

Properties of Logarithms

Expand each logarithm.

1) $\log(6 \cdot 11)$

$\log 6 + \log 11$

2) $\log(5 \cdot 3)$



3) $\log\left(\frac{6}{11}\right)^5$

$5\log 6 - 5\log 11$

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



5) $\log \frac{2^4}{5}$

$4\log 2 - \log 5$

6) $\log\left(\frac{6}{5}\right)^6$



7) $\log \frac{x}{y^6}$

$\log x - 6\log y$

8) $\log(a \cdot b)^2$



9) $\log \frac{u^4}{v}$

$4\log u - \log v$

10) $\log \frac{x}{y^5}$



11) $\log \sqrt[3]{x \cdot y \cdot z}$

$\frac{\log x}{3} + \frac{\log y}{3} + \frac{\log z}{3}$

12) $\log(x \cdot y \cdot z^2)$



Condense each expression to a single logarithm.

13) $\log 3 - \log 8$

$$\log \frac{3}{8}$$

14) $\frac{\log 6}{3}$



15) $4\log 3 - 4\log 8$

$$\log \frac{3^4}{8^4}$$

16) $\log 2 + \log 11 + \log 7$



17) $\log 7 - 2\log 12$

$$\log \frac{7}{12^2}$$

18) $\frac{2\log 7}{3}$



19) $6\log_3 u + 6\log_3 v$

$$\log_3 (v^6 u^6)$$

20) $\ln x - 4\ln y$



21) $\log_4 u - 6\log_4 v$

$$\log_4 \frac{u}{v^6}$$

22) $\log_3 u - 5\log_3 v$



23) $20\log_6 u + 5\log_6 v$

$$\log_6 (v^5 u^{20})$$

24) $4\log_3 u - 20\log_3 v$



Critical thinking questions:

25) $2(\log 2x - \log y) - (\log 3 + 2\log 5)$

$$\log \frac{4x^2}{75y^2}$$

26) $\log x \cdot \log 2$



The Meaning Of Logarithms

Rewrite each equation in exponential form.

1) $\log_6 36 = 2$

$$6^2 = 36$$

2) $\log_{289} 17 = \frac{1}{2}$



3) $\log_{14} \frac{1}{196} = -2$

$$14^{-2} = \frac{1}{196}$$

4) $\log_3 81 = 4$

**Rewrite each equation in logarithmic form.**

5) $64^{\frac{1}{2}} = 8$

$$\log_{64} 8 = \frac{1}{2}$$

6) $12^2 = 144$



7) $9^{-2} = \frac{1}{81}$

$$\log_9 \frac{1}{81} = -2$$

8) $\left(\frac{1}{12}\right)^2 = \frac{1}{144}$

**Rewrite each equation in exponential form.**

9) $\log_u \frac{15}{16} = v$

$$u^v = \frac{15}{16}$$

10) $\log_v u = 4$



11) $\log_{\frac{7}{4}} x = y$

$$\left(\frac{7}{4}\right)^y = x$$

12) $\log_2 v = u$



13) $\log_u v = -16$

$$u^{-16} = v$$

14) $\log_y x = -8$

**Rewrite each equation in logarithmic form.**

15) $u^{-14} = v$

$$\log_u v = -14$$

16) $8^b = a$



$$17) \left(\frac{1}{5}\right)^x = y$$

$$\log_{\frac{1}{5}} y = x$$

$$18) 6^y = x$$



$$19) 9^y = x$$

$$\log_9 x = y$$

$$20) b^a = 123$$



Evaluate each expression.

$$21) \log_4 64$$

3

$$22) \log_6 216$$



$$23) \log_4 16$$

2

$$24) \log_3 \frac{1}{243}$$



$$25) \log_5 125$$

3

$$26) \log_2 4$$



$$27) \log_{343} 7$$

$\frac{1}{3}$

$$28) \log_2 16$$



$$29) \log_{64} 4$$

$\frac{1}{3}$

$$30) \log_6 \frac{1}{216}$$



Simplify each expression.

$$31) 12^{\log_{12} 144}$$

144

$$32) 5^{\log_5 17}$$



$$33) x^{\log_x 72}$$

72

$$34) 9^{\log_3 20}$$

