

5.4.1 Laws of Logarithms (Continued)

Investigation B

Use a calculator to evaluate the following logarithms (all to base 10):

$$\text{Log } 40\,000 = \underline{\hspace{2cm}}$$

$$\text{Log } 4000 = \underline{\hspace{2cm}}$$

$$\text{Log } 400 = \underline{\hspace{2cm}}$$

$$\text{Log } 40 = \underline{\hspace{2cm}}$$

What would you expect the answer to be for $\log 4$? $\underline{\hspace{2cm}}$

How did you arrive at that answer?

Use a calculator to evaluate the following common logarithms:

$$\text{Log } 1000 = \underline{\hspace{2cm}}$$

$$\text{Log } 100 = \underline{\hspace{2cm}}$$

$$\text{Log } 10 = \underline{\hspace{2cm}}$$

$$\text{Log } 1 = \underline{\hspace{2cm}}$$

If you rewrite $\log 4$ as $\log (40 \div 10)$, how would you rewrite its numerical value, so as to take into account the quotient ($40 \div 10$)?

Rewrite the following:

$$\text{Log } 4000 = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

$$\text{Log } 400 = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

Write a generalization for the pattern:

Given the values for $\log 96$ and $\log 4$, how could you find the value of $\log 24$?

How could we rewrite the general case, $\log_a \left(\frac{x}{y} \right)$?

5.5.2 Home Activity: Logarithm Laws

Answer the following questions using the laws of logarithms for products, quotients, and powers, as applicable. Write full solutions showing all steps.

1. Evaluate.

a) $\log_2 640 - \log_2 80$

d) $\log_{12} 4 + \log_{12} 36$

b) $\log_3 18 + \log_3 36$

e) $\log_5 125^4$

c) $\log_3 9^3$

f) $\log_4 192 - \log_4 3$

2. Write as a single logarithm. Do not solve.

a. $4\log x + 2\log(x-1)$

b. $3\log(x+2) - \log(2x-3)$

c. $\log(x+1) + 2\log(2x+1) - \log(x-3)$

d. $2x\log(x) + x\log(3x-4)$

3. Simplify. Evaluate where possible.

a. $\log_2 16 + \log_2 32 + \log_2 2$

c. $\log_2 6.4 + \log_2 10 - \log_2 8$

b. $2\log 9 + \log 9 - \log 3$

d. $7\log_a x + 4\log_a z$