

When we condense logarithmic expressions, we will take two or more logarithmic terms (with the same bases) that are being added/subtracted and turn them into a single logarithm.

Example 1 Condense $2 \log_3 7 - 5 \log_3 x$

Step 1- Move coefficients up to the exponent position

$$\begin{array}{c} \overbrace{} \quad \overbrace{} \\ 2 \log_3 7 - 5 \log_3 x \\ \log_3 7^2 - \log_3 x^5 \end{array}$$

Step 2- Write a single logarithm with a fraction bar

$$\log_3 \text{ — }$$

Step 3- Fill in the fraction. Pay attention to positive (+) and negative (–) signs to know if things go in the numerator (+) or denominator (–).

$$\log_3 \frac{7^2}{x^5} = \boxed{\log_3 \frac{49}{x^5}}$$

Example 2 Condense $2 \log_8 x - \log_8 5 - 3 \log_8 y$

Step 1- Move coefficients up to the exponent position

$$\begin{array}{c} \overbrace{} \downarrow \qquad \qquad \qquad \overbrace{} \downarrow \\ 2 \log_8 x - \log_8 5 - 3 \log_8 y \\ \log_8 x^2 - \log_8 5 - \log_8 y^3 \end{array}$$

Step 2- Write a single logarithm with a fraction bar

$$\log_8 \text{—}$$

Step 3- Fill in the fraction. Pay attention to positive (+) and negative (−) signs to know if things go in the numerator (+) or denominator (−).

$$\log_8 \frac{x^2}{5y^3}$$