MATHEMATICS · GRADES 7-9

Power of a power

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you shrink a power raised to another power into a single power, like working out the total number of squares when a grid is built from grids. A chessboard is eight rows of eight squares, and a bigger grid made of chessboards multiplies the same way. Computer storage grows the same way too, since each step up multiplies by the same base again. Knowing how powers stack keeps big counts short and easy to handle.



Rule

To raise a power to a power, $(x^a)^b = x^{ab}$. Multiply the exponents.

The base stays the same. For example, $(x^3)^4$ is x^{12}.

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Worked examples

EXAMPLE 1

Q Simplify $(x^3)^4$

SOLUTION

Picture it

Simplify $(x^3)^4$

Work it one step at a time, top to bottom.

A power raised to a power uses the power rule.

Multiply the exponents: $3 \times 4 = 12$.

So $(x^3)^4 = x^{12}$

EXAMPLE 2

Q Simplify $(2^2)^5$

SOLUTION

Picture it

Simplify $(2^2)^5$

Work it one step at a time, top to bottom.

A power raised to a power uses the power rule.

Multiply the exponents: $2 \times 5 = 10$.

So $(2^2)^5 = 2^{10} = 1{,}024$

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Practice questions

1 Write $(3^2)^3$ as a single power.

- A 3^5
- B 3^9
- C 3^6
- D 3^2

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2 What is n if $(5^2)^n = 5^8$?

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3 What is $(2^3)^2$ as a whole number?

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4 Write $(a^3)^2$ as a single power.

A a^6

B a^5

C a^9

D a^3

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5 Is $(b^3)^2 = b^5$?

- **A** Yes
- **B** No

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6 Which is equal to 7^6?

- **A** $(7^2)^3$
- **B** $(7^3)^2$
- **C** Both A and B
- **D** Neither

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7 Write $(x^5)^0$ as a single power.

- **A** x^5
- **B** x^1
- **C** x^{10}
- **D** x^0

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8 Which shows $(4^2)^3$ written as a product?

- **A** $4^2 \times 4^2 \times 4^2$
- **B** $4^2 + 4^2 + 4^2$
- **C** $4 \times 4 \times 4$
- **D** $4^2 \times 4^3$

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9 What is $(y^3)^0$ as a number?

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10 Write $(6^1)^5$ as a single power.

A 6^6

B 6^1

C 6^5

D 6^{10}

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ANSWER KEY

1. 3^6

2. 4

3. 64

4. a^6

5. No

6. Both A and B

7. x^0

8. $4^2 \times 4^2 \times 4^2$

9. 1

10. 6^5

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