

A1. Convert $e^d = f$ to logarithmic form.

B1. Evaluate (without a calculator) $\log_3 81$.

C1. Use benchmarks to estimate $\log_2 20$ to the nearest tenth.

A2. Convert $\log_5(7y) = x$ to exponential form.

B2. Evaluate (without a calculator) $\log_5\left(\frac{1}{25}\right)$.

C2. Use benchmarks to estimate $\log_3 35$ to the nearest tenth.

D1A. Write the expression $y\log_a b - \log_a c^3 + \log_a d$ as a single logarithm.

D1B. Write the expression $\log\left(\frac{a^{\frac{1}{4}}}{b^2c^3}\right)$ in terms of $\log a$, $\log b$, and $\log c$.

D1C. Evaluate the expression $2\log_4 6 - 3\log_4 3 + \log_4 12$ without a calculator.

D2A. Write the expression $5\log_5 2 + 2$ as a single logarithm.

D2B. Write the expression $\log\left(\frac{a^3 b^2}{c^{1/3}}\right)$ in terms of $\log a$, $\log b$, and $\log c$.

D2C. Evaluate the expression $2\log_2 6 - 3\log_2 3 + \log_2 6$ without a calculator.

F1. Sketch the graph of $y = 2\log_2 x + 2$

G1. Identify the domain, range, vertical asymptote, and intercepts of $y = 2\log_2 x + 2$.

E1. Determine the value of $\log_7 90$ to 3 decimal places.

F2. Sketch the graph of $y = 3\log_3(x + 3)$.

G2. Identify the domain, range, vertical asymptote, and intercepts of $y = 3\log_3(x + 3)$

H1. Solve the equation to 3 decimal places: $3^x = 5^{x-2}$

E2. Determine the value of $\log_3 68$ to 3 decimal places.

H2. Solve the equation to 3 decimal places: $2(5^x) = 7^{x+3}$

I1. Solve and verify: $\log_4(x-1) + \log_4(x+2) = 1$

I2. Solve and verify: $\log(2x + 3) + \log(x - 1) = \log(x - 2) + \log(x - 1)$

J1a. A ninja invests \$2500 at 3% compounded semi-annually. How much money will the ninja have after 5 years?

J1b. How long would it take for the same investment to double in value? (Note: This is a NINJA's investment).

J2. The half-life of Sodium-24 is 14.9 hours. Suppose a hospital buys a 50 mg sample. How long will it be until only 5 mg remain?

K1. How many times as intense is an earthquake with magnitude 5.0 compared to an earthquake with magnitude 7.0.

K2. How many times louder is a car horn (110 dB) compared to city traffic (80 dB)

L1. A major earthquake of magnitude 8.2 is 110 times as intense as a minor earthquake. What is the magnitude of the minor earthquake?

J2. The population of a town is decreasing at a rate of 10% every 5 years. If there are currently 20,000 people in the town, how long until only half remain?

K1. How many times as acidic is a solution with pH 4.2 compared to a solution with pH 5.8?

L2. Solution X has a pH of 9.2. Solution Y is 20 times more alkaline than solution X. What is the pH of solution Y?

M1. Solve the equation to 3 decimal places: $2e^{0.04x} = 30$

M2. Solve and verify: $\ln x + \ln(x - 1) = \ln 6$