

**Quotient Property
of Logs**

$$\log \frac{x}{y}$$

$$\log(x) - \log(y)$$

GLUE HERE

**Product Property
of Logs**

Condensed
 $\log x \cdot y$

$$\log(x) + \log(y)$$

Expanded

**CHANGE OF BASE
PROPERTY OF
LOGS**

$$\log_y(x) = \frac{\log x}{\log y}$$

It's not that I'm so
smart, it's just
that I stay with
problems longer.
~Albert Einstein

**POWER PROPERTY
OF LOGS**

$$\log(x)^y$$

$$y \cdot \log(x)$$

Write in Expanded form:

$$\log_3 2xy =$$

$$\log_3(2) + \log_3(x) + \log_3(y)$$

$$\log_{10}(4x) =$$

$$\log(4) + \log(x)$$

$$\log_5 5xyz =$$

Write in Condensed form:

$$\log_3(2) + \log_3(10)$$

$$\log_3(2 \cdot 10)$$

$$\log_3(20)$$

$$\log_2(3) + \log_2(x) + \log_2(y)$$

$$\log_2(3 \cdot x \cdot y)$$

$$\log_2(3xy)$$

$$\log(10) + \log(x) + \log(y)$$

$$\log(10xy)$$

Write in Condensed form:

$$\log_3 2 - \log_3 10$$

$$\log_3\left(\frac{2}{10}\right) = \log_3\left(\frac{1}{5}\right)$$

$$\log_3 x - \log_3 10 + \log_3 y$$

$$\log_3\left(\frac{x}{10} \cdot y\right)$$

$$\log_3\left(\frac{xy}{10}\right)$$

$$\log_3 x - (\log_3 3 + \log_3 y)$$

$$\log_3\left(\frac{x}{3y}\right)$$

Write in Expanded form:

$$\log_3 \frac{2}{5} =$$

$$\log_3(2) - \log_3(5)$$

$$\log_3 \frac{2x}{y} =$$

$$\log_3(2) + \log_3(x) - \log_3(y)$$

$$\log_7 \frac{x}{2y} =$$

$$\log_7(x) - (\log_7(2) + \log_7(y))$$

Write in Expanded form:

$$\log_3 \frac{2x^3}{y^2} =$$

$$\log_3(2) + \log_3(x^3) - \log_3(y^2)$$

$$\log_3(2) + 3 \log_3(x) - 2 \log_3(y)$$

$$\log_7 \frac{x^2}{8y^5} =$$

$$\log_7(x^2) - (\log_7(8) + \log_7(y^5))$$

$$2 \log_7(x) - (\log_7(8) + 5 \log_7(y))$$

$$\log_5(2x^3y)^5$$

Write in Condensed form:

$$\log_3 9 + \frac{1}{2} \log_3 x$$

$$\log_3(9) + \log_3 x^{1/2}$$

$$\log_3(9 \cdot x^{1/2})$$

$$5 \log x - 4 \log y + \log 5$$

$$\log\left(\frac{x^5 \cdot 5}{y^4}\right)$$

$$\log\left(\frac{5x^5}{y^4}\right)$$

$$4 \log(x) + \log(y) - 5 \log(xy)$$

$$\log\left(\frac{x^4 \cdot y}{x^5 y^5}\right) = \log\left(\frac{1}{xy^4}\right)$$

Use a calculator to estimate to the nearest hundredth:

Alpha \rightarrow Window \rightarrow 5

$$\log_3 6 = 1.63$$

$$\log_5 65 = 2.59$$

$$\log_7 100 = 2.37$$

$$\log_8 2 = .33 \rightarrow \frac{1}{3}$$

Special Cases, simplify without a calculator:

$$\log_7 7 = x \quad x = 1$$

$$7^x = 7$$

$$\log_3 81 = x$$

$$3^x = 81 \quad x = 4$$

$$\log_3 1 = x$$

$$3^x = 1 \quad x = 0$$