LESSON MAKER PRO

Undo the Exponent

Solve equations by switching between powers and logarithms.

HIGH SCHOOL · MT.PLUS.ALG.EXP.5

MT.PLUS.ALG.EXP.5 "Solve exponential and logarithmic equations using inverse operations with and without the use of technology."

NAME _____ DATE _____

INVERSE OPERATIONS

To solve an exponential equation without a calculator, rewrite both sides as powers of the same base, then set the exponents equal. To solve $\log_b(A) = c$, rewrite it as $b^c = A$. Check that every logarithm's input is positive.

WORKED EXAMPLE

Solve $7^{x+14} = 49$.

1. Rewrite 49 as 7^2.
2. Set the exponents equal: $x + 14 = 2$.
3. Subtract 14: $x = -12$.

Answer: x = -12

PRACTICE 6 problems

1 Solve $2^x = 32$.

ANSWER _____

2 Solve $3^{x-1} = 81$.

ANSWER _____

3 Solve $4^x = 1/64$.

ANSWER _____

4 Solve $\log_5(x) = 3$.

ANSWER _____

5 Solve $\log_2(x + 6) = 4$.

ANSWER _____

6 Solve $\log_3(x - 5) = 0$.

ANSWER _____

APPLY IT Show your work

1 A clip has 20 views when you post it. During its first few hours online, its view count triples each hour. After how many hours will it have 540 views?

WORK SPACE

ANSWER _____

2 Your phone has 640 MB of files left to back up. The amount left halves each minute. After how many minutes will 40 MB be left?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $\log_2(x - 1) + \log_2(x - 5) = 5$. Show why any other algebraic solution is invalid.

WORK SPACE AND ANSWER

Undo the Exponent

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve $2^x = 32$.	**x = 5**
2	Solve $3^{x-1} = 81$.	**x = 5**
3	Solve $4^x = 1/64$.	**x = -3**
4	Solve $\log_5(x) = 3$.	**x = 125**
5	Solve $\log_2(x + 6) = 4$.	**x = 10**
6	Solve $\log_3(x - 5) = 0$.	**x = 6**

PART 2 · APPLY IT

1. **3 hours** Solve $20 \cdot 3^x = 540$. Dividing by 20 gives $3^x = 27$, so x = 3.
2. **4 minutes** Solve $640 \cdot (1/2)^x = 40$. Dividing by 640 gives $(1/2)^x = 1/16$, so x = 4.

CHALLENGE

x = 9. Combining the logarithms gives (x - 1)(x - 5) = 32, or (x - 9)(x + 3) = 0. The other algebraic solution, x = -3, is invalid because both logarithm inputs would be negative.

For the challenge, accept any valid method that finds both algebraic solutions and rejects x = -3 using the logarithm domain. Equivalent exact forms of the practice answers are acceptable.