

Indices – Quick Summary

Laws of Indices

Laws	Example
<p>Multiplicative Law</p> $a^m \times a^n = a^{m+n}$	$8 \times 16 = 2^3 \times 2^4$ $= 2^{3+4}$ $= 2^7$
<p>Division Law</p> $a^m \div a^n = a^{m-n}$	$(2x)^3 \div (2x)^5 = (2x)^{3-5}$ $= (2x)^{-2}$ $= \frac{1}{2^2 x^2}$ $= \frac{1}{4x^2}$
<p>Power of Index</p> $(a^m)^n = a^{mn}$	$(x^3 y^{-4})^{-1} = (x^3)^{-1} (y^{-4})^{-1}$ $= x^{-3} y^4$ $= \frac{y^4}{x^3}$ <p><i>always leave answer in positive index</i></p>
<p>Rational Index</p> $\sqrt[n]{a} = a^{\frac{1}{n}}$	$\sqrt[4]{x} \times \sqrt[3]{x} \div x^3 = x^{\frac{1}{4}} \times x^{\frac{1}{3}} \div x^3$ $= x^{\frac{1}{4} + \frac{1}{3} - 3}$ $= x^{-\frac{29}{12}}$ $= \frac{1}{x^{\frac{29}{12}}}$ <p><i>change all rational index to index form</i></p>
<p>Rational Index (with power)</p> $\sqrt[n]{a^m} = a^{\frac{m}{n}} = (\sqrt[n]{a})^m$	$\sqrt[3]{\sqrt{x^3}} \times x^2 = (\sqrt{x^3})^{\frac{1}{3}} \times x^2$ $= \left[(x^3)^{\frac{1}{2}} \right]^{\frac{1}{3}} \times x^2$ $= (x^3)^{\frac{1}{2} \times \frac{1}{3}} \times x^2$ $= (x^3)^{\frac{1}{6}} \times x^2$ $= x^{\frac{1}{2}} \times x^2$ $= x^{\frac{5}{2}}$ <p><i>change all rational index, starting from the inner to outer layer</i></p>

Solving Equation involving indices

Comparing power of same base

For any given equation

$$a^x = a^m$$

Comparing power of a

$$x = m$$

Note: Always change the base the lowest possible before attempting to solve them.

Example 1

Solve

$$16^x = 8$$

Change both side to common base

$$(2^4)^x = 2^3$$

$$2^{4x} = 2^3$$

Comparing power of 2

$$4x = 3$$

$$x = \frac{3}{4}$$

