P. 42-43 Solving Log Equations Applications

Get sheet from front to glue in to notebook!

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Warm-up:

Solve each equation by writing in logarithm form. Make sure you are first in exponential form. If necessary, round to the nearest hundredths.

1.) $\frac{5 \cdot 18^{6x}}{5} = \frac{25}{5}$

$18^{6x} = 5$

$\log_{18} 5 = 6x$

$\frac{\log 5}{\log 18} = 6x$

$\frac{.56}{6} = \frac{6x}{6}$ $x = .09$

2.) $11^{n-8} - 5 = 54$

$+5 \quad +5$

$11^{n-8} = 59$

$\log_{11} 59 = n-8$

$\frac{\log 59}{\log 11} = n-8$

$1.7 = n-8$

$+8 \quad +8$

$9.7 = n$

3) $\frac{5\log_2(x+3)}{5} = \frac{15}{5}$

$\log_2(x+3) = 3$

$2^3 = x+3$

$8 = x+3$

$-3 \quad -3$

$5 = x$

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Remember the Zombies?

8) How long would it take for the zombies to take over the world if the population is 6,975,000,000, we started with 5 zombies, and the exponential growth continues until the last human is turned. (Hint: set up an equation)

$\frac{6,975,000,000}{5} = \frac{5 \cdot (3)^x}{5}$

$1,395,000,000 = (3)^x$

When the variable is part of the exponent and we cannot use mental math to solve, rewrite into logarithm form!

$\log_3 1,395,000,000 = x$

Then evaluate using the Change of Base Formula

$\frac{\log 1,395,000,000}{\log 3} = x$

$x = 19.2$ days

1.) You drink a beverage with 120 mg of caffeine. The caffeine in your system decreases by about 12% each hour. How many hours will it take for there to be 10mg of caffeine from the beverage remaining in your system?

$y = P(1-r)^t$

$\frac{10}{120} = \frac{120(1-.12)^t}{120}$

$.08\overline{3} = (.88)^t$

$\log_{.88}(.083) = t$

$\frac{\log(.083)}{\log(.88)} = t$

$t = 19.5$ hours

2.) The local government projects that the town will grow at a constant rate of thirty-two percent per year. At this rate, how many years will it take the town's population to be five times its current size?

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

$\frac{5P}{P} = \frac{P(1+.32)^t}{P}$

$5 = (1.32)^t$

$\log_{1.32} 5 = t$

$\frac{\log 5}{\log 1.32} = t$

$t = 5.8$ years

Practice!

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$y = Pe^{rt}$

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

$y = P(1-r)^t$

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