = 500 \cdot (.06)^3$$

$$d = 500 \cdot (1.06)^3$$

$$d = 500 \cdot (6)^3$$

$$d = 500 \cdot (106)^3$$

When given a percentage of increase or decrease, what must we do to calculate our rate?

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**Calculate the rate for the following situations.**

1. A car decreases in value by 10% each year after the car leaves the lot.

2. Jerry's savings account earns 3.75% interest each month.

3. The interest on Mr. Falci's investment compounds 8% annually.

4. How much Iodine-131 is left after 5 half-lives.

5. Mary's boat depreciates 5  $\frac{1}{4}$ % in value each year.

Let's Try a Couple

Write and solve an exponential equation to model each situation.

1. Suppose the population for a city is 50,000 people and is growing 3% each year. Use your equation to predict the population in 25 years.

2. Since 1985, the average annual cost  $y$  (in dollars) for tuition and fees at public two-year colleges in the U.S. has increased about 6.5% per year. In 1985, tuition and fees were an average of \$584 per year. Predict the annual cost for 2015.

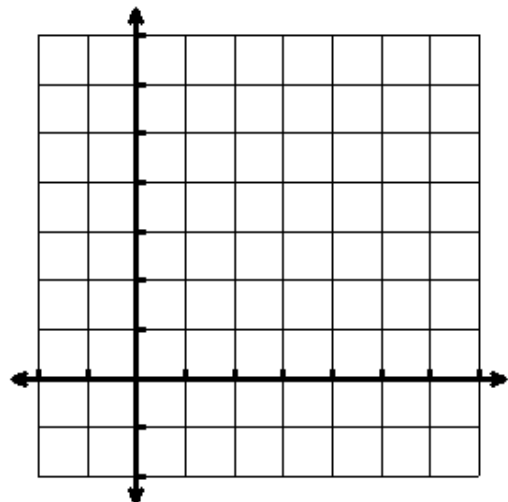
3. The Booster Club raised \$30,000 for a sports fund. No more money will be placed into the fund. Each year the fund will decrease by 5%. Determine the amount of money, to the *nearest cent*, that will be left in the sports fund after 4 years.

4. The New York Volleyball Association invited 64 teams to compete in a tournament. After each round, half of the teams were eliminated.

Write an exponential function to represent the number of teams,  $t$ , that remained in the tournament after  $r$  rounds?

Graph your function over an appropriate scale.

How many rounds must be played to award a champion?



Write and solve an exponential equation to model each situation.

1. The current student population of the Brentwood Student Center is 2,000. The enrollment at the center increases at a rate of 4% each year. To the *nearest whole number*, what will the student population in 3 years'?

2. Kathy plans to purchase a car that depreciates (loses value) at a rate of 14% per year. The initial cost of the car is \$21,000. Predict the value of the car, *to the nearest cent* of the car after 3 years?

3. The population of Henderson City was 3,381,000 in 1994, and is growing at an annual rate of 1.8%. If this growth rate continues, what will the approximate population of Henderson City be in the year 2000?

4. This table shows information about the population of two countries in South America.

<b>Country</b>	<b>Population (estimated in 1994)</b>	<b>Annual Population Growth Rate</b>
Chile	14,000,000	1.7%
Ecuador	10,782,000	4.5%

Will the population of Ecuador surpass the population of Chile in 20 years?