LESSON MAKER PRO

Unlock the Logs

Combine logarithms, solve, and check the domain.

HIGH SCHOOL · A2.A.1.6

A2.A.1.6 "Solve common and natural logarithmic equations using the properties of logarithms."

NAME _____ DATE _____

LOG RULES

For positive a and b, log(a) + log(b) = log(ab) and log(a) - log(b) = log(a/b); these rules also work for ln. You can move a coefficient into an exponent: k log(a) = log(a^k). When two logarithms with the same base are equal, set their arguments equal, then check that every original argument is positive.

WORKED EXAMPLE

Solve log(x) + log(4) = log(28).

1. Combine the left side: log(4x) = log(28).
2. Set the arguments equal: 4x = 28.
3. Solve: x = 7. Both original arguments are positive.

Answer: x = 7

PRACTICE 6 problems

1 Solve log(x) + log(2) = log(18).

ANSWER _____

2 Solve ln(x) - ln(5) = ln(6).

ANSWER _____

3 Solve 2log(x) = log(25).

ANSWER _____

4 Solve log(x/2) = log(6).

ANSWER _____

5 Solve log(x - 2) + log(x + 2) = log(21).

ANSWER _____

6 Solve ln(x + 6) - ln(x) = ln(2).

ANSWER _____

APPLY IT Show your work

1 At a school concert, a sound meter reads 80 decibels. Use $L = 10\log(x)$, where L is the decibel level and x is the sound intensity divided by a reference intensity. How many times the reference intensity is the sound?

WORK SPACE

ANSWER _____

2 The view count of a new video is modeled by $V = 50e^{t/2}$, where t is hours after posting. When does the model predict $50e^3$ views?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $\ln(x - 1) + \ln(x - 5) = \ln(8)$. Explain why only one algebraic root works.

WORK SPACE AND ANSWER

ANSWER KEY

Unlock the Logs

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve log(x) + log(2) = log(18).	**x = 9**
2	Solve ln(x) - ln(5) = ln(6).	**x = 30**
3	Solve 2log(x) = log(25).	**x = 5**
4	Solve log(x/2) = log(6).	**x = 12**
5	Solve log(x - 2) + log(x + 2) = log(21).	**x = 5**
6	Solve ln(x + 6) - ln(x) = ln(2).	**x = 6**

PART 2 · APPLY IT

1. **10^8 times the reference intensity** 80 = 10log(x), so log(x) = 8. Therefore x = 10^8.
2. **6 hours after posting** Set $50e^{t/2} = 50e^3$ and divide by 50. Taking ln of both sides gives t/2 = 3, so t = 6.

CHALLENGE

x = 3 + 2sqrt(3). Combining logs gives (x - 1)(x - 5) = 8, with roots 3 + 2sqrt(3) and 3 - 2sqrt(3). The original equation requires x > 5, so 3 - 2sqrt(3) does not work.

Accept equivalent exact forms, such as 100,000,000 for 10^8. Do not accept roots that make an original logarithm's argument zero or negative.