

Properties of Logs

Properties of logs

1. Product Property: Multiplication  $\longleftrightarrow$  Addition
2. Quotient Property: Divide  $\longleftrightarrow$  Subtraction
3. Power Property: Exponents  $\longleftrightarrow$  # in front

Write as a single log.

1)  $\log_2 x + \log_2 y$

$$\boxed{\log_2 xy}$$

2)  $2 \log_{10} x + 3 \log_{10} y$

$$\log_{10} x^2 + \log_{10} y^3$$

$$\boxed{\log_{10} x^2 y^3}$$

3)  $2 \log_2 3x - \log_2 y$

$$\log_2 (3x)^2 - \log_2 y$$

$$\log_2 9x^2 - \log_2 y$$

$$\boxed{\log_2 \frac{9x^2}{y}}$$

4)  $\frac{1}{2} \log_b 3c + \frac{1}{2} \log_b 4d - 2 \log_b 5e$

$$\log_b (3c)^{1/2} + \log_b (4d)^{1/2} - \log_b (5e)^2$$

$$\log_b \sqrt{3c} + \log_b \sqrt{4d} - \log_b 25e^2$$

$$\log_b \sqrt{12cd} - \log_b 25e^2$$

6)  $1 - 3 \log_5 y$

$$\log_5 5 - 3 \log_5 y$$

$$\log_5 5 - \log_5 y^3$$

$$\boxed{\log_5 \frac{5}{y^3}}$$

7)  $\log_5 xy$

$$\boxed{\log_5 x + \log_5 y}$$

5)  $2 \log_3 8 - 5 \log_3 2$

$$\log_3 8^2 - \log_3 2^5$$

$$\log_3 64 - \log_3 32$$

$$\log_3 \frac{64}{32}$$

$$\boxed{\log_3 2}$$

Expand the following:

7)  $\log_5 xy$

8)  $\log_{10} \frac{a}{b}$

$$\boxed{\log_{10} a - \log_{10} b}$$

9)  $\log_7 a^3 b^4$

$$\log_7 a^3 + \log_7 b^4$$

$$\boxed{3 \log_7 a + 4 \log_7 b}$$

Given  $\log_3 7 \approx 1.7712$ , approximate the value for each logarithm by using the Product and Quotient Properties of Logarithms.

17)  $\log_3 21$

$$\log_3 3 \cdot 7$$

$$\log_3 3 + \log_3 7$$

$$1 + 1.7712$$

$$\boxed{2.7712}$$

Evaluate each expression.

19)  ~~$9^{\log_9 2}$~~

Exp.  $9^{\log_9 2} = x$

$\downarrow$

Log  $\log_9 x = \log_9 2$

$$\boxed{x=2}$$

22)  $\log_3 3^5 + \log_5 125$

$$5 + 3$$

$$\log_5 5^3$$

$$\boxed{8}$$

18)  $\log_3 343$

$$\log_3 7 \cdot 7 \cdot 7$$

$$\log_3 7 + \log_3 7 + \log_3 7$$

$$1.7712 + 1.7712 + 1.7712$$

$$\boxed{5.3136}$$

20)  $\log_{10} 10^2 = x$

$$10^x = 10^2$$

$$x=2$$

21)  $5^{\log_5 9} + \log_3 9$

$$\log_3 3^2$$

$$7 + 2$$

$$\boxed{9}$$

23)  $2^{\log_2 7} + \log_6 \frac{1}{36}$

$$3 + -2$$

$$\boxed{1}$$

$$\log_6 6^{-2}$$

$$5^{\log_5 7} = x$$

$$\log_5 x = \log_5 7$$

$$x=7$$

$$\log_3 9 = x$$

$$3^x = 9$$

$$3^x = 3^2$$

$$x=2$$

$$7 + 2 = \boxed{9}$$