Algebra 1 | Unit 10: Exponential Functions | Practice

Day 7: Applications of Exponential Functions | **Name:** Key

Practice Assignment

Growth: $y = a(1+r)^t$	Decay: $y = a(1-r)^t$	Compound Interest: $y = P\left(1+\frac{r}{n}\right)^{n \cdot t}$
Key Words: Increase, Gains, Appreciate, Grows	Key Words: Decreases, Loses, Depreciates, Decays	Key Words: Compound interest

Directions: Create an exponential model and use it to solve each problem.

Example 1: Russell's health and fitness blog is really taking off. The blog had 45,000 commenters (a) this month and the number of commenters has consistently gone up by 10% (r) per month. How many commenters can Russell expect to have in 5 months? (t) growth

$y = 45{,}000(1+.10)^t$

$y = 45{,}000(1.1)^t$

$y = 45{,}000(1.1)^5$

$y = 72{,}473$ commenters

Example 2: A pot of soup, currently at 84°C is left out to cool. If that temperature decreases by 5% per minute, what will the temperature be in 5 minutes? (t) decay (r)

$y = 84(1-.05)^t$

$y = 84(.95)^t$

$y = 84(.95)^5$

$y = 65°C$

Example 3: The population of a small town started at 233 (a) people in 1999. If the population grows at a rate of 16% per year, how many people are now in the town in 2006? (t = 7) growth (r)

$y = 233(1+.16)^t$

$y = 233(1.16)^t$

$y = 233(1.16)^7$

$y = 659$ people

Example 4: $3000 is deposited in an account that pays 4% annual interest compounded monthly. How much will be in the account after 20 years?

$P = \$3{,}000$, $r = .04$, $n = 12$, $t = 20$

$A = 3{,}000\left(1+\frac{.04}{12}\right)^{12t}$ model

$A = 3{,}000(1+.00333)^{12 \cdot 20}$

$A = \$6667.21$

Example 5: $3000 is deposited in an account that pays 4% annual interest compounded quarterly. How much will be in the account after 20 years?

$P = \$3000$, $r = .04$, $n = 4$, $t = 20$

$A = 3{,}000\left(1+\frac{.04}{4}\right)^{4t}$ model

$A = 3{,}000(1+.01)^{4 \cdot 20}$

$A = \$6650.15$

Example 6: Raheem was offered two different jobs as a webmaster. Each job had different starting annual salaries and different increases each year. The table shows the salaries for the first few years. Use this information to answer questions 11–13. Round all answers to the nearest dollar.

Year	Job A	Job B
1	$30,000.00	$24,000.00
2	$30,660.00	$25,080.00
3	$31,334.52	$26,209.00

$\frac{30,660}{30,000} = 1.022$ $\frac{25,080}{24,000} = 1.045$

Answer the following questions about Job A:

a. What is Raheem's annual pay raise percent?

102.2% → 2.2% pay raise

b. Create an equation to represent Job A:

$y = 30,000(1.022)^t$

c. What is the annual salary for the 5th year?

$y = 30,000(1.022)^5$

$y = \$33,448.43$

Answer the following questions about Job B:

a. What is Raheem's annual pay raise percent?

104.5% → 4.5% pay raise

b. Create an equation to represent Job B:

$y = 24,000(1.045)^t$

c. What is the annual salary for the 5th year?

$y = 24,000(1.045)^5$

$y = 29,908.37$

d. At what year will Job B pay a higher annual salary than Job A?

At the 11th year, Job B will pay more (used table on calculator)

Example 7: The value of a rare baseball card increases every year at a rate of 4%. Today, the card is worth $300. The owner expects to sell the card as soon as the value is over $600. How many years will the owner wait before selling the card? ~~Round your answer to the nearest whole number.~~ → y

$y = 300(1.04)^t$

use table to find when y-value is about $600.

$t \approx 17$ to 18 years

Example 8: A bank A, $600 is invested with an interest rate of 5% compounded annually. At Bank B, $500 is invested with an interest rate of 6% compounded quarterly. Which account will have more money at the end of 10 years?

Bank A

$A = 600\left(1 + \frac{.05}{1}\right)^{1 \cdot 10}$

$A = \$977.34$

Bank B

$A = 500\left(1 + \frac{.06}{4}\right)^{4 \cdot 10}$

$A = \$907.00$

Bank A will have more money after 10 years.