

Student Activity: To investigate how to calculate $x = \log_n m$

Use in connection with the interactive file, 'Changing log bases', on the Student's CD.



$$\log_2(8) = \frac{\log_{10} 8}{\log_{10} 2} = \frac{0.9031}{0.301} = 3$$

$$2^3 = 8$$

1.

- a. Using the format used in the interactive file, write $m = \log_3 81$ as $m = \frac{\log_{10} x}{\log_{10} y}$.

- b. Use a calculator to calculate $m = \log_3 81$.

- c. Check your answer using the interactive file.

- d. What is 3^m , where m is the answer to part **b.** above?

2.

- a. Using the format used in the interactive file, write $r = \log_4 36$ as $\frac{\log_{10} x}{\log_{10} y}$.

- b. Use a calculator to calculate $r = \log_4 36$.

- c. Check your answer using the interactive file.

- d. What is 4^r , where r is the answer to part **b.** above?

3.

- a. Use your calculator to calculate $\log_{10}1$.

- b. Prove that $\log_m 1=0$, for all m .

- c. Prove that $\log_{\frac{1}{5}} x = \log_5 x$.

- d. Show that $\log_r \left(\frac{1}{r^{-100}} \right) = 100$ for all values of r .

4. Given that $\log_3 x = a$ and $\log_3 4 = b$. Find $\log_4 x$ in terms of a and b .

5. If $\log_n m = b$:

- a. Write m as a power of n .

b. Take the log of both sides of your answer in part a. Now prove that

$$B = \log_n m = \frac{\log_a m}{\log_a n}.$$

c. Given that $\log_n m = \frac{\log_a m}{\log_a n}$, prove that $\log_n m = \frac{1}{\log_m n}$.

d. Given that $\log_{10} 2 = b$, show that $\log_8 5 = \frac{1-b}{3b}$.

6. Prove that $\log_x y^4 z - \log_x y^2 z^2 = \log_x \frac{y^2}{z}$.

7. If $\log_4 y = 3$, find $\log_4 \left(\frac{1}{16} y \right)$.
