

Name Key Date \_\_\_\_\_ Hour \_\_\_\_\_



## 9.3 - Properties of Logarithms

*Algebra 2 Trig G - DAY 2*

$$\star \log(mn) = \log m + \log n$$

$$\star \log\left(\frac{m}{n}\right) = \log m - \log n$$

~~$\log a^x = x \cdot \log a$~~

$$\log_a a^x = x$$

**PRACTICE!**

Rewrite each statement using only: log 2, log 3, log 5, and log 10.

$$1) \log 50 = \log(5 \cdot 10)$$

$$= \boxed{\log 5 + \log 10}$$

$$2) \log 75 = \log(5 \cdot 5 \cdot 3) \rightarrow \log(5^2 \cdot 3)$$

$$\log 5 + \log 5 + \log 3$$

$$\boxed{2 \cdot \log 5 + \log 3}$$

$$\checkmark \log 5^2 + \log 3$$

$$\boxed{2 \cdot \log 5 + \log 3}$$

$$3) \log 1.5 = \log\left(\frac{3}{2}\right)$$

$$= \boxed{\log 3 - \log 2}$$

$$4) \log 18 = \log(3^2 \cdot 2)$$

$$\log 3^2 + \log 2$$

$$\boxed{2 \cdot \log 3 + \log 2}$$

$$5) \log 5000 = \log(10^3 \cdot 5)$$

$$\log 10^3 + \log 5$$

$$\boxed{3 \cdot \log 10 + \log 5}$$

$$6) \log 80$$

$$\log(2^4 \cdot 5) \quad \leftarrow \text{OR} \quad \log(2^4 \cdot 5)$$

$$\boxed{3 \cdot \log 2 + \log 10}$$

$$\boxed{4 \cdot \log 2 + \log 5}$$

Rewrite each statement using only:  $\log_5 2 = a$  and  $\log_5 3 = b$ .

$$7) \log_5 6 = \log_5(2 \cdot 3)$$

$$\log_5 2 + \log_5 3$$

$$\boxed{a + b}$$

$$8) \log_5\left(\frac{3}{2}\right) = \log_5 3 - \log_5 2$$

$$\boxed{b - a}$$

$$9) \log_5 16 = \log_5(2^4)$$

$$= 4 \cdot \log_5 2$$

$$= \boxed{4a}$$

$$10) \log_5 81 = \log_5(3^4)$$

$$= 4 \cdot \log_5 3$$

$$= \boxed{4b}$$

$$\log a^x = \underline{x} \cdot \log a$$

Solve for x.

**either guess+check**

**OR raise both sides to the reciprocal power**

11)  $x^2 = 9$

$x = 3$  *guess + check*

13)  $(x^{-1})^{-1} = (7)^{-1}$

$x = \frac{1}{7}$

15)  $\log(x-1) = \log(4)$

$x-1 = 4$

$x = 5$

17)  $\underbrace{\log(x) + \log(x)}_{\log(x \cdot x)} = \log(36)$

$\log(x \cdot x) = \log(36)$

$x^2 = 36$

$x = 6$

*division*

19)  $\log_5(x) - \log_5(2) = \log_5(40)$

$\log_5\left(\frac{x}{2}\right) = \log_5(40)$

$* \cdot \frac{x}{2} = 40 \cdot 2$

$x = 80$

21)  $\underline{2} \log_5(x) - \underline{2} \log_5(2) = \log_5(4)$

$\log_5(x^2) - \log_5(2^2) = \log_5(4)$

$\log_5\left(\frac{x^2}{4}\right) = \log_5(4)$

$* \cdot \frac{x^2}{4} = 4 \cdot 4$

$x^2 = 16$

$x = 4$

12)  $x^3 = 125$

$x = 5$  *guess + check*

14)  $(x^4)^{\frac{1}{4}} = \left(\frac{1}{16}\right)^{\frac{1}{4}}$

$x = \frac{1}{2}$

16)  $\log_3(2) + \log_3(x) = \log_3(18)$

$\log_3(2 \cdot x) = \log_3(18)$

$2x = 18$

$x = 9$

18)  $\log_3(x) + \log_3(4) = \log_3(100)$

$\log_3(x \cdot 4) = \log_3(100)$

$4x = 100$

$x = 25$

20)  $\underline{2} \log_2(3) + \underline{3} \log_2(2) = \log_2(x)$

$\log_2(3^2) + \log_2(2^3) = \log_2(x)$

$\log_2(3^2 \cdot 2^3) = \log_2(x)$

$72 = x$



22)  $\underline{2} \log_3(9) = x$

$\log_3(9^2) = x$

$3^x = 9^2$

$3^x = 81$

$x = 4$

← log only on one side,  
CHANGE FORMS!