

Algebra 2/Pre-Calculus

More Word Problems (Day 3, Exponentials)

Name _____

In this handout, we will continue our study of exponential word problems. **Note:** Unless otherwise stated, assume all problems in this handout follow an exponential model.

1. Annika put \$3500 into a bank account. Three years later, she had \$3700 in her account.
 - a. Write a function giving the amount of money in the bank account as a function of time. **Hint:** Start with the equation $f(x) = ab^x$ and determine the values for a and b .

- b. What is the growth rate? Give your answer as a percent.

- c. When does the amount of money in Annika's account exceed \$4200?

Answers a. $f(x) = 3500(1.019)^x$ b. 1.9% c. 9.69 years

2. When Nathan bought his car, it was valued at \$19,000. Five years later, the value of the car had decreased to \$11,000.

- a. Write a function giving the value of the car as a function of time.

- b. What percent of the value was lost each year?

- c. What percent of its value does the car retain each year?

Answers a. $f(x) = 19000(0.896)^x$ b. 10.4% c. 89.6%

- e. Here's a way you could solve the last problem:

$$f(x) = ab^x$$

$$2a = ab^{10}$$

$$2 = b^{10}$$

$$1.072 = b$$

So the growth rate is 7.2%

Amelle invests some money in a bank account. 12 years later, the amount of money in the account had doubled. What was the annual growth rate?

- f. Takuro invested some money in a bank account. 14 years later, the amount of money in his account had tripled. What was the annual growth rate?

- g. Which is better: An investment that doubles in value in 5 years or an investment that triples in value in seven years?

- c. What percent of element A decays every year?
- d. Element B has a half life of 8 years. A chunk of element B currently weighs 7 kg. How many years will it take before only 2 kg of element B remains?
- e. **(Optional Challenge)** When will the amount of element A be equal to the amount of element B?

Answers a. 6 kg, 3 kg, 1.5 kg b. $f(x) = 12(0.87)^x$ or $f(x) = 12(\frac{1}{2})^{x/5}$ c. 13%

d. 14. 46 years e. 10.37 years

7. **(Optional challenge)** A radioactive element has a half life of 10 years. After 13 years, there are 100 grams of the element remaining. How many grams of the element were there at the start?

Answer: 246.23

d. Miriam drank a glass of Coke. Three hours later, 20 mg of caffeine still remained in her body. If Miriam's body metabolizes 19% of the caffeine each hour, how much caffeine did she start with?

e. At noon, Glenn drank a cappuccino. By 5:30, his body had metabolized half the caffeine. What percent of the caffeine was metabolized each hour?

Answers a. 42.3 mg b. 14.6 hours c. 9.6% d. 37.6 mg e. 11.8%