

Using Logs to Solve Exponent Equations

Grade 11 – Algebra 2 math · Worksheet · Standards: F-LE.A.4, A-SSE.B.3c

Name: _____ Date: _____ Class: _____

These problems train solving equations with the unknown in an exponent or inside a logarithm, standards F-LE.A.4 and A-SSE.B.3c.

They begin with matching bases, move to logarithm methods and extraneous roots, and finish with interest, half-life, population, pH and sound-level applications.

Standards: F-LE.A.4, A-SSE.B.3c · **Level:** Grade 11 Algebra 2

Problem 1 Match the bases (easy)

Solve $3^x = 729$.

Problem 2 Same base on both sides (easy)

Solve $4^{x+1} = 64$.

Problem 3 Simplest logarithmic equation (easy)

Solve $\log_5 x = 3$.

Problem 4 Negative log value (easy)

Solve $\log_2 x = -3$.

Problem 5 Isolate, then match bases (easy)

Solve $3 \cdot 2^x = 48$.

Problem 6 Exponential equation with logs (medium)

Solve $7^x = 20$. Round to the nearest hundredth.

Problem 7 Base e equation (medium)

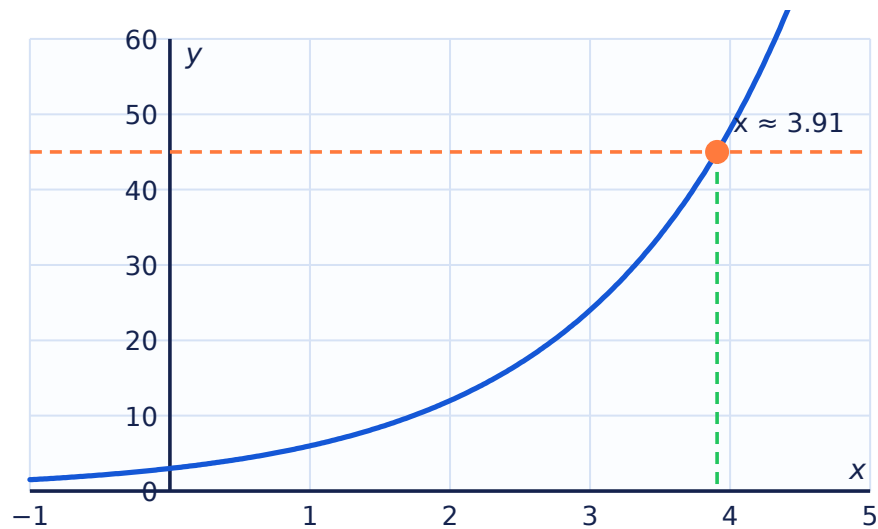
Solve $e^{2x} = 15$. Round to the nearest hundredth.

Problem 8 Logarithm with a shifted argument (medium)

Solve $\log(x + 4) = 2$.

Problem 9 Graph of an exponential equation (medium)

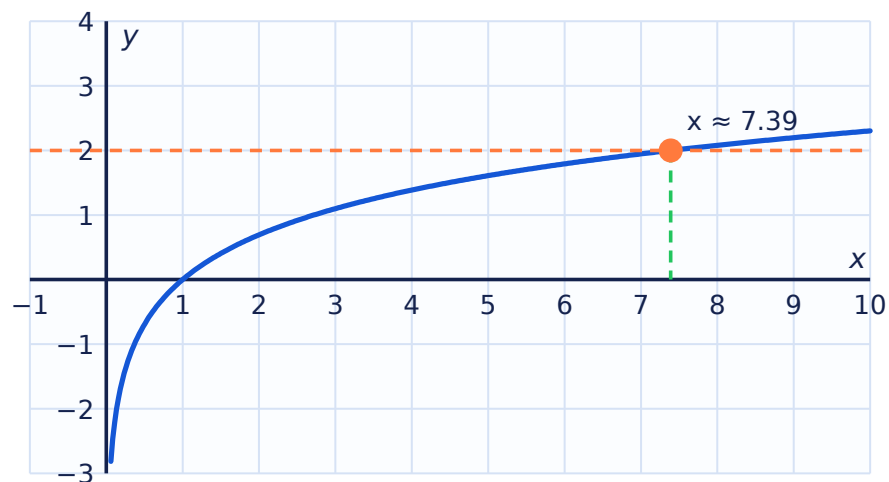
The graph shows $y = 3 \cdot 2^x$ and the line $y = 45$. Solve $3 \cdot 2^x = 45$ exactly, then to the nearest hundredth.



Graph of $y = 3 \cdot 2^x$ and $y = 45$.

Problem 10 Natural log on a graph (medium)

The graph shows $y = \ln x$ and the line $y = 2$. Find the exact x-coordinate of the intersection and approximate it to the nearest hundredth.



Graph of $y = \ln x$ and $y = 2$.

Problem 11 Condense logs and solve (medium)

Solve $\ln x + \ln(x + 2) = \ln 24$. Reject any extraneous solution.

Problem 12 Different bases on each side (medium)

Solve $2^{x+3} = 5^x$. Round to the nearest hundredth.

Problem 13 Logarithm equation leading to a quadratic (medium)

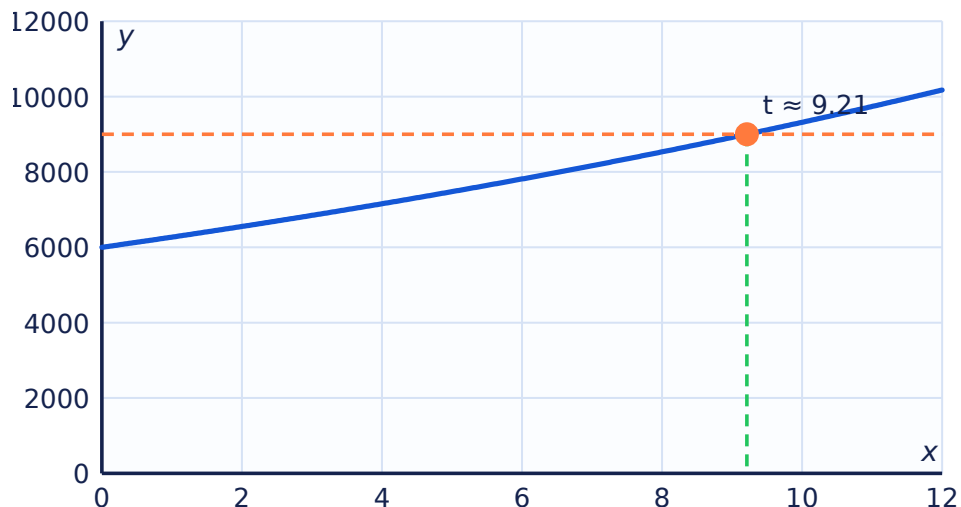
Solve $\log x + \log(x - 3) = 1$.

Problem 14 Equation with a coefficient on the log (hard)

Solve $3 \log_2(x - 1) + 5 = 14$.

Problem 15 Savings goal with annual compounding (hard)

Camille deposits \$6,000 in an account paying 4.5% interest compounded annually. After how many years will the balance reach \$9,000? Round to the nearest hundredth of a year.



Balance of the account over 12 years.

Problem 16 Medicine half-life (hard)

A 80 mg dose of a medicine has a half-life of 6 days, so the amount left is $A(t) = 80(1/2)^{t/6}$. After how many days does 15 mg remain? Round to the nearest tenth.



Medicine remaining over 30 days.

Problem 17 Town population growth (hard)

The population of a town is modeled by $P = 1200e^{0.035t}$, where t is years since 2020. When will the population reach 2,000? Give the year, rounding up to the next whole year.

Problem 18 Doubling time at 3.2% (hard)

An investment grows continuously at 3.2% per year, $A = Pe^{0.032t}$. Find the doubling time to the nearest tenth of a year, and explain why the starting amount P does not matter.

Problem 19 Hydrogen ion concentration (hard)

Black coffee has a pH of 4.3. Use $\text{pH} = -\log[\text{H}^+]$ to find $[\text{H}^+]$ in scientific notation with the coefficient rounded to the nearest hundredth.

Problem 20 Comparing two sound levels (hard)

A concert is 92 dB and a conversation is 68 dB, where $L = 10 \log(I/I_0)$. How many times greater is the intensity of the concert? Round to the nearest whole number.