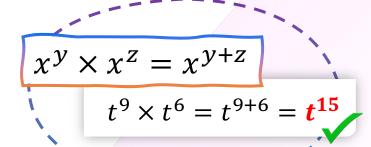
Index laws Indices, powers or exponents are how many times a number is multiplied by itself.





$$x^{1} = x$$

$$-4.36^{1} = -4.36$$

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

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

$$(xy)^{Z} = x^{Z} \times y^{Z}$$

$$(2a)^{4} = 2^{4} \times a^{4} = \mathbf{16}a^{4}$$

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

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

$$x^0 = 1$$
 For all values of  $x$  except 0. 5.644 $^0 = 1$ 

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

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

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

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

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

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

## **⚠** Index notation

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

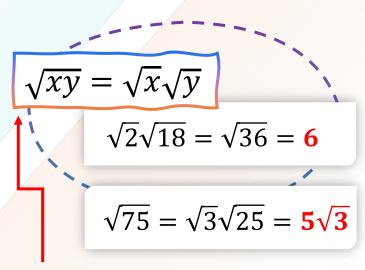
## AddvanceMaths.com Indices & Surds

AddvanceMaths.com/Revision/Indices

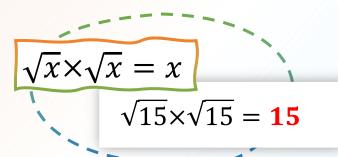


Designed and Written by Adithya Arangan

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



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



## 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 (×), 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.

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

Hard: Multiply by the denominator with a flipped sign.

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

$$\times (\sqrt{5}+1)$$