CHAPTER 8: EXPONENTS & EXPONENTIAL FUNCTIONS

Section 8 Part 2 -Exponential Decay
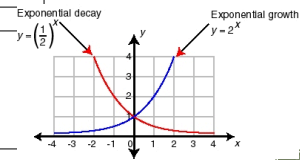
OBJECTIVES

- ❑ I can model exponential decay

## VOCABULARY

Exponential Function	Exponential Decay
A function in the form $y = a \cdot b^x$ a = y-intercept b = growth factor	An exponential function where the growth factor is greater than 0 but less than 1
EXAMPLE	**EXAMPLE**
In $y = 3 \cdot 0.95^x$ what is the growth factor? Where does it cross the y-axis?	

Exponential decay
$y = \left(\frac{1}{2}\right)^x$

Exponential growth
$y = 2^x$

NOTES
PART 1: EXPONENTIAL DECAY

6. The graph below shows an exponential decay relationship.

(0, 300)
(1, 100)
(2, 33⅓)
(3, 11⅑)
(4, 3⁷⁄₂₇)
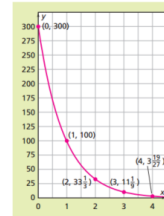
a. Find the decay factor and the y-intercept.
b. What is the equation for the graph?

PART 1: EXPONENTIAL DECAY

1. A different flea medicine breaks down at a rate of 20% per hour. This means that as each hour passes, 20% of the active medicine is used. The initial dose is 60 milligrams. Extend and complete this table to show the amount of active medicine in an animal's blood at the end of each hour for 6 hours.

Breakdown of Medicine

Time Since Dose (hr)	Active Medicine in Blood (mg)
0	60
1	■
2	■
⋮	⋮
6	■

PART 1: EXPONENTIAL DECAY

Milk Consumption Since 1980, the number of gallons of whole milk each person in the United States drinks each year has decreased 4.1% each year. In 1980, each person drank an average of 16.5 gallons of whole milk per year.

a. Write an equation to model the gallons of whole milk drunk per person.

b. Use your equation to find the approximate consumption per person of whole milk in 2000.

PART 1: EXPONENTIAL DECAY

Medicine The half-life of a radioactive substance is the length of time it takes for one half of the substance to decay into another substance. To treat some forms of cancer, doctors use radioactive iodine. The half-life of iodine-131 is 8 days. A patient receives a 12-mCi (millicuries, a measure of radiation) treatment. How much iodine-131 is left in the patient 16 days later?

In 16 days, there are two 8-day half-lives.

After one half-life, there are 6 mCi left in the patient.

After two half-lives, there are 3 mCi left in the patient.

PART 1: EXPONENTIAL DECAY

4 **a.** How many half-lives of iodine-131 occur in 32 days?
b. Suppose you start with a 50-mCi sample of iodine-131. How much iodine-131 is left after one half-life? After two half-lives?
c. **Chemistry** Cesium-137 has a half-life of 30 years. Suppose a lab stored a 30-mCi sample in 1973. How much of the sample will be left in 2003? In 2063?

CAN YOU?? PROVE IT!!

❑ Model exponential decay

Statistics In 1990, the population of Washington, D.C., was about 604,000 people. Since then the population has decreased about 1.8% per year.

a. What is the initial number of people?

b. What is the decay factor?

c. Write an equation to model the population of Washington, D.C., since 1990.

d. Suppose the current trend in population change continues. Predict the population of Washington, D.C., in 2010.