MATHEMATICS · GRADES 7-9

Exponent rules

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

These are the shortcuts for working with powers that show up in real calculations. Compound interest grows by powers, and so does a rumour spreading through a school, doubling and redoubling. The rules let you combine those powers without writing out every multiplication. They turn a long, error-prone calculation into a short one.



Rule

Exponent rules: when the bases match, $x^a \times x^b = x^{a+b}$, $x^a \div x^b = x^{a-b}$, and $(x^a)^b = x^{ab}$.

$a^0 = 1$ for any non-zero a, and $a^{-n} = \frac{1}{a^n}$.

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Worked examples

EXAMPLE 1

Q Simplify $2^3 \times 2^4$ using a rule.

SOLUTION

This is the product rule: same base, so add the exponents instead of working out both powers.

$3 + 4 = 7$

So the answer is 2^7

EXAMPLE 2

Q Simplify $(3^2)^3$ using a rule.

SOLUTION

This is the power of a power rule: a power raised to a power, so multiply the exponents.

$2 \times 3 = 6$

So the answer is 3^6

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Practice questions

1 Simplify $x^3 \times x^5$.

- **A** x^{15}
- **B** x^7
- **C** x^8
- **D** x^2

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2 Simplify $5^6 \div 5^2$.

- **A** 5^3
- **B** 5^4
- **C** 5^8
- **D** 5^{12}

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3 Simplify $(2^4)^2$.

- **A** 2^6
- **B** 2^{16}
- **C** 2^2
- **D** 2^8

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4 Simplify $(3x)^2$.

- **A** $3x^2$
- **B** $9x$
- **C** $9x^2$
- **D** $6x^2$

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5 Simplify 8^0.

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6 Simplify 2^{-3} as a fraction.

A) 8

B) -8

C) $\frac{1}{6}$

D) $\frac{1}{8}$

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7 Simplify $y^{3} \times y^{-5}$.

A y^{-2}

B y^{2}

C y^{-8}

D y^{8}

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8 Simplify $(2x^{3})^{2}$.

A $4x^{6}$

B $2x^{6}$

C $4x^{5}$

D $2x^{5}$

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9 Simplify $6^4 \times 6^0$.

- A 6^0
- B 1
- C 6^4
- D 6^5

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10 Simplify $3^5 \div 3^5$ as a single power.

- A 3^{10}
- B 3^0
- C 3^1
- D 3^{25}

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ANSWER KEY

1. x^8

2. 5^4

3. 2^8

4. $9x^2$

5. 1

6. $\frac{1}{8}$

7. y^{-2}

8. $4x^6$

9. 6^4

10. 3^0

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