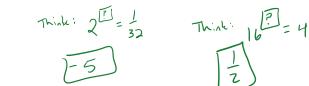
## Algebra 2

## 6.3: Logarithms (Day 2 Worksheet)

Note the "NC" and "C" indications. When using a calculator, round final answers to three decimals.

- 1. Evaluate each logarithm. NC
- $a. \log 1,000$
- **b.**  $\log_{3} 27$
- $\operatorname{c.} \log_2\left(\frac{1}{32}\right)$
- **d.**  $\log_{16} 4$

Think: 3 = 27



- 2. Solve each equation for x by rewriting in logarithmic form. Show all work. C
  - **a.**  $4^x = 99$

**b.**  $6^x = 42$ 

**c.**  $2^x = 1.5$ 

$$\log_2^{1.5} = x$$

$$\sqrt{x \approx 0.585}$$

**d.**  $15 - 2^x = 10$ 

$$1 \times 2.322$$

**e.**  $4^{x-5} = 17$ 

**f.**  $4 - 8^x = 1$ 

3. Solve each equation for x by rewriting in logarithmic form. Show all work. NC

**a.** 
$$9^{x-5} = 81$$

$$\begin{array}{c} X-5=2 \\ \hline /X=7 \end{array}$$

**b.**  $2^{6x-9} = \frac{1}{64}$ 

**c.**  $2^{3+x} - \frac{1}{4} = 0$ 

$$2^{3+\times} = \frac{1}{4}$$

$$\log_2 \frac{1}{4} = 3+x$$
$$-2 = 3+x$$

- **4.** Solve each equation for x by rewriting in exponential form. Show all work. **NC**

**a.** 
$$\log_x 16 = 2$$

$$x = \sqrt{16}$$

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(base is position)

**b.** 
$$\log_{32} x = \frac{3}{5}$$

$$32^{3/5} = \times$$

$$(5\sqrt{32})^3 = \times$$

$$2^3 = \times$$

**c.** 
$$\log_1 6 = x$$

Not possible! No solution

d. 
$$\frac{6}{2} = 2 \frac{\log_3(10x - 3)}{2}$$
 $\log_3(10x - 3) = 3$ 
 $2^3 = 10x - 3$ 
 $10x - 3 = 27$ 
 $10x = 30$ 
 $2 = 3$ 

e. 
$$-4\log_2\left(\frac{1}{5x+4}\right)-5=19$$
f.  $\log_x 3=0$ 

$$-4\log_2\left(\frac{1}{5x+4}\right)=24$$

$$\log_2\left(\frac{1}{5x+4}\right)=-6$$

$$2^6=\frac{1}{5x+4}$$

$$5x+4=64$$

$$x=12$$

- 5. The Richter magnitude of an earthquake is  $R = 0.67 \log(0.37E) + 1.46$ , where E is the energy (in kilowatt-hours) released by the earthquake. C
  - a. What is the magnitude of an earthquake that releases 11,800,000,000 kilowatt-hours of energy? Round to the nearest tenth.

$$R = 0.67 \log (0.37 \cdot 11,800,000,000) + 1.46$$

**b.** How many kilowatt-hours of energy would an earthquake have to release in order to be an 8.2 on the Richter scale? Round to the nearest whole number.

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8. 
$$Z = 0.67 \cdot log (0.37 E) + l.46$$

6.  $74 = 0.67 \cdot log (0.37 E)$ 

10  $E = log (0.37 E)$ 

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c. If walls may start to crack at a magnitude of 4 or higher, what is the least number of kilowatt-hours an earthquake would have to release to start cracks in walls? Round to the nearest whole number.

$$4 = 0.67 \log (0.37E) + 1.46$$

$$\log (0.37E) = \frac{2.54}{0.67}$$

$$E = \frac{10^{\left(\frac{2.54}{0.67}\right)}}{0.37}$$

$$E = \frac{10}{0.37}$$

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- **6.** The function  $c(t) = 108(2.71828)^{-0.08t} + 75$  calculates the temperature (in °F) of a cup of coffee that was handed out a drive-thru window t minutes ago.
  - **a.** What was the coffee's temperature the instant it was handed out the window?

b. After how many minutes is the coffee in the cup 98° F? Round to the nearest whole minute.

After how many minutes is the coffee in the cup 98° F? Round to the nearest whole minute.

$$98 = 108 (2.71828)^{-0.08t} + 75$$

$$2.71828 = \frac{23}{108}$$

$$475 = \frac{109_{2.71828}}{108} = \frac{23}{108}$$

$$1.71828 = \frac{23}{108}$$

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