

**Classwork: Word Problem Practice**

Use your knowledge of exponential functions to answer the following questions. Show your work, especially equations written to assist in finding solutions.

$$A = P \left( 1 + \frac{r}{n} \right)^{n \cdot t}$$

1. How much will your investment be worth if \$5,000 is invested for three years at 8.2% compounded semi-annually?

$$\$ 6363.18$$

$$A = 5000 \left( 1 + \frac{.082}{2} \right)^{2 \cdot 3}$$

2. How much will your investment be worth if \$90,000 is invested at a rate of 5% compounded quarterly for two years?

$$\$ 99,403.75$$

3. The population of a bacteria culture doubles after 1 hour. An experiment begins with 620 bacteria. Determine the number of bacteria after

a. 3 hours

$$y = 620(2)^3 = 4960$$

b. 1 day

$$y = 620(2)^{24} = 1.04 \times 10^{10}$$

~~1 week~~



4. The population of Littleton is currently 23,000. Assume that Littleton's exponential growth rate is 2% per year.

- a. Complete the table by predicting the population for the next six years.

Time (years)	0	1	2	3	4	5	6
Population	23,000	23,460	23,929	24,408	24,896	25,394	25,902

- b. Create the equation to model the equation.  $y = 23000(1 + .02)^x$

- c. Use your equation to predict the population in 10 years.

$$\cancel{y} = 28,037 \text{ people}$$

- d. Use your calculator to estimate how long it will take the population will reach 30,000.

$$14 \text{ years}$$

- e. Predict the population of Littleton after 10 years if the growth rate is increased to 3%.

$$y = 23000(1 + .03)^{10} = 30,910 \text{ people}$$

5. An old stamp is currently worth \$60. The stamp's value will grow exponentially 15% per year.

- a. What will the value of the stamp be in 8 years?  $\$ 183.54$

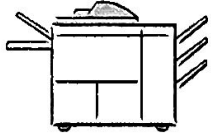
$$y = 60(1 + .15)^x$$

- b. When will the value of the stamp be worth 3 times the initial value?

$$8 \text{ years}$$

6. A photocopier, which originally costs \$500,000, depreciates exponentially by 10% each year.

a. What will the photocopier's value be worth in 5 years?  $\$295,245$



b. When will the photocopier's value be \$175,000?

10 years

7. An exponential function is expressed in the form  $y = a(b)^x$ . How can you tell whether the relation represents growth or decay?

If  $b$  is greater than 1 = growth

If  $b$  is less than 1 = decay

8. Identify if the following situations represent sequences that are growing or decaying geometrically or arithmetically.

Situation	Growing or Decaying?	Write an Equation	Linear or Exponential?
a. A Car's value depreciates by 40% each year.	Decay	$y = a_0(1-.4)^x$	exponential
b. The new high school is adding 40 students each year.	Grow	$y = 40x$	Linear
c. You invest \$1,000.00 at an annual interest rate of 4.8% each year.	Grow	$A = 1000(1+.048)^t$	exponential