Your notes

GCSE Maths: revision notes

Laws of indices

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Multiplying and dividing

- When multiplying powers of the same number, add the indices: $a^3 \times a^4 = a^7$.
- When dividing, subtract the indices: $a^8 \div a^2 = a^6$.
- Multiply any numbers in front separately: $4x^2 \times 3x^5 = 12x^7$.

Powers of powers

- When raising a power to another power, multiply the indices: $(a^3)^2 = a^6$.
- $(2x^3)^2 = 4x^6$: square the 2 as well.

Zero and negative indices

- Anything to the power 0 is 1: $a^0 = 1$, $5^0 = 1$.
- A **negative index** means 'one over': $a^{-n} = 1 \div a^n$. So $2^{-3} = 1/8$.

Fractional indices (Higher)

- A **fractional index** means a root: a^(1/2) = √a and a^(1/3) = $\sqrt[3]{a}$. So 25^(1/2) = 5.
- a^(m/n) means take the nth root, then raise to the power m: 8^(2/3) = $(\sqrt[3]{8})^2 = 2^2 = 4$.
- Negative fractional indices: 16^(–1/2) = 1 ÷ √16 = 1/4.

Worked examples

Simplify $(x^4 \times x^3) \div x^2$

When you multiply, add the powers. $\mathbf{x^4 \times x^3 = x^7}$

When you divide, subtract the powers. $\mathbf{x^7 \div x^2 = x^5}$

Answer: x^5

(Higher) Work out 8 to the power 2/3

The bottom of the fraction (3) means a cube root. **cube root of 8 = 2**

The top of the fraction (2) means square it. **$2^2 = 4$**

Answer: 4

Key terms

Index	The power a number is raised to (plural: indices).
Base	The number being raised to a power.
Index laws	Rules for multiplying, dividing and raising powers of the same base.
Negative index	A power that means the reciprocal: $a^{-n} = 1/a^n$.
Fractional index	A power that means a root: a^(1/n) is the nth root of a.
Reciprocal	One divided by a number.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. Simplify $x^3 \times x^4$.
2. Simplify $y^8 \div y^2$.
3. Simplify $(a^3)^2$.
4. What is 5^0?
5. What is 2^{-3}?
6. Simplify $3^5 \times 3^2$.
7. What is 25^(1/2)? (Higher)
8. What is 8^(2/3)? (Higher)

Answers

1. x^7
2. y^6
3. a^6
4. 1
5. 1/8
6. 3^7
7. 5
8. 4

What to do next

Practise 12 questions on this topic

Try 4 exam questions, with mark schemes

Read the lesson, one step at a time

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