Supporting Australian Mathematics Project
Middle Years SAM-MY

Year 9

Number and Algebra

Indices

Index laws

The following index laws have been established, where a and b are integers and m and n are non-zero whole numbers.

1 To multiply powers with the same base, add the indices.

$a^m \times a^n = a^{m+n}$

2 To divide powers with the same base, subtract the indices.

$\frac{a^m}{a^n} = a^{m-n}$, provided $m > n$ and $a \neq 0$

3 To raise a power to a power, multiply the indices.

$(a^m)^n = a^{mn}$

4 A power of a product is the product of the powers.

$(ab)^m = a^m b^m$

5 A power of a quotient is the quotient of the powers.

$(\frac{a}{b})^m = \frac{a^m}{b^m} = a^{m-n}$, provided $b \neq 0$

These laws also hold when a and b are real.

Example 2

Write $5^3 \times 5^6$ as a single power of 5.

Solution

$$\begin{aligned} 5^3 \times 5^6 &= 5^{3+6} \\ &= 5^9 \end{aligned}$$

Example 3

Simplify $\frac{3^5}{3^2}$

Solution

$$\begin{aligned} \frac{3^5}{3^2} &= 3^{5-2} \\ &= 3^3 \\ &= 27 \end{aligned}$$

Example 4

Simplify $(\frac{x^3}{y^2})^2 \times (\frac{y}{x})^4$

Solution

$$\begin{aligned} (\frac{x^3}{y^2})^2 \times (\frac{y}{x})^4 &= \frac{x^6}{y^4} \times \frac{y^4}{x^4} \\ &= x^2 \end{aligned}$$

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