

YEAR 8 — ALGEBRAIC TECHNIQUES...

Indices

What do I need to be able to do?

By the end of this unit you should be able to:

- Add/ Subtract expressions with indices
- Multiply expressions with indices
- Divide expressions with indices
- Know the addition law for indices
- Know the subtraction law for indices

Keywords

Base: The number that gets multiplied by a power

Power: The exponent — or the number that tells you how many times to use the number in multiplication

Exponent: The power — or the number that tells you how many times to use the number in multiplication

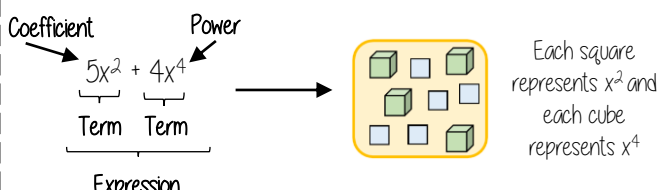
Indices: The power or the exponent

Coefficient: The number used to multiply a variable

Simplify: To reduce a power to its lowest term

Product: Multiply

Addition/ Subtraction with indices



Only similar terms can be simplified
If they have different powers, they are unlike terms

$5x^2 + 2x^2 \rightarrow$ [Visual representation of 7 squares] $\rightarrow 7x^2$

$5x^2 + 6x^4 - 3x^2 + x^4 \rightarrow$ [Visual representation of 2 squares and 7 cubes] $\rightarrow 2x^2 + 7x^4$

Multiply expressions with indices

$4b \times 3a$
 $\equiv 4 \times b \times 3 \times a$
 $\equiv 4 \times 3 \times b \times a$
 $\equiv 12ab$

$5t \times 9t$
 $\equiv 5 \times t \times 9 \times t$
 $\equiv 5 \times 9 \times t \times t$
 $\equiv 45t^2$

$2b^4 \times 3b^2$
 $\equiv 2 \times b \times b \times b \times b \times 3 \times b \times b$
 $\equiv 2 \times 3 \times b \times b \times b \times b \times b \times b$
 $\equiv 6b^6$

There are often misconceptions with this calculation but break down the powers

Addition/ Subtraction laws for indices

$3^5 \times 3^2 \rightarrow 3^7$
 $= (3 \times 3 \times 3 \times 3 \times 3) \times (3 \times 3)$

The base number is all the same so the terms can be simplified

Addition law for indices

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

$3^5 \div 3^2 \rightarrow 3^3$

$\frac{3 \times 3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} \rightarrow \frac{3^3}{3^0} \rightarrow \frac{3^3}{1}$

Subtraction law for indices

$a^m \div a^n = a^{m-n}$

Divide expressions with indices

$\frac{24}{36} \rightarrow \frac{\cancel{2} \times \cancel{2} \times 2 \times \cancel{3}}{\cancel{2} \times \cancel{3} \times 2 \times \cancel{3}} \rightarrow \frac{2}{3}$

$\frac{5a^3b^2}{15ab^6} \rightarrow \frac{\cancel{5} \times \cancel{a} \times a \times a \times \cancel{b} \times \cancel{b}}{3 \times \cancel{5} \times \cancel{a} \times \cancel{b} \times \cancel{b} \times b \times b \times b \times b} \rightarrow \frac{a^2}{3b^4}$

Cross cancelling factors shows cancels the expression

$\frac{23a^7y^2}{5db^6}$ } This expression cannot be divided (cancelled down) because there are no common factors or similar terms