## Assignment

## Write

Write the Change of Base Formula.

## Remember

The Change of Base Formula allows you to calculate an exact value for a logarithm by rewriting it in terms of a different base.

If $\log_b a = \log_b c$, then $a = c$.

If $a = c$, then $\log_b a = \log_b c$.

## Practice

1. Ten volunteers begin recruiting people to be volunteers for a large fundraising event. After 1 week, the total number of volunteers has doubled to 20. Each subsequent week, the total number of volunteers doubles.
   a. Write a function to model the total number of volunteers, $V$, in the group after $t$ weeks.
   b. How many weeks will it take for the total number of volunteers to reach 1280?
   c. How many weeks will it take for the volunteers to reach their goal of 15,000 total volunteers?
2. A group of citizens established a new political party called the People's Party. The number of members in the party, $P$, can be modeled by the function $P(m) = 500 \cdot 1.2^m$, where $m$ represents the number of months since the founding of the party.
   a. How many months will it take for the membership of the party to grow to 10,000 members?
   b. How many years will it take for the membership of the party to grow to 200,000 members?
3. Solve each exponential equation. Round your answer to the nearest hundredth.
   a. $9^{x+2} + 3 = 52$
   b. $\frac{7^{3x-2}}{5} = 2$

## Stretch

Consider the Triangle of Power diagram. Explain how the diagram shows that the Change of Base Formula works for $a = 10$, $b = 100$, and $c = 1000$. Determine the values of $x_1$ and $x_2$.



$$\log_b c = \log_a c \div \log_a b$$
$$x_2 = x_1 \cdot x_2 \div x_1$$
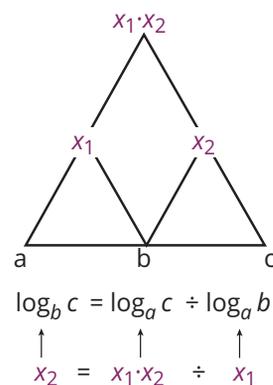
# Review

1. Use the properties of logarithms to rewrite each logarithmic expression in expanded form.

   a. $\log_4 (x^2 y^5 z)$

   b. $\log \left( \frac{2a^6}{b^3} \right)$

   c. $\log_3 (55r^2 s t^8)$

   d. $\ln \left( \frac{a^3}{2b^4} \right)$

2. Use the properties of logarithms to rewrite each logarithmic expression as a single logarithm.

   a. $\log_2 x - 4 \log_2 y$

   b. $10 \ln a - \ln 6 - 2 \ln b$

   c. $10 \log x - 4(\log x + \log 2)$

   d. $8 \log_2 x - 3(\log_2 y + 2 \log_2 x)$

3. Given: $f(x) = 2^x$.

   a. Write the function $f^{-1}(x)$, the inverse of $f(x) = 2^x$.

   b. Graph and label the functions $f(x)$ and $f^{-1}(x)$ on the coordinate plane.

   c. Describe how to calculate $f^{-1}(2)$ without a calculator. Then, calculate $f^{-1}(2), f^{-1}(16)$ , and $f^{-1}(128)$.

   d. Determine the domain, range, asymptotes, intercepts, end behavior, and intervals of increase and decrease for $f^{-1}(x)$.