

3.3 Product and Quotient Laws of Logarithms Worksheet

This document was composed and formatted by Annie Bernatchez.

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1) Simplify using laws of logarithms and then evaluate.

a) $\log 9 + \log 6$

b) $\log 48 - \log 6$

c) $\log_3 7 + \log_3 3$

2) Simplify each algebraic expression.

a) $\log x + \log y + \log(2z)$

b) $\log_2 a + \log_2(3b) - \log_2(2c)$

c) $2\log m + 3\log n - 4\log y$

3) Evaluate using the product law of logarithms.

a) $\log_6 18 + \log_6 2$

b) $\log 40 + \log 2.5$

c) $\log_{12} 8 + \log_{12} 2 + \log_{12} 9$

4) Evaluate using the quotient law of logarithms.

a) $\log_3 54 - \log_3 2$

b) $\log 50\,000 - \log 5$

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c) $\log_4 320 - \log_4 5$

5) Evaluate, using the laws of logarithms

a) $3\log_{16} 2 + 2\log_{16} 8 - \log_{16} 2$

b) $\log 20 + \log 2 + \frac{1}{3} \log 125$

6) Write as a sum or difference of logarithms. Simplify, if possible.

a) $\log_7(cd)$

b) $\log_3\left(\frac{m}{n}\right)$

c) $\log(uv^3)$

d) $\log\left(\frac{a\sqrt{b}}{c^2}\right)$

e) $\log_2 10$

7) Simplify

a) $\log\left(\frac{x^2}{\sqrt{x}}\right)$

b) $\log\sqrt{k} + \log(\sqrt{k})^3 + \log\sqrt[3]{k^2}$

c) $\log(x^2 - 4) - \log(x - 2)$

d) $\log(x^2 - x - 6) - \log(2x - 6)$

Answer Key

1) a) $\log 54 = 1.732$ b) $\log 8 = 0.903$ c) $\log_3 21 = 2.771$

2) a) $\log(2xyz)$ b) $\log_2\left(\frac{3ab}{2c}\right)$ c) $\log\left(\frac{m^2n^3}{y^4}\right)$

3) a) 2 b) 2 c) 2

4) a) 3 b) 4 c) 3

5) a) 2 b) 2.301

6) a) $\log_7 c + \log_7 d$ b) $\log_3 m - \log_3 n$ c) $\log u + 3\log v$ d) $\log a + \frac{1}{2}\log b - 2\log c$ e) $1 + \log_2 5$

7) a) $\frac{3}{2}\log x$ b) $\frac{8}{3}\log k$ c) $\log(x+2)$ d) $\log\left(\frac{x+2}{2}\right)$