

## 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

$5x^2 + 4x^4$   
 Coefficient      Power  
 Term      Term  
 Expression

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

$$5x^2 + 2x^2 \rightarrow \text{7 squares} \rightarrow 7x^2$$

$$5x^2 + 6x^4 - 3x^2 + x^4 \rightarrow \text{2 squares and 7 cubes} \rightarrow 2x^2 + 7x^4$$

## 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

## 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

## 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

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