Properties of Logarithms:

Power Property: $\log_a C^b = b \cdot \log_a C$

The exponent becomes a coefficient.

Rewrite using the Power Property:

$\log W^4 + \log X^7 = 4\log W + 7\log X$

Solve without using the change of base formula.

$\log 8^x = \log 90$ Take the logarithm of both sides

$x \log 8 = \log 90$ Use the Power Property

$x = \dfrac{\log 90}{\log 8}$ Divide by log8

Product Property of Logarithms:

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

Expand using the properties of Logs:

$\log_2 G^5H^3 = 5\log_2 G + 3\log_2 H$

$\log_6 5X^7 = \log_6 5 + 7\log_6 X$

$$\log_3(A^2B^4)^6 = \log_3 A^{12}B^{24} = 12\log_3 A + 24\log_3 B$$

or

$$\log_3(A^2B^4)^6 = 6\left(2\log_3 A + 4\log_3 B\right)$$

Quotient Property of Logarithms:

$$\log_b \frac{M}{N} = \log_b M - \log_b N$$

Expand using as many of the properties of Logs as you can:

$$\log_2 \frac{R^2}{S^7} = 2\log_2 R - 7\log_2 S$$

$$\log_4 \frac{A^5B^6}{C^7} = 5\log_4 A + 6\log_4 B - 7\log_4 C$$

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

$$\log_3 \frac{K^5}{\sqrt{J}} = 5\log_3 K - \frac{1}{2}\log_3 J$$

$J^{1/2}$

$\log_8 M\sqrt{N^3P} =$ $\rightarrow$ $(N^3P)^{1/2} = N^{3/2}P^{1/2}$

$\log_8 M + \frac{3}{2}\log_8 N + \frac{1}{2}\log_8 P$

or

$\log_8 M + \frac{1}{2}(3\log_8 N + \log_8 P)$

Use the properties of logarithms to write each as a single logarithm.

$8\log_5 Q + 7\log_5 R =$

$\log_5 Q^8R^7$

$\log E - 3\log A + \frac{1}{3}\log Q =$ $\log\frac{E\sqrt[3]{Q}}{A^3}$