Exponent Matchup

Do both sides have the same value?

PA.N.1.1 "Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions."

NAME _____ DATE _____

EQUAL

Both sides have the same value for every allowed value of a variable. When you multiply powers with the same base, add their exponents.

$12^3 \cdot 12^2 = 12^5$

UNEQUAL

The sides have different values, or at least one allowed value of a variable makes them different. When you raise a power to another power, multiply the exponents instead of adding them.

$(q^2)^3 = q^5$

1 SORT

8 items

Circle EQUAL or UNEQUAL for each equation, then choose two items and explain each choice using an exponent rule or a value check.

1. $2^3 \cdot 2^{-1} = 2^2$ — EQUAL UNEQUAL

2. $(-4)^0 = 1$ — EQUAL UNEQUAL

3. $x^3 \cdot x^{-2} = x^{-6}, x \neq 0$ — EQUAL UNEQUAL

4. $(3^2)^{-1} = 3^{-2}$ — EQUAL UNEQUAL

5. $5^{-2} = -25$ — EQUAL UNEQUAL

6. $y^4 \div y^{-1} = y^3, y \neq 0$ — EQUAL UNEQUAL

7. $(ab)^{-2} = a^{-2}b^{-2}, a \neq 0, b \neq 0$ — EQUAL UNEQUAL

8. $(-3)^{-2} = 1/9$ — EQUAL UNEQUAL

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new EQUAL equation and one new UNEQUAL equation using integer exponents.

EQUAL _____

UNEQUAL _____

CHALLENGE

Write an UNEQUAL equation that uses both a zero exponent and a negative exponent, then correct it without changing its left side.

ANSWER KEY

Exponent Matchup

GRADE 8 · PA.N.1.1

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	$2^3 \cdot 2^{-1} = 2^2$	**EQUAL**	Add exponents when multiplying powers with the same base: 3 + (−1) = 2.
2	$(-4)^0 = 1$	**EQUAL**	Any nonzero number raised to the zero power equals 1.
3	$x^3 \cdot x^{-2} = x^{-6}$, $x \neq 0$	**UNEQUAL**	The left side is x to the first power, not x to the −6 power.
4	$(3^2)^{-1} = 3^{-2}$	**EQUAL**	Multiply the exponents: 2 · (−1) = −2.
5	$5^{-2} = -25$	**UNEQUAL**	5 to the −2 power is 1/25, not −25.
6	$y^4 \div y^{-1} = y^3$, $y \neq 0$	**UNEQUAL**	Subtract exponents when dividing powers with the same base: 4 − (−1) = 5.
7	$(ab)^{-2} = a^{-2}b^{-2}$, $a \neq 0$, $b \neq 0$	**EQUAL**	The exponent applies to both factors in the product.
8	$(-3)^{-2} = 1/9$	**EQUAL**	The negative exponent gives the reciprocal of (−3) squared, which is 1/9.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **EQUAL**: $13^0 = 1$
- **UNEQUAL**: $6^{-1} = -6$

Challenge: $4^0 \cdot 4^{-2} = 4^{-1}$ is unequal. The corrected equation is $4^0 \cdot 4^{-2} = 4^{-2}$.

For Part 2, accept any two explanations that correctly use an exponent rule or show a value that disproves an equation. For item 3, x = 2 gives 2 on the left and 1/64 on the right.