Warm Up

Identify the property of powers associated with each example.

1. $2^5 \cdot 2^2 = 2^7$

2. $2^1 = 2$

3. $2^0 = 1$

4. $\frac{2^{14}}{2^5} = 2^9$

1. **Use the properties of logarithms to rewrite each logarithmic expression in expanded form.**

   a. $\log_4 (6x^5)$

   b. $\log_7 \left(\frac{3y^4}{x^3}\right)$

   c. $\ln (3xy^3)$

2. Use the properties of logarithms to rewrite each logarithmic expression as a single logarithm.

a. $\log_2 10 + 3 \log_2 x$

b. $4 \log 12 - 4 \log 2$

3. Suppose $\log_a 5 = p$, $\log_a 3 = q$, and $\log_a 2 = r$. Write an algebraic expression for each logarithmic expression.

a. $\log_a 50$

b. $\log_a 0.3$

c. $\log_a \frac{1}{27}$

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. $\log_a \left(\frac{10}{7}\right)$