P. 42-43 Solving Log Equations Applications

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Warm-up:

Solve the equations

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

$\frac{5}{5} \quad \frac{5}{5}$

$18^{6x} = 5$

$\log_{18} 5 = 6x$

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

$\frac{0.56}{6} = \frac{6x}{6}$

$.09 = x$

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

$+5 \quad +5$

$11^{n-8} = 59$

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

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

$1.7 = n - 8$

$+8 \quad +8$

$9.7 = n$

Remember the Zombies?

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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)

$y = 5(3)^x$

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

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

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

Then evaluate using the Change of Base Formula

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

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

$x = 19.17$

$x =$ 19 days (whole number of zombies)

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?

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

$$0.083 = (.88)^t$$

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

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

$$t = 19.47 \text{ hrs}$$

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?

32%

$$\frac{500}{100} = \frac{100(1+.32)^t}{100}$$

$$5 = 1.32^t$$

$$\log_{1.32} 5 = t$$

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

$t = 5.8$ years

Practice!

Complete EVEN problems on Applications HW
Use the following formulas:

(2) $5000 = 800e^{(.055t)}$

(4) $4 = (1+.19)^{t}$

(6) $512 = 1(2)^{8t}$

(8) $5 = (1+.32)^{t}$