Exponential Growth (Day 6–3)

$$y = ab^x$$

- "***a***" is the ________________ value, population, number, etc.
- "***b***" is the growth/decay _____________ .

  "***b***" will either be 1 + rate (growth) or 1 – rate (decay).

  Recall: To turn a percent to a rate move decimal place ___________________, or divide by ________.
- "**x**" is usually refers to _____________ , unless otherwise stated.

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1. The population of the country of Oz was 600,000 in the year 2010. The population is expected to grow by a factor of 5% annually. The annual food supply of Oz is currently sufficient for 700,000 people and is increasing at a rate which will supply food for an additional 10,000 people per year.

   a) Write a formula to model the population of Oz. Is your formula linear or exponential?

   b) Write a formula to model the food supply. Is the formula linear or exponential?

2. In the 2000-2001 school year, the average cost for one year at a four-year college was \$16,332, which was an increase of 5.2% from the previous year. If this trend were to continue, write a function to model the cost, $C(x)$, of a college education x years from 2000 and:

   a) Find $C(4)$. Explain what $C(4)$ represents in words.

   b) If this trend continues, how much would parents expect to pay for their new born baby's first year of college? (Assume the child would enter college in 18 years.)

3. In 1993, the population of New Zealand was 3,424,000, with an average annual growth rate of 1.3%. Suppose that this growth rate were to continue.

   a) Express the population *P* as a function of *n*, the number of years after 1993.

   b) Estimate New Zealand's population in the year 2010.

4. Do the examples below require a linear or exponential growth model? Write a function that models the growth for each case.

   a) A savings account that starts with \$5000 and receives a deposit of \$825 per month.

   b) The value of a house that starts at \$150,000 and increases by 1.5% per year.

   c) An alligator population starts with 200 alligators and every year, and it grows by a factor of $\frac{9}{7}$ each year.

   d) The temperature increases by 2°F every hour from 8:00 a.m. to 4:00 p.m. for a July day that has a temperature of 66°F at 8:00 a.m.

Classwork 6–3

1. A three-bedroom house in Burbville was purchased for $190,000. If housing prices are expected to increase by 1.8% annually in that town, write a function that models the price of the house in t years. Find the price of the house in 5 years.

2. In 1995, there were 85 rabbits in Central Park. The population increased by 12% each year. How many rabbits were in Central Park in 2005?

3. The value of an early American coin increases in value at the rate of 6.5% annually. If the purchase price of the coin this year is $1,950, what is the value to the nearest dollar in 15 years?

4. In 1985, there were 285 cell phone subscribers in the small town of Centerville. The number of subscribers increased by 75% per year after 1985. How many cell phone subscribers were in Centerville in 1994?

5. Ben & Jerry are going to Dairy Queen to order ice cream. They only brought dimes, quarters, and half dollar coins with them. In order to pay their bill of $3.85, they used 2 more half dollar coins than quarters and also used twice as many dimes than quarters. How many of each coin did they use to pay?

6. In a piggy bank there are only dimes and nickels. If all together there are 40 coins that total $2.50 in value, how many of each coin are there in the bank?