Index laws

With the same base, powers can be combined by working with their indices.

Simplify (2³ × 2⁵) ÷ 2⁴.

$2^3 \times 2^5 = 2^8$	Add indices when multiplying.
$2^8 \div 2^4 = 2^4$	Subtract when dividing.

16

Remember

For a power of a power, multiply indices. A power outside brackets applies to each factor: (ab)³ = a³b³.

Zero, negative and fractional indices

A negative index gives a reciprocal. A fractional index involves a root.

Evaluate 27 raised to the power −⅔.

$27^{-2/3} = \frac{1}{27^{2/3}}$	A negative index means take the reciprocal.
$27^{2/3} = (\sqrt[3]{27})^2 = 3^2$	The denominator 3 tells you to take the cube root.

$\frac{1}{9}$

Remember

For a non-zero base, $a^0 = 1$. For positive a and b, $(a/b)^n = a^n/b^n$; the same rule works for fractional indices.

Surds

Take out perfect-square factors before collecting like surds.

Simplify √72 + √8.

$\sqrt{72} = \sqrt{36 \times 2} = 6\sqrt{2}$	The square root of 36 is 6.
$\sqrt{8} = \sqrt{4 \times 2} = 2\sqrt{2}$	Simplify the other surd.
$6\sqrt{2} + 2\sqrt{2} = (6+2)\sqrt{2}$	Both terms contain the same surd.

$8\sqrt{2}$

Remember

Unlike surds cannot be added as like terms. For products, √3 × √6 = √18 = 3√2.

Standard form and accuracy

In standard form, the first factor is at least 1 and less than 10.

Write 0.0005078 in standard form, correct to three significant figures.

$0.0005078 = 5.078 \times 10^{-4}$	Move the decimal point four places right to make 5.078.
$5.078 \approx 5.08$	The first three significant digits are 5, 0 and 7; the next digit is 8.

5.08×10^{-4}

Remember

Leading zeros are not significant. Decimal places instead count digits to the right of the decimal point.

Number operations and estimation

Use brackets and indices first, then multiply or divide, then add or subtract.

Find 18 − (−3)² × 2, and explain how to check.

$(-3)^2 = 9$	Square the whole bracket.
$18 - 9 \times 2 = 18 - 18$	Multiply before subtracting.

0

Remember

Independent check: 9 × 2 is exactly 18. Subtraction is not commutative. Multiplication is distributive: 7 × 19 = 7 × (20 − 1).

JUNIOR CYCLE HIGHER LEVEL · CHAPTER PRACTICE

Number Extensions

Try the questions before opening the separate answer key. Show one step per line.

7.1 · Fluency

Simplify $(3^5 \times 3^4) \div 3^6$.

7.2 · Variation

Simplify $\sqrt{50} - \sqrt{8}$.

7.3 · Choose a method

Write 0.0004837 in standard form to three significant figures.

Check your work: are the sign, units and level of accuracy appropriate?