

Power Equation Quest

Use matching bases to solve for x .

HIGH SCHOOL • MA.912.AR.5.1

MA.912.AR.5.1 "Solve one-variable exponential equations using the properties of exponents."

NAME _____

DATE _____

MATCH THE EXPONENTS

When two exponential expressions have the same base, set their exponents equal. If the bases are different but can be rewritten as the same base, rewrite them first, then solve the resulting equation.

WORKED EXAMPLE

Solve $11^{(x+3)} = 11^9$.

1. The bases match, so set the exponents equal: $x + 3 = 9$.
2. Subtract 3 from both sides.
3. $x = 6$

Answer: $x = 6$

PRACTICE 6 problems

1 Solve $2^x = 2^8$.

ANSWER _____

2 Solve $4^{(x+2)} = 4^{10}$.

ANSWER _____

3 Solve $5^{(2x)} = 5^{14}$.

ANSWER _____

4 Solve $7^{(x-4)} = 7^8$.

ANSWER _____

5 Solve $8^{(2x+1)} = 8^{15}$.

ANSWER _____

6 Solve $(\frac{1}{2})^{(x+5)} = (\frac{1}{2})^{12}$.

ANSWER _____

APPLY IT Show your work

- 1** At an esports tournament, the number of possible player slots is modeled by 2^x . The organizer has 128 player slots. What is x ?

WORK SPACE

ANSWER _____

- 2** A student is organizing digital photos. A backup system uses $5^{(x-2)}$ storage units for a project at level x . The project uses 3,125 storage units. What is x ?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Solve $4^{(x-5)} = 2^{(x+8)}$. Explain how you made the bases match.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve $2^x = 2^8$.	$x = 8$
2	Solve $4^{(x+2)} = 4^{10}$.	$x = 8$
3	Solve $5^{(2x)} = 5^{14}$.	$x = 7$
4	Solve $7^{(x-4)} = 7^8$.	$x = 12$
5	Solve $8^{(2x+1)} = 8^{15}$.	$x = 7$
6	Solve $(\frac{1}{2})^{(x+5)} = (\frac{1}{2})^{12}$.	$x = 7$

PART 2 · APPLY IT

- $x = 7$** Rewrite 128 as 2^7 . Then $2^x = 2^7$, so $x = 7$.
- $x = 7$** Rewrite 3,125 as 5^5 . Set $x - 2 = 5$, then solve to get $x = 7$.

CHALLENGE

$x = 18$. Rewrite 4 as 2^2 , so $2^{(2x-10)} = 2^{(x+8)}$. Set $2x - 10 = x + 8$, which gives $x = 18$.

Accept equivalent exponent equations and correct work that rewrites 128 as 2^7 and 3,125 as 5^5 . For the challenge, students should rewrite 4 as 2^2 before equating exponents.