Assignment

Write

State whether applying the Change of Base formula or rewriting in exponential form would be most efficient for solving the logarithmic equation based on its unknown quantity. Explain your reasoning in your own words.

1. argument of the logarithm is unknown
2. value of the logarithm is unknown
3. base of the logarithm is unknown

Remember

To solve for an unknown in a simple logarithmic equation, consider the relationship between the base, argument, and exponent.

Practice

1. In music, the cent, c, is a unit of measure that is used to measure the differences in frequencies between musical notes. The formula $c = 1200 \log_2 \left(\frac{f_1}{f_2} \right)$ can be used to determine the number of cents, c, between a musical note of a higher frequency f_1 and a musical note of a lower frequency f_2.
   a. Determine the number of cents between the notes F4 and C4 if F4 has a frequency of 349.23 Hz (hertz) and C4 has a frequency of 261.63 Hz. Round your answer to the nearest cent.
   b. Determine the frequency (in hertz) of the note G4 if the notes A4 and G4 are separated by 200 cents and A4 has a frequency of 440 Hz. The note A4 has a higher frequency than the note G4. Round your answer to the nearest hertz.
2. The magnitude limit, L, of a telescope refers to the magnitude of the faintest star that is observable with the telescope. Stars with lower magnitudes are brighter than stars with higher magnitudes. The equation $L = \frac{\log_6 d}{0.257} + 2$ can be used to determine the magnitude limit of a telescope with an objective lens diameter, d, in millimeters.
   a. Lorinda purchases a telescope that has an objective lens that is 80 mm in diameter. Determine the magnitude limit of her telescope to the nearest tenth.
   b. After using her telescope, Lorinda realizes she should have purchased a larger telescope. She wants to purchase a telescope with a magnitude limit of 13.5. Determine the minimum diameter of the objective lens to the nearest tenth for such a telescope.
3. Solve each logarithmic equation. Check your work.
   a. $4 = \log_2 x + \log_2 (x - 6)$
   b. $\log_x 216 = 1.5$

Stretch

Solve $2 \log_3 x - \log_3 (x - 4) = 2 + \log_3 2$.

Review

1. A species of bird was recently introduced to an island. The bird population on the island, B, can be modeled by the function $B(t) = 40 \cdot 1.4^t$, where t represents the number of years since the birds were introduced to the island.

   a. How many years will it take for the bird population to grow to 500 birds?

   b. How many years will it take for the bird population to grow to 1,000 birds?

2. Solve each exponential equation. Round your answer to the nearest hundredth.

   a. $5^{x-1} - 8 = 70$

   b. $2^{2x+7} = 15$

3. In the year 2007, Mint Beach had a population of 23 thousand people and an annual growth rate of 1.02%.

   a. Write a function to model the population of Mint Beach with respect to t, the number of years since 2007. Write your function in the form $N(t) = N_0 e^{rt}$.

   b. Discuss the domain, range, asymptotes, intercepts, end behavior, and intervals of increase and decrease for your population model as they relate to the problem situation.

4. Identify the extrema, zeros, and intercepts of the graph of $p(x)$.