Algebra 1

Chapter 9: Exponents and Exponential Functions

**9e: Exponential Growth and Decay Functions**

 **a:** Starting value **b:** Multiplier.

‘b’ ALWAYS starts at 100%. ‘b’ is the percent REMAINING.

If the function ***grows***, we ***add*** the extra percent to the 100%.   
If the function ***decays***, we ***subtract*** the extra percent from the 100%.

**Given the following information, create**  **equations. (Remember, write the percent as a decimal!)**

**1)** Growth of 1.5% starting at 867 million

**3)** Growth of 0.52% starting at 50 mg

**2)** Decay of 16% starting at 200 cm

**4)** Decline of 3% starting at 2 billion

**Given the following equations, label them as either growth or decay AND give the percent increase or decrease of each.**

**5)** 

Growth or Decay?

Percent increase/decrease?

**7)** 

Growth or Decay?

Percent increase/decrease?

**6)** 

Growth or Decay?

Percent increase/decrease?

**8)** 

Growth or Decay?

Percent increase/decrease?

**Given the following information, create**  **equations. (Remember, write the percent as a decimal!)**

**9)** Growth of 10% starting at 120000

**11)** Growth of 6% starting at 287

**10)** Decay of 5% starting at 8000

**12)** Decline of 12% starting at 10,000.

**13)** Automotive

A new truck depreciates at about 10% per year (on average) If I buy a Jeep Wrangler for $23,995, write an equation that represents this situation.

1. Next = Now \_\_\_\_\_\_ starting at \_\_\_\_
2. y =
3. What would be the value of the truck after 5 years (assuming I didn’t wreck it)?

**14)** Penicillin (the 1st antibiotic) has a 40% decay in 1 hour.

a) Find the percent of penicillin in the blood after 2 hours.

b) How long does it take for the amount of penicillin in the blood to drop below 15%

**15)** Medical

Over the past several years, all sorts of sports have had doping scandals. One of the popular steroids is testosterone cypionate. It has a half-life of 14 days. Usually the initial dose is an injection of 250 mg.

a) After you stop taking the steroids, how much is still in your bloodstream after 2 weeks?

b) When will the amount of extra testosterone in the bloodstream be below 20 mg?

**16)** Carbon-14

Carbon-14 dating is a reliable method of determining the age of organic objects up to 40,000 years old. Carbon-14 is a radioactive form of carbon (found in carbon-dioxide) that has a half-life of about 5,700 years. This means that half of the carbon-14 is converted to non-radioactive carbon every 5700 years. For example, it can be concluded that an organic object with half as much carbon-14 as its living counterpart died 5700 years ago. Every 5700 years, half of the remaining amount of carbon-14 decays.

1. Fill in the following table.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Years | 0 | 5700 | 11400 | 17100 | 22800 | 28500 | 34200 |
| Number of 5700 year increments | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Percent of Carbon-14 remaining | 100 |  |  |  |  |  |  |

1. If an object has 10% of its carbon-14 remaining, how old is it?

**17)** Radioactive Strontium-90

Radioactive materials have many important uses in the modern world, from fuel for power plants to medical x-rays and cancer treatments. But the radioactivity that produces energy and tools for “seeing” inside our bodies has some dangerous effects too, for example, it can cause cancer in humans.

The radioactive chemical strontium-90 is produced in many nuclear reactions. It’s a byproduct of the fission of uranium and plutonium. Extreme care must be taken in transportation and disposal of this substance. It decays rather slowly—if any amount is stored at the beginning of a year, 97.6% of that amount will still be present at the end of that year.

1. If 100 grams (about 0.22 pounds) of strontium-90 are released due to an accident (as in the Chernobyl and Fukushima nuclear accidents), how much of that radioactive substance will still be around after 1 year? After 2 years? After 3 years?
2. Write two different equations that can be used to calculate the amount of strontium-90 remaining at any year in the future, from an initial 100 grams. (Next,Now and y,x)
3. Use one of the equations in part b to find the amount of strontium-90 left from an initial amount of 100 grams after 100 years.