

Index laws Indices, powers or exponents are how many times a number is multiplied by itself.

Learn these 9 rules!

$$x^y \times x^z = x^{y+z}$$

$$t^9 \times t^6 = t^{9+6} = t^{15}$$

$$x^1 = x$$

$$-4.36^1 = -4.36$$

$$x^y \div x^z = x^{y-z}$$

$$7^8 \times 7^2 = 7^{8-2} = 7^6$$

$$(x^y)^z = x^{yz}$$

$$(3x^2)^3 = 3^3 x^{2 \times 3} = 27x^6$$

$$x^0 = 1$$

For all values of x except 0.

$$5.644^0 = 1$$

$$(xy)^z = x^z \times y^z$$

$$(2a)^4 = 2^4 \times a^4 = 16a^4$$

$$x^{\frac{y}{z}} = \sqrt[z]{x^y}$$

$$81^{\frac{3}{4}} = \sqrt[4]{81^3} = 3^3 = 27$$

$$x^{-y} = \frac{1}{x^y}$$

$$\left(\frac{3}{4}\right)^{-1} = \frac{4}{3}$$

$$\left(\frac{x}{y}\right)^z = \frac{x^z}{y^z}$$

$$\left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2} = \frac{9}{16}$$

Index notation

The power or index is always written in superscript above the base, example 2^3 .

AddvanceMaths.com Indices & Surds

AddvanceMaths.com/Revision/Indices

Surds video



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Surds A surd is an irrational number represented in the form of a root, for example $\sqrt{2} \approx 1.41421 \dots$

Surd notation rules

\sqrt{x} is the same as $\sqrt[2]{x}$ (only applies for square roots)

When writing a surd with a coefficient, the integer **always** comes first (example $5\sqrt{3}$).

There is no need for a multiplication sign (\times), example $5\sqrt{3}\sqrt{7}$.

Rationalising the denominator

This means to get rid of any surds in the denominator. There are easier and harder questions.

Easy: Multiply the denominator and numerator by the surd.

$$\frac{3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{5}}{5} \quad \frac{\sqrt{7} \times \sqrt{3}}{2\sqrt{3} \times \sqrt{3}} = \frac{\sqrt{7}\sqrt{3}}{2\sqrt{3}\sqrt{3}} = \frac{\sqrt{21}}{2 \times 3} = \frac{\sqrt{21}}{6}$$

Hard: Multiply by the denominator with a **flipped** sign.

$$\frac{3}{\sqrt{5}-1} \times \frac{(\sqrt{5}+1)}{(\sqrt{5}+1)} = \frac{3(\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)} = \frac{3\sqrt{5}+3}{5+\sqrt{5}-\sqrt{5}-1} = \frac{3+3\sqrt{5}}{4}$$

$$\sqrt{xy} = \sqrt{x}\sqrt{y}$$

$$\sqrt{2}\sqrt{18} = \sqrt{36} = 6$$

$$\sqrt{75} = \sqrt{3}\sqrt{25} = 5\sqrt{3}$$

When asked to simplify a surd, check for factors of the surd that are a perfect square, such as 9 or 25.

$$\sqrt{x} \times \sqrt{x} = x$$

$$\sqrt{15} \times \sqrt{15} = 15$$