ANSWERS

MORE PRACTICE: Properties of Logarithms

Let $\log_b X = 2$, $\log_b Y = 7$, $\log_b Z = 6$, $\log_b W = 3$. Find:

1. $\log_b W^3$

$= 3\log_b W = 3 \cdot 3 = 9$

2. $\log_b \frac{Y}{X}$ $= \log_b Y - \log_b X$

$= 7 - 2 = 5$

3. $\log_b \frac{Z}{X^2}$

$= \log_b Z - \log_b X^2$

$= \log_b Z - 2\log_b X = 6 - 2 \cdot 2 = 6 - 4 = 2$

4. $\log_b \frac{Y^2X^3}{W^2}$ $= \log Y^2 + \log X^3 - \log W^2$

$= 2\log Y + 3\log X - 2\log W$

$= 2 \cdot 7 + 3 \cdot 2 - 2 \cdot 3$

$= 14 + 6 - 6 = 14$

5. $\log_b \frac{1}{XYZW}$

$\log_b 1 - \{\log_b X + \log_b Y + \log_b Z + \log_b W\}$

$0 - \{2 + 7 + 6 + 3\} = -18$

6. $\log_b (X^2Y^{-3})^{-1}$

$= -1 \cdot \log_b (X^2 Y^{-3})$

$= -1 \left[\log_b X^2 + \log_b Y^{-3}\right]$

$= -1 \left[2\log_b X - 3\log_b Y\right] = -1[2 \cdot 2 - 3 \cdot 7]$

$= -1[4 - 21]$

$= -1[-17]$

$= 17$

Write the following as a single logarithm.

7. $\log_b X - \log_b W$

$\log_b \frac{X}{W}$

8. $\log_b W + 4\log_b Y$

$\log_b W + \log_b Y^4$

$= \log_b WY^4$

9. $5\log_b X + 4\log_b Z - \log_b Y$

$= \log_b X^5 + \log_b Z^4 - \log_b Y$

$= \log_b \frac{X^5 Z^4}{Y}$

10. $2\{\log_b Z + 3\log_b W\}$

$2\{\log_b Z + 3\log_b W\}$

$2\log_b Z + 6\log_b W$

$\log_b Z^2 + \log_b W^6$

$\log_b Z^2 W^6$