Assignment

Write

Define each term in your own words.

1. Zero Property of Logarithms
2. Logarithm with Same Base and Argument
3. Power Rule of Logarithms

Remember

The Product Rule of Logarithms states: "The logarithm of a product is equal to the sum of the logarithms of the factors."

The Quotient Rule of Logarithms states: "The logarithm of a quotient is equal to the difference of the logarithms of the dividend and divisor."

Practice

1. Use the properties of logarithms to rewrite each logarithmic expression in expanded form.
   a. $\log_3 (ab^2c^3)$
   b. $\log \left(\frac{x^3}{5y^2}\right)$
   c. $\log_2 (6mn^4)$
   d. $\ln \left(\frac{2x}{y^{10}}\right)$
2. Use the properties of logarithms to rewrite each logarithmic expression as a single logarithm.
   a. $2 \log_5 3 - \log_5 y$
   b. $7 \ln x + \ln 8 - 3 \ln y$
   c. $2(\log 5 + \log m) - \log (m^3)$
   d. $8 \log_2 x - 3(\log_2 y + 2 \log_2 x)$
3. Suppose $\log_a 2 = m$, $\log_a 5 = n$, and $\log_a 7 = t$. Write an algebraic expression for each logarithmic expression.
   a. $\log_a 14$
   b. $\log_a 20$
   c. $\log_a \left(\frac{5}{14}\right)$
   d. $\log_a \left(\frac{1}{49}\right)$
   e. $\log_a 100$
   f. $\log_a \left(\frac{10}{7}\right)$
4. An earthquake's magnitude, M, can be determined using the formula $M = \log \left(\frac{I}{10^{-4}}\right)$, where I represents the intensity of the earthquake. Rewrite the logarithmic expression in the formula in expanded form.
5. The loudness, L, of a sound, in decibels, can be determined using the formula $L = 10 \log \left(\frac{I}{10^{-12}}\right)$, where I represents the intensity of the sound. Rewrite the logarithmic expression in the formula in expanded form.

Stretch

Use properties of logarithms to rewrite $\log_8\left(\frac{\sqrt{x}}{y^3}\right)$ in expanded form.

Review

1. Solve for the unknown in each logarithmic equation.
   a. $\log 10000 = n$
   b. $\log_n\left(\frac{1}{81}\right) = -2$
   c. $\log_{\frac{1}{2}} 64 = n$
   d. $\log_9 27 = n$
2. Estimate $\log_4 5$ to the nearest tenths place. Explain your reasoning.
3. The Richter scale is used to rate the magnitude of an earthquake, or the amount of energy released. An earthquake's magnitude, M, is determined using the equation, $M = \log\left(\frac{I}{I_0}\right)$, where I is the intensity of the earthquake being measured (measured by the amplitude of a seismograph reading taken 100 km from the epicenter of the earthquake), and I_0 is the intensity of a standard earthquake or "threshold quake" whose seismograph amplitude is 10^{-4} cm.
   a. An earthquake in San Francisco measured 7.9 on the Richter scale, while an earthquake in Chile measured 8.8. How many times more intense was the Chilean earthquake?
   b. An earthquake in Mexico City measured 8.0 on the Richter scale. An earthquake was recorded in Haiti that was three times stronger. What was the magnitude of the Haitian earthquake?
4. Determine the quadratic equation that goes through the points (1, 3), (−2, −3), and (−1, −5).