

Expand using as many of the properties of Logs as you can:

$$1. \log_3 \frac{\sqrt[4]{a^3 b}}{c^5} \log_3 \frac{(a^3 b)^{\frac{1}{4}}}{c^5} \log_3 \frac{a^{\frac{3}{4}} b^{\frac{1}{4}}}{c^5}$$

$$\frac{3}{4} \log_3 a + \frac{1}{4} \log_3 b - 5 \log_3 c$$

$$2. \log \left(\frac{m^5}{np^3} \right)^2$$

$$\log \left(\frac{m^{10}}{n^2 p^6} \right) = 10 \log m - 2 \log n - 6 \log p$$

Use the properties of logarithms to write each as a single logarithm.

$$3. \frac{1}{2} \log_6 W - 5 \log_6 R \quad \log_6 \frac{\sqrt[2]{W}}{R^5}$$

$$4. -4 \log_6 C + 5(3 \log_6 R + 2 \log_6 T)$$

$$\log_6 \frac{(R^3 T^2)^5}{C^4} \quad \text{or} \quad \log_6 \frac{R^{15} T^{10}}{C^4}$$

$$5. \log_4(X+1) - 2 \log_4 X$$

$$\log_4 \frac{X+1}{X^2}$$

$$6. \log x + \log(x-3) \quad \log x \cdot (x-3) \rightarrow \log(x^2 - 3x)$$

Use the properties of logarithms to evaluate each.

$$7. 2 \log_2 6 - \log_2 9 \quad \log_2 \frac{6^2}{9} = \log_2 4 = \textcircled{2}$$

$$8. \frac{1}{2} \log_{12} 81 + 2 \log_{12} 2 - \log_{12} 3$$

$$\log_{12} \frac{9 \cdot 4}{3} = \log_{12} 12 = \textcircled{1}$$