Algebra 2

Application Problems

Name: KEY

Date: ______ **Period:** ______

$A = P(1+r)^t$ $\quad A = P\left(1+\frac{r}{n}\right)^{nt}$ $\quad A = Pe^{rt}$ $\quad A = P(1-r)^t$

Use the appropriate formula for each exponential growth/decay problem.

1.) In 1995, there were 85 rabbits in Central Park. The population increased by 12% each year. How many rabbits were in Central Park in 2005?

$A = P(1+R)^t$

$A = 85(1+.12)^{10}$

$A = 263$

2.) Each year the local country club sponsors a tennis tournament. Play starts with 128 participants. During each round, half of the players are eliminated. How many players remain after 5 rounds?

$A = P(1-R)^t$

$A = 128(1-.5)^5$

$A = 128(.5)^5$

$A = 4$

3.) During normal breathing, about 12% of the air in the lungs is replaced after one breath. Write an exponential decay model for the amount of the original air left in the lungs if the initial amount of air in the lungs is 500 mL. How much of the original air is present after 240 breaths?

$A = P(1-R)^t$

MODEL: $A = 500(1-.12)^t$

$A = 500(1-.12)^{240}$

$A = .0000000000237$ or 2.37×10^{-11}

4.) The foundation of your house has about 1,200 termites. The termites grow at a rate of about 2.4% per day. After 29 days, how many terminates will be in the foundation of your house?

$A = P(1+R)^t$

$A = 1200(1+.024)^{29}$

$A = 2387$

5.) The population of Winnemucca, Nevada, can be modeled by $P = 6191(1.04)^t$ where t is the number of years since 1990.

a.) What was the population in 1990?

$P = 6191(1.04)^0$

$P = 6191$

b.) By what percent did the population increase by each year?

4%

c.) How many people lived in Winnemucca in 2001?

$P = 6191(1.04)^{11}$

$P = 9530$

$A = P(1+r)^t$ $\quad$ $A = P\left(1+\frac{r}{n}\right)^{nt}$ $\quad$ $A = Pe^{rt}$ $\quad$ $A = P(1-r)^t$

6.) Most cars decrease in value after you leave the dealer. However, some cars are now considered "classics" and actually increase in value. You have the choice of owning two cars:

A 2006 Mazda Maita which is worth $19,000 but is depreciating 10% per year, or a classic 1970 Ford Mustang which is worth $11,500 and is increasing in value by 6% each year.

Your tasks:

a.) Write an equation to represent the value of each car over time.

Ford

$A = 19000(1 - .10)^t$

$A = 19000(.90)^t$

$A = 11500(1 + .06)^t$

$A = 11500(1.06)^t$

b.) Complete the table to represent the value of each car for ten years

CAR	0	1	2	3	4	5	6	7	8	9	10
MAZDA	19000	17100	15390	13851	12466	11219	10097	9087.60	8178.90	7361	6624.90
MUSTANG	11500	12190	12921	13697	14518	15390	16313	87292	18329	19429	20595

c.) Using the information from the table, determine when the Mazda and the Ford will have the same value. (Estimate) and explain your reasoning.

BOTH CARS WOULD HAVE THE SAME VALUE BETWEEN YEARS 3 AND 4

d.) Using your equations from part (a), find the value of the Mazda and the Ford after 15 years.

MAZDA

$A = 19000(.90)^{15}$

$A = \$3911.93$

FORD

$A = 11500(1.06)^{15}$

$A = \$27560.42$

Use the appropriate formula for simple and compound interest.

7.) You deposit $1600 in a bank account. Find the balance after 3 years for each of the following situations:

a.) The account pays 2.5% annual interest compounded monthly.

$A = 1600\left(1 + \frac{.025}{12}\right)^{12 \cdot 3}$

$A = \$1724.48$

b.) The account pays 1.75% annual interest compounded quarterly.

$A = 1600\left(1 + \frac{.0175}{4}\right)^{4 \cdot 3}$

$A = \$1686.05$

c.) The account pays 4% annual interest compounded yearly.

$A = 1600\left(1 + \frac{.04}{1}\right)^{1 \cdot 3}$

$A = \$1799.78$

$A = P(1+r)^t$ $\quad A = P\left(1+\frac{r}{n}\right)^{nt}$ $\quad A = Pe^{rt}$ $\quad A = P(1-r)^t$

8.) If you invest $2,000 at an annual interest rate of 13% compounded continuously, calculate the final amount you will have in the account after 20 years.

$A = Pe^{Rt}$

$A = 2000e^{(.13 \cdot 20)} \rightarrow A = \$26927.48$

9.) Kelly plans to put her graduation money into an account and leave it there for 4 years while she goes to college. She receives $750 in graduation money that she puts it into an account that earns 4.25% interest compounded semi-annually. How much will be in Kelly's account at the end of four years??

$A = 750\left(1 + \frac{.0425}{2}\right)^{2 \cdot 4}$

$A = \$887.40$

10.) A newborn child receives a $5000 gift towards a college education from her grandparents. How much will the gift be worth in 17 years, if it in invested at 7% compounded quarterly?

$A = 5000\left(1 + \frac{.07}{4}\right)^{4 \cdot 17}$

$A = \$16267.11$

11.) You receive a $5000 gift which you want to invest for 3 years. Should you choose an investment paying 4.5% interest compounded monthly or one paying 4.25% interest compounded continuously?

$A = 5000\left(1 + \frac{.045}{12}\right)^{12 \cdot 3}$

$A = \$5721.24$

$A = 5000e^{.045 \cdot 3}$

$A = \$5722.68$

CHOOSE COMPOUNDED CONTINUOUSLY

12.) If $8000 is invested in an account that pays 4% interest compounded continuously, how much is in the account at the end of 10 years?

$A = 8000e^{.04 \cdot 10}$

$A = \$11934.60$

13.) A necklace is appraised at $6300. If the value of the necklace has increased at an annual rate of 7%, how much was it worth 15 years ago?

$6300 = P(1 + .07)^{15}$

$P = \$2283.41$

14.) William wants to have a total of $4000 in two years so that he can put a hot tub on his deck. He finds an account that pays 5% interest compounded monthly. How much should William put into this account so that he'll have $4000 at the end of two years?

$4000 = P\left(1 + \frac{.05}{12}\right)^{12 \cdot 2}$

$P = \$3620.10$

15.) Suppose that you plan to need $10,000 in three years when your child starts attending university. You want to invest in an instrument yielding 3.5% interest, compounded monthly. How much should you invest?

$10000 = P\left(1 + \frac{.035}{12}\right)^{12 \cdot 3}$

$P = \$9004.62$