Year 8 Integers, Powers and Roots – Revision Notes

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Year 8 · Maths · Integers, Powers and Roots · Key ideas and worked examples

For grown-ups and learners: read each part and try the worked example. Then work through the sheets: Foundation, Developing, Challenge, then Mixed Practice to revise everything. Show your working: it earns marks in tests and helps you spot mistakes.

1. Index laws

A power such as 5^4 means $5 \times 5 \times 5 \times 5$. When you **multiply** powers of the same number, **add** the indices: $3^5 \times 3^2 = 3^7$. To **divide**, **subtract** them: $7^6 \div 7^2 = 7^4$. Any number (except 0) to the power **0** is **1**, because $4^3 \div 4^3 = 4^0$ and it also equals 1.

Example: Write $10^6 \times 10^8$ as a single power of 10.
→ Same base, so add the indices: 6 + 8 = 14
→ = 10^{14}
Answer: 10^{14}

2. Squares, cubes and roots of negative numbers

$(-6)^2 = (-6) \times (-6) =$ **36**, so 36 has **two** square roots: 6 and −6. Be careful: -6^2 means $-(6^2) = -36$. Three negatives multiply to a negative, so $(-4)^3 =$ **−64** and $\sqrt[3]{(-64)} = -4$. Every number has exactly one cube root.

Example: Work out $(-3)^3$.
→ $(-3) \times (-3) \times (-3)$
→ Three negatives multiply to a negative: −27
Answer: −27

3. Order of operations

Work out brackets first, including anything under a root sign, then indices and roots, then × and ÷, then + and −. For example $\sqrt{(9 \times 16)} - 2^3 = \sqrt{144} - 8 = 12 - 8 =$ **4**. When multiplying or dividing integers, the same signs give a positive answer and different signs give a negative answer.

Example: Work out $(18 - 3^2) \times \sqrt[3]{(-8)}$.
→ Brackets first (including the part under a root sign), then indices and roots
→ Then × and ÷, then + and −
→ = −18
Answer: −18

4. Types of number

Natural numbers are 1, 2, 3, … **Integers** are the whole numbers, including 0 and the negatives. **Rational numbers** can be written as a fraction of two integers, such as 3/4, −1.5 = −3/2 or 7 = 7/1. Every natural number is an integer, and every integer is rational.

Think like a mathematician: test a few cases (**specialising**), look for the rule that always works (**generalising**), and explain why you are sure (**convincing**). When you check someone's working, say what is wrong and how to **improve** it.

Common mistakes: multiplying the indices instead of adding them. Writing $5^0 = 0$. Thinking $(-3)^2 = -9$. Forgetting the negative square root.