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CC ALGEBRA 2 TROICI

LESSON #1: LOG WORD PROBLEMS

Do Now:

1. A loan for $8,000 compounds yearly at a rate of 2.5%. What will the cost of the loan after 3 years? *(HINT: Use the formula $A = P(1 + r)^t$)*

$A=?$ $t=3$
$P=8000$
$r=.025$

$A = 8000(1+.025)^3 = \boxed{\$8615.13}$

2. A house purchased 5 years ago for $100,000 was just sold for $135,000. Assuming exponential growth, approximate the annual growth rate, to the *nearest percent*. *(HINT: Use the formula $A = P(1 + r)^t$)*

$A=135{,}000$
$P=100{,}000$
$r=?$
$t=5$

$\frac{135000}{100000} = \frac{100{,}000(1+r)^5}{100{,}000}$

$(1.35)^{1/5} = ((1+r)^5)^{1/5}$

$1.0618 = 1 + r$
$-1 \quad -1$

$\boxed{r = .0618 \text{ OR } \approx 6\%}$

Compounded **Annually**	Compounded **Semi-annually/ quarterly/ weekly/monthly/daily**	Compounded **Continuously**
$A = P(1 \pm r)^t$ A= final amount P= initial amount r= rate as a decimal	$A = P(1 \pm \frac{r}{n})^{nt}$ A= ~~initia~~ final P= initial r = rate as decimal t = time n = compounded	$A = Pe^{rt}$ A= Final P= initial r= rate as a decimal

t = time **SOLVING FOR AN EXPONENT? USE LOGS!!!!!!!!!** t = time

1. Find the time, to the nearest year, required for a $7500 investment to double at an interest rate of 7.25% compounded annually.

→ growth → +

$A = 15000$
$P = 7500$
$r = .0725$
$t = ?$

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

$\frac{15000}{7500} = \frac{7500(1+.0725)^t}{7500}$

convert to LOG! → $2 = (1.0725)^t$

$t = \log_{1.0725} 2$

$t = 9.9031$ → $\boxed{t = 10 \text{ years}}$

2. Going away on a family vacation of four to Disney World is very expensive. The cost of the trip is $5,500. If you put $1,000 into an account at a .5% annual interest rate compounded monthly, how long, to the nearest tenth, will it take you to save up for this trip?

A P r n = 12 t

$A = 5500$
$P = 1000$
$r = .005$
$n = 12$
$t = ?$

$A = P(1 + \frac{r}{n})^{nt}$

$\frac{5500}{1000} = \frac{1000(1 + \frac{.005}{12})^{12t}}{1000}$ → calc.

convert to LOG! → $5.5 = (1.0004)^{12t}$

$12t = \log_{1.0004} 5.5$

$\frac{12t}{12} = \frac{4092.2444}{12}$ → $\boxed{t = 341.0 \text{ yrs}}$

3. Grace invests \$6,000 in a CD at an annual rate of 8% compounded continuously. P $r=.08$ $A=Pe^{rt}$

a) Determine, to the nearest dollar, the amount of money she will have after 5 years. $\rightarrow t$

$A = 6000e^{(.08)(5)} \rightarrow$ calc

$\boxed{A = \$8951}$

b) Determine how many years, to the nearest year, it will take for her investment to triple.

$\frac{18000}{6000} = \frac{6000e^{.08t}}{6000}$ $\quad \hookrightarrow A = 6000 \times 3$, $A = 18000$

convert to LN!

$3 = e^{.08t}$

$\frac{.08t}{.08} = \frac{\ln 3}{.08}$

$t = 13.73$ yrs

$\boxed{t = 14 \text{ years}}$

Partner Practice:

4. Depreciation of a cars value can be determined by the formula $V = C(1-r)^t$, where V is the value of the car after t years, C is the original cost, and r is the rate of depreciation. If a cars cost, when new, is \$15,000, the rate of depreciation is 30%, and the value of the car now is \$3,000. How old is the car to the nearest tenth of a year? C $\hookrightarrow r = .30$ $\hookrightarrow V$ $\hookrightarrow t$

$\frac{3000}{15000} = \frac{15000(1-.30)^t}{15000}$

$.2 = (.7)^t$

$t = \log_{.7} .2 \rightarrow \boxed{t = 4.5 \text{ years}}$

5. Sabrina is saving for a new car which will cost \$15,000. If she puts \$5,000 in an account which earns a 10% interest compounded semi-annually, how long will it take her to save enough money to buy the car? Round to the nearest year. A P $r=.10$ $\hookrightarrow n=2$ $\hookrightarrow t=?$

$A = P(1+\frac{r}{n})^{nt}$

$\frac{15000}{5000} = \frac{5000(1+\frac{.10}{2})^{2t}}{5000}$

$3 = (1.05)^{2t}$

$2t = \log_{1.05} 3$

$\frac{2t}{2} = \frac{22.5170}{2}$

$t = 11.2585$

$\boxed{t = 12 \text{ years}}$

6. Luke invests \$10,000 at an annual rate of 5% compounded continuously. P $r=.05$ $A = Pe^{rt}$

a) Determine, to the nearest dollar, the amount of money he will have after 2 years. $\hookrightarrow t$

$A = 10{,}000e^{(.05)(2)}$

$A = 11051.70918$

$\boxed{A = \$11{,}052}$

b) Determine how many years, to the nearest year, it will take for his investment to double.

$\frac{20{,}000}{10000} = \frac{10000e^{.05t}}{10000}$ $\quad A = 20{,}000$

$2 = e^{.05t}$

$\frac{.05t}{.05} = \frac{\ln 2}{.05} \rightarrow t = 13.8629$

$\boxed{t = 14 \text{ years}}$