7.4 Properties of Logarithms **Algebra 2** **THOMPSON**

$$\log_b(MN) = \log_b(M) + \log_b(N)$$

$$\log_b\left(\frac{M}{N}\right) = \log_b(M) - \log_b(N)$$

$$\log_b(M^p) = p\log_b(M)$$

1) Write the expression as a single logarithm. Adding means to multiply

$\log_9 3 + \log_9 27$ $\log_9 3 \cdot 27$ $\log_9 81$ $9^x = 81$ $x = 2$

2) Expand the logarithm. Simplify if possible. Multiplication means to add

$\log_9 rs$

Choose the correct answer below.

A. $\log_9 r + \log_9 s$

3) Write the expression as a single logarithm. Adding means to multiply

$\log 3 + \log 7$ $\log 21$

4) Write the expression as a single logarithm. 5 is the exponent of 3 bc it is out front

$5 \log 3 + \log 4$ $\log 3^5 \cdot 4$ $\log 243 \cdot 4 =$ $\log 972$

5) Expand the following logarithm. Multiplication means to add

$\log_8 64tqr$ $\log_8 64 = 2$

Choose the correct answer below.

A. $\log_8 64tqr = \log_8 64 - \log_8 t - \log_8 q - \log_8 r$

B. $\log_8 64tqr = \log_8 2t(\log_8 q + \log_8 r)$

C. $\log_8 64tqr = 2 \cdot \log_8 t \cdot \log_8 q \cdot \log_8 r$

D. $\log_8 64tqr = 2 + \log_8 t + \log_8 q + \log_8 r$

6) Expand the logarithm. Simplify if possible.

$\log_4 \frac{a}{b}$ Division means to subtract

Choose the correct answer below.

- A. $(\log_4 a)(\log_4 b)$
- B. $\log_4 a - \log_4 b$ ✔
- C. $\frac{\log_4 a}{\log_4 b}$
- D. $\log_4 a + \log_4 b$

CHANGE BASE FORMULA $\log_b(a) = \frac{\log_x(a)}{\log_x(b)}$ * base on bottom

7) Use the change-of-base formula to evaluate the expression.

close paranthesis

$\log_{13} 23$ Base on bottom $\frac{\log 23}{\log 13}$ put in calculator log(23) ÷ log (13) = 1.222

8) Use the change-of-base formula to evaluate the expression.

close paranthesis

$\log_{15} 20$ Base on bottom $\frac{\log 20}{\log 15}$ put in calculator log(20) ÷ log (15) = 1.106

9) Use the change-of-base formula to evaluate the expression.

close paranthesis

$\log_{15} 23$ Base on bottom $\frac{\log 23}{\log 15}$ put in calculator log(23) ÷ log (15) = 1.158

10) Use the change-of-base formula to evaluate the expression.

close paranthesis

$\log_{11} 15$ Base on bottom $\frac{\log 15}{\log 11}$ put in calculator log(15) ÷ log (11) = 1.129

11) Use the properties of logarithms to evaluate the expression.

$\log_3 243 - 4\log_3 3$

$\frac{log_3 243}{log_3 3^4}$ $\frac{log_3 243}{log_3 81}$ divide $\log_3 3$ $3^x = 3$ $x = 1$

12) Write the following logarithm as a quotient of two common logarithms. Do not simplify the quotient.

$\log_3 14$

Choose the correct answer below.

A. $\frac{\log_{11} 3}{\log_{11} 14}$

B. $\frac{\log_{13} 3}{\log_{13} 14}$

C. $\frac{\log_3 14}{\log_3 13}$

D. $\frac{\log 14}{\log 3}$