



Pythagoras Theorem

Component Knowledge

- Identify the hypotenuse in a right-angled triangle.
- Use substitution in formula.
- Solve an equation by rearranging

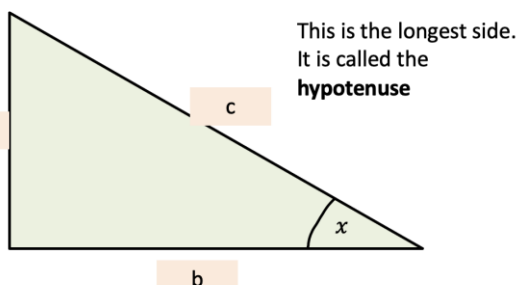
Key Vocabulary

Hypotenuse	The longest side in a right-angled triangle
Opposite	The side facing the given angle in a right-angled triangle
Adjacent	The side next to the given angle in a right-angled triangle
Square number	The result when you multiply a number by itself.

Key Properties:

This is the **opposite** side to "angle x"

Note – the hypotenuse is always the side facing the right angle

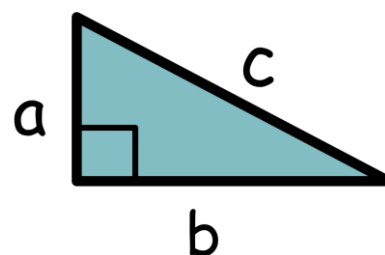


This is the **adjacent** side to "angle x"

This is the longest side. It is called the **hypotenuse**

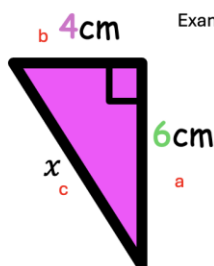
The formula:

$$a^2 + b^2 = c^2$$



Using Pythagoras Theorem to find missing sides

Finding the hypotenuse:



Example: Find x to 1dp

- Step 1** – Label all the sides
- Step 2** – substitute values into the formula

$$a^2 + b^2 = c^2$$

$$6^2 + 4^2 = c^2$$

Solve the equation

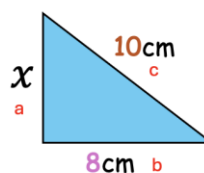
$$36 + 4 = c^2$$

$$\begin{array}{r|l} 40 & = c^2 \\ (\sqrt{}) & \\ 6.426 & = c \end{array}$$

- Step 3** – round the number and don't forget your units

$$x = 6.4\text{cm (to 1dp)}$$

Finding a shorter side:



Example: Find x to 1dp

- Step 1** – Label all the sides
- Step 2** – substitute values into the formula

$$a^2 + b^2 = c^2$$

$$a^2 + 8^2 = 10^2$$

$$a^2 + 64 = 100$$

$$a^2 = 36$$

$$(\sqrt{}) \quad (\sqrt{})$$

$$a = 6$$

- Step 3** – round the number and don't forget your units

$$x = 6\text{cm}$$

Online Clips

U385, U828

Angles in Polygons



Component Knowledge

- Recognise and name different polygons
- Understand the difference between regular and irregular polygons
- Calculate and use the sum of interior angles
- Know that the sum of any exterior angles of any polygon is 360°
- Know that the interior + exterior angle is 180°

Key Vocabulary

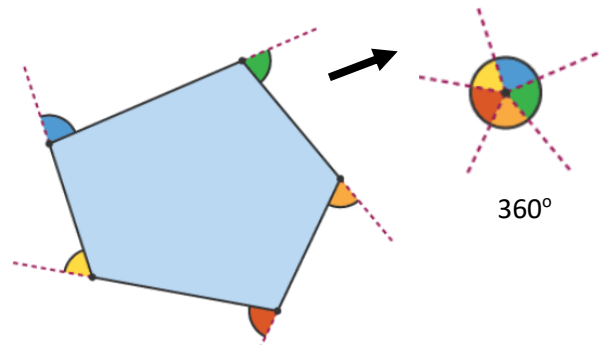
Interior angles	The angles inside the shape
Exterior angles	The angles between the side of a shape and a line extended from the adjacent side
Sum	Total – to add all the angles together
Polygon	A 2D closed shape made with straight lines
Regular	When all the sides are the same length and all angles are the same
Irregular	Shape with sides of different lengths and angles of different sizes

Exterior angles

The **sum of exterior angles** in any polygon is 360°

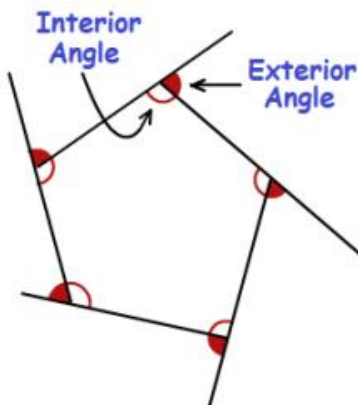
The size of each exterior angle in a regular polygon is $360^\circ \div \text{number of sides}$

This can be rearranged to
number of sides = $360 \div \text{angle}$



Interior and Exterior angles

Interior + exterior angle = 180°

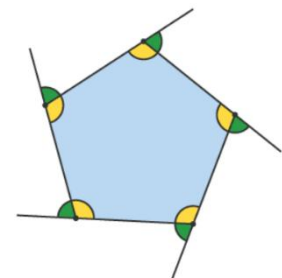


Example 1 – Calculate the interior and exterior angle of a regular pentagon.

Exterior angle

$$= 360 \div 5 = 72^\circ$$

$$\text{Interior angle} = 180 - 72 = 108^\circ$$



Example 2 – A regular polygon has exterior angles of 20° . How many sides does it have?

$$\text{Exterior angle} = 360 \div \text{number of sides}$$

$$\text{Number of sides} = 360 \div 20 = 18$$

$$= 18 \text{ sides}$$

Interior angles in regular polygons

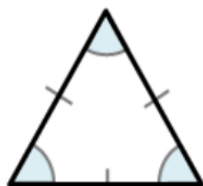
$$\text{Sum of interior angles} = (n - 2) \times 180$$

Where n is the number of sides.

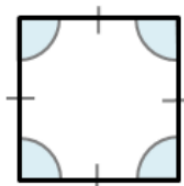
$$\text{Each interior angle on a regular shape} =$$

$$\text{Total interior angles} \div \text{number of sides}$$

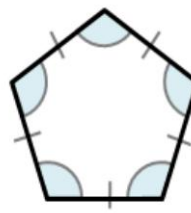
Triangle



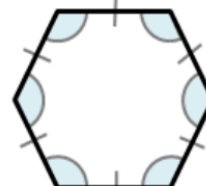
Square



Pentagon



Hexagon



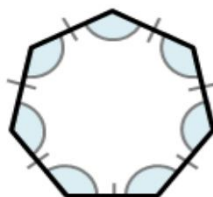
Number of sides	3
Sum of interior angles	180°
Size of each interior angle	60°

Number of sides	4
Sum of interior angles	360°
Size of each interior angle	90°

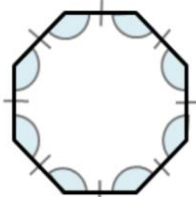
Number of sides	5
Sum of interior angles	540°
Size of each interior angle	108°

Number of sides	6
Sum of interior angles	720°
Size of each interior angle	120°

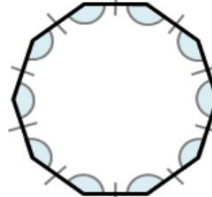
Heptagon



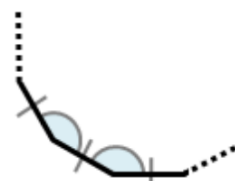
Octagon



Decagon



n Sided Shape



Number of sides	7
Sum of interior angles	900°
Size of each interior angle	128.6° (1dp)

Number of sides	8
Sum of interior angles	1080°
Size of each interior angle	135°

Number of sides	10
Sum of interior angles	1440°
Size of each interior angle	144°

Number of sides	n
Sum of interior angles	$(n - 2) \times 180^\circ$
Size of each interior angle	$\frac{(n - 2) \times 180^\circ}{n}$

Irregular polygons

Example – Find the value of y

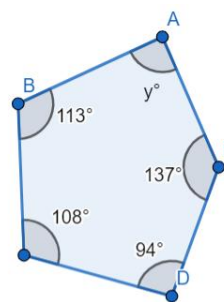
5 sides, irregular polygon

$$\text{Sum of interior angles} = (5 - 2) \times 180 = 540^\circ$$

$$113 + 108 + 137 + 94 = 452$$

$$540 - 452 = 88$$

$$x = 88^\circ$$



Online clips

U628, U732, U329, U427



Algebraic Vocabulary

Component Knowledge

- Understand the difference between the various algebraic words
- Understand how each previous word builds on to the next

Key Vocabulary

Variable	A quantity that can take on many values denoted by a symbol or a letter
Term	Is a single variable or number or variables and numbers multiplied together.
Expression	A group of numbers, letters and operational symbols, e.g. $2x + 3y - 8$
Equation	A number statement with an equals sign (=). Expressions on either side of the equals sign are of equal value, e.g. $a + 14 = 20$ or $2(x + 12) = 44$ or $x + 5 = 2x + 3$
Formula	A special type of equation that shows the relationship between different variables. They tend to describe real-world situations. Plural is formulae.
Identity	An equation where both sides are identical whatever the value of the variable

A **variable** is a symbol (often a letter) that is used to represent an unknown.

E.g. x or y or a etc.

Variables can also have exponents (can be raised to a certain power).

E.g. x^2

A coefficient is the value that is before a variable. It tells us how many lots of the variable there is.

E.g. $x + x + x + x + x = 5 \times x = 5x$

The coefficient here is 5.

An **algebraic term** is either a single number or a variable.

e.g. '3' or ' x ' or ' h '

A term can also be a number and a variable multiplied together.

e.g. $2a$ or $6y$ or $4xy$

When 2 or more algebraic terms are added (or subtracted) they form an expression.

Formula/Formulae

A formula is a special type of equation that shows the relationship between different substituted variables. Formulas are often used in geometry to find area and volume.

Area of rectangle =
length $\times$ width

Area of triangle =
(base $\times$ height) $\div$ 2

(12.5 $\times$ hours worked)
+ 25 = cost of job

Algebraic identities use the ' $\equiv$ ' symbol. It is like an equal's sign, but it means identical to. No matter what the value of the variable this will always be true.
e.g. $2x = x + x$

An **algebraic expression** is a single term or a set of terms that are combined using addition (+), subtraction (-), multiplication (x) and division (÷)

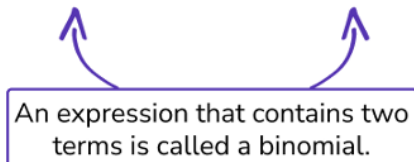
 Examples

$$3x$$

$$2x + 3y$$

$$2 - 5y^2$$

$$2x + 3y - 5$$



An expression that contains two terms is called a binomial.

Equations are mathematical expressions which contain one or more variables and an equals sign.

 Examples

$$3x - 5 = 7$$

$$\frac{4(x - 2)}{5} = 8$$

$$x^2 = 9$$

$$2x^2 - 3x - 5 = 0$$

We can solve an equation to find the value of the variable(s).

 Example

Solve $4x + 3 = 23$

$$4x + 3 = 23$$

$$\begin{array}{cc} -3 & -3 \end{array}$$

$$4x = 20$$

$$\begin{array}{cc} \div 4 & \div 4 \end{array}$$

$$x = 5$$

Online clips

M813, M830



Collecting Like terms

Component Knowledge

- Recognise terms in algebra
- Use of positive and negative directed numbers

Key Vocabulary

Variable	A Variable is a symbol for a number we don't know yet. It is usually a letter like x or y
Term	A Term is either a single number or a variable (x), or numbers and variables multiplied together ($5y$).
Expression	An Expression is a group of terms (the terms are separated by + or - signs) (eg, $5y + 6x - 8y$)
Simplify	reducing the expression/fraction/problem in a simpler form.

Collecting like terms : We collect like terms to simplify an expression. We look at terms which share the same variable

Like terms

$$(3y) + (2x) + (4x) - (y) = 2y + 6x$$

Like terms

In this example:

We collect all the x variables : $2x + 4x = 6x$

AND

Collect all the y variables: variables : $3y - y = 2y$

Collecting like terms - example 2

When collecting like terms, it is important to find the same terms and combine them to simplify the algebraic expression. We need to be able to recognise that x is different to x^2

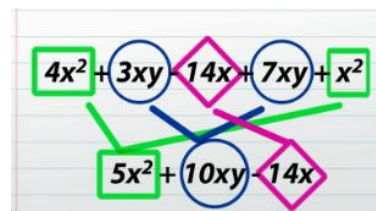
Like Terms

$$(4x^2) + (2x) + (3x^2) = 7x^2 + 2x$$

Like Term

Handy Hint:

It helps if you can visually see the different terms before you collect them. Using a different coloured pen, highlighter or shape works!



Online Clips

M795, M531, M949



Simplifying Expressions



Component Knowledge

- Law of indices
- Collecting like terms
- Recognise Algebraic terms and expressions

Key Vocabulary

Terms	In Algebra a term is either a single number or variable
Expression	Numbers, symbols and operators grouped together to show the value of something
Simplify	Reducing the expression/fraction to a simpler form.

Simplifying Terms - Multiplying:

Algebraic terms can be multiplied to give a simplified term. We focus on the number first, and then the variable (*x or y*), often using laws of indices.

Important – we always write terms in alphabetical order

Example	Answer
$2x \times 3 =$	$6x$
$4a \times 5b =$	$20ab$
$y^2 \times y^3 =$	$y \times y \times y \times y \times y = y^5$
$2ab \times 8cd =$	$2 \times 8 \times a \times b \times c \times d = 16abcd$
$a^5 b^3 \times a^4 bc^2 =$	$a^9 b^4 c^2$

Remember, any number to the power 0 is always 1

Simplifying Terms - Dividing:

Algebraic terms can be divided to give a simplified term. We focus on the number first, and then the variable (*x or y*), often using laws of indices.

Important – we should always write the division as a fraction,

e.g. $12a \div 6 = \frac{12a}{6}$

Example	Answer
$\frac{12a}{6} =$	$2a$
$\frac{18x}{24} =$	$\frac{3x}{4}$
$y^5 \div y^3 =$	$\frac{y \times y \times y \times y \times y}{y \times y \times y} = y^2$
$15a^4 \div 3a^2 =$	$\frac{15 \times a \times a \times a \times a}{3 \times a \times a} = 5a^2$
$a^3 \div a^3 =$	1

Online Clips

M795, M531, M120

Expanding single brackets

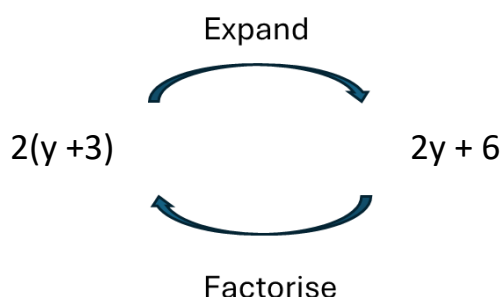


Component Knowledge

- Multiply terms together to remove a bracket from an expression
- Collect like terms together when expanding multiple single brackets

Key Vocabulary

Expression	Numbers, symbols and operators grouped together that show the value of something
Expand	Remove the brackets by multiplying terms together
Simplify	Collect like terms together
Term	Either a single number or variable or numbers and variables multiplied together



Expanding is the opposite of factorising. When we expand, we are multiplying terms together to remove the brackets.

Examples

Expand and simplify where appropriate

1) $7(3 + a) = 21 + 7a$

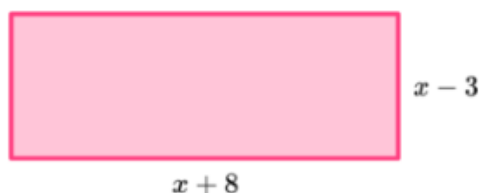
2) $2(5 + a) + 3(2 + a) = 10 + 2a + 6 + 3a$
 $= 5a + 16$

Note – collect like terms to simplify

To expand, we multiply all the terms inside the bracket by the term in front of the bracket

One use of brackets in maths is to group items together, another is to give information about the order of operations.

Here is a rectangle.



Its perimeter is:

$$(x + 8) + (x - 3) + (x + 8) + (x - 3)$$

Here the brackets are used to group the terms so that the expressions for the sides are clear.

The perimeter can also be written as: $2(x + 8) + 2(x - 3)$

Here brackets are needed to preserve that the whole expressions for the sides are doubled to find the perimeter of a rectangle.

Online clips

U179, U105

Expanding Double Brackets



Component Knowledge

- To use algebraic notation when multiplying terms.
- To be able to expand double brackets and simplify where necessary.
- Use identity notation correctly.

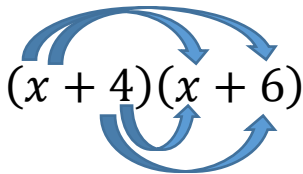
Key Vocabulary

Expand	Multiplying out a bracket.
Term	Either a single number or variable, or the product of several numbers or variables.
Collecting like terms	Simplifying an expression by grouping the same type of terms together.
Identity	An equality that relates one variable to another. It will be equal for ALL values of the variable, unlike an equation which gives a single solution.

Expanding double brackets

Expanding double brackets is long multiplication using algebraic terms as well as numerical values. There are 2 common ways of completing this.

Example 1 -Expand $(x + 4)(x + 6)$



We multiply all terms together (this can be known as FOIL method):

$$x \times x = +x^2$$

$$x \times 6 = +6x$$

$$4 \times x = +4x$$

$$4 \times 6 = +24$$

$$(x + 4)(x + 6) \equiv +x^2 + 6x + 4x + 24$$

We now collect like terms:

$$\equiv +x^2 + 10x + 24$$

Example 1 -Expand $(x + 4)(x + 6)$

We can also use an area model (also known as the grid method).

X	x	+4
x	$+x^2$	$+4x$
+6	$+6x$	$+24$

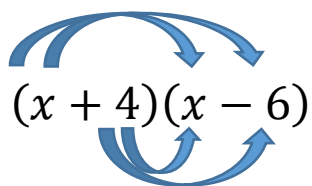
We have still multiplied all the terms together, like the previous method, but they remain in the grid. We can see all 4 terms in the expanded expression in the grid:

$$(+x^2 + 6x + 4x + 24).$$

We now collect like terms:

$$(x + 4)(x + 6) \equiv +x^2 + 10x + 24$$

Example 2 -Expand $(x + 4)(x - 6)$



We multiply all terms together

$$x \times x = +x^2$$

$$x \times -6 = -6x$$

$$4 \times x = +4x$$

$$4 \times -6 = -24$$

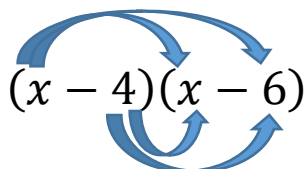
$$(x + 4)(x - 6) \equiv +x^2 - 6x + 4x - 24$$

We now collect like terms:

$$\equiv +x^2 - 2x - 24$$

Note: be careful
when multiplying
and adding with
negatives!

Example 3 -Expand $(x - 4)(x - 6)$



$$x \times x = +x^2$$

$$x \times -6 = -6x$$

$$-4 \times x = -4x$$

$$-4 \times -6 = +24$$

$$(x - 4)(x - 6) \equiv +x^2 - 6x - 4x + 24$$

We now collect like terms:

$$\equiv +x^2 - 10x + 24$$

Example 2 -Expand $(x + 4)(x - 6)$

X	x	+4
x	$+x^2$	$+4x$
-6	$-6x$	-24

We can see all 4 terms in the expanded expression in the grid:

$$+x^2 - 6x + 4x - 24$$

We now collect like terms:

$$(x + 4)(x - 6) \equiv +x^2 - 2x - 24$$

Example 3 -Expand $(x - 4)(x - 6)$

X	x	-4
x	$+x^2$	$-4x$
-6	$-6x$	$+24$

We can see all 4 terms in the expanded expression in the grid:

$$+x^2 - 6x - 4x + 24$$

We now collect like terms:

$$(x - 4)(x - 6) \equiv +x^2 - 10x + 24$$

Online clip

M960



Substitution

Component Knowledge

- To substitute positive and negative numbers into expressions with one, or more, variables.

Key Vocabulary

Expression	A maths sentence that includes a minimum of 2 variables, including an algebraic term and at least one operation.
Term	Either a single number or variable, or the product of several numbers or variables.
Substitute	To exchange an unknown variable for a number in an expression/equation/formula.

Substitution-formula

For example: The time in minutes to cook a chicken is given by the formula:

Time = 40 minutes per kilogram plus 20 minutes

Find how long it takes to cook a 5kg chicken.

Here we substitute 5kg into the formula.

So, Time = $40 \times 5 + 20 = 220$ minutes

The formula for speed is shown: $Speed = \frac{Distance}{Time}$

Find the average speed when travelling 150 miles in 4 hours.

Here we substitute Distance = 150 and Time = 4 into the formula. $Speed = \frac{150}{4} = 37.5$ mph

Substitution-expressions

Example 1

$f = p + 4$. find the value of f when $p = 6$.

We substitute 6 for p in the formula.

$$f = (6) + 4$$

$$f = 10$$

Example 2

$f = 2p + 4$. find the value of f when $p = -6$.

We substitute -6 for p in the formula.

$$f = 2(-6) + 4$$

$$f = -8$$

Example 3

$f = t^2$. find the value of f when $t = -6$.

We substitute -6 for t in the formula.

$$f = (-6)^2$$

$$f = 36$$

Example 4

$f = \frac{t^2}{5y}$. find the value of f when $t = -6$, $y = 4.2$

We substitute -6 for t and 4.2 for y in the formula.

$$f = \frac{(-6)^2}{5(2.4)}$$

$$f = \frac{36}{12}$$

When substitute negative numbers, we must put brackets around them to ensure the correct order of operations occurs. **This very important when we use calculators.** (We can also do this with positive numbers)

From example 4. $-6^2 = -(6)^2 = -36$ is not equal to $(-6)^2 = -6 \times -6 = 36$.

Online clips: M417, M327, M208, M979

Factorise Linear



expressions

Component Knowledge

- Factorise an expression with a numerical common factor.
- Factorise an expression with a variable (letter) as the common factor

Key Vocabulary

Factor	A number or quantity that when multiplied with another produces a given number or expression.
Factorise	The reverse of expanding. Factorising is writing an expression as a product of terms by 'taking out' a common factor.
Expression	A mathematical statement written using symbols, numbers or letters.

Factorising Examples

- Factorising is the opposite of expanding a bracket.
- Find the largest common factors of all terms and divide by these.
- The factors are put in front of the bracket.

Example 1

Factorise fully:

$$12y + 4$$

What is common to both? **4**

4 goes on the outside of the bracket
4 (3y + 1)

Check your answer by expanding the bracket.

Example 2

Factorise fully:

$$18a^2 - 4a$$

What is common to both? **2 and a**

2 a goes on the outside of the bracket
2 a (9 a - 2)

Check your answer by expanding the bracket.

Online clips

U365

Solving linear equations



Component Knowledge

- To be able to solve one-step equations.
- To be able to solve two-step equations.
- To be able to solve three-step equations
- To be able to form and solve equations

Key Vocabulary

Operation	Common operations are addition, subtraction, multiplication and division.
Inverse	The opposite operation of another function.
Equation	a mathematical statement that shows that two mathematical expressions are equal
Solve	To find the solution

One- step equations

To solve a one-step equation, you need to do the inverse operation.

$$\begin{array}{l} 5x = 30 \\ x = 6 \end{array}$$

$\div 5$

The inverse of multiplying is **dividing**.

We divide 30 by 5.

$$\begin{array}{l} x - 3 = 7 \\ x = 10 \end{array}$$

$\div 5$ $+3$

The inverse of subtracting is **addition**.

We add 3 to 7.

$$\begin{array}{l} x + 5 = 9 \\ x = 4 \end{array}$$

-5 -5

The inverse of addition is **subtraction**.

We subtract 4 from 9.

$$\begin{array}{l} \frac{x}{2} = 3 \\ x = 6 \end{array}$$

$\times 3$ $\times 3$

The inverse of dividing is **multiplying**.

We multiply 2 by 3.

Two- step equations

To solve a two-step equation, we need to complete 2 inverse calculations in a specific order.

$$\begin{array}{l} 6x + 3 = 32 \\ 6x = 30 \\ x = 5 \end{array}$$

-3 The inverse of adding 3 is subtracting 3

$\div 6$ The inverse of multiplying by 6 is dividing by 6

$$\begin{array}{l} \frac{x-5}{3} = 4 \\ x-5 = 12 \\ x = 14 \end{array}$$

$\times 3$ The inverse of dividing by 3 is multiplying by 3

$+5$ The inverse of subtracting 5 is adding 5

Three - step equations

To solve a three – step equation, we need to complete 3 inverse calculations in a specific order.

$$\begin{array}{rcl} \frac{2x}{7} + 2 & = & 12 \\ \frac{2x}{7} & = & 10 \\ 2x & = & 70 \\ x & = & 35 \end{array}$$

The inverse of adding 2 is subtracting 2

The inverse of dividing by 7 is multiplying by 7

The inverse of multiplying by 2 is dividing by 2

$$\begin{array}{rcl} \frac{8x}{3} - 9 & = & 7 \\ \frac{8x}{3} & = & 16 \\ 8x & = & 48 \\ x & = & 6 \end{array}$$

The inverse of subtracting 9 is adding 9

The inverse of dividing by 3 is multiplying by 3

The inverse of multiplying by 8 is dividing by 8.

Forming and solving equations

I think of a number, multiply it by 3 and add 5. The answer is 29. What number did I think of?

Write the unknown number as a letter like x

Multiply x by 3 to get 3x

Add 5 to get 3x + 5

Put equal to 29 to get an equation to solve

3x + 5 = 29

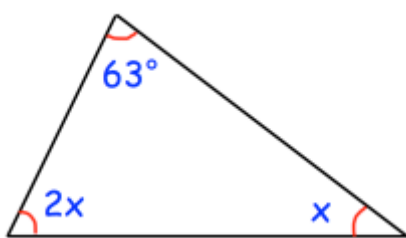
Solve

$$\begin{array}{rcl} 3x + 5 & = & 29 \\ 3x & = & 24 \\ x & = & 8 \end{array}$$

-5

÷ 3

Form and solve an equation to find the size of the angle labelled x.



1st step: form an equation

$$x + 2x + 63^\circ = 180^\circ$$

$$3x + 63^\circ = 180^\circ$$

2nd step: solve the equation

$$3x + 63^\circ = 180^\circ$$

$$3x = 117^\circ$$

$$x = 39^\circ$$

-63

÷ 3

3rd step: show your final answer

Angle x = 39°

Online clips

U755, U325, U599

Changing the subject



Component Knowledge

- Use inverse operations to change the subject of a formula
- Rearranging simple and harder formula
- Use the order of operations to rearrange

Key Vocabulary

Rearrange	Change the order of
Inverse	The opposite (adding is the inverse of subtracting)
Operation	A mathematical process that produces an output (+, -, x, ÷)
Term	A part of an equation (2, a and 2a are all terms)
Formula	A fact or rule that relates two or more quantities
Subject	The beginning of a formula/equation

Rearrange to make r the subject of the formula:

$$\begin{array}{lcl}
 \times 3 & Q = \frac{2r - 7}{3} & \times 3 \\
 + 7 & 3Q = 2r - 7 & + 7 \\
 \div 2 & 3Q + 7 = 2r & \div 2 \\
 & \frac{3Q + 7}{2} = r &
 \end{array}$$

Rearranging Formulae

Make u the subject: $v = u + at$

$$\begin{array}{l}
 \boxed{-at} \quad \boxed{-at} \\
 v - at = u \\
 \text{so } \underline{u = v - at}
 \end{array}$$

Change the order of the terms so 'u' is on its own

Make m the subject: $l = mv - mu$

If the letter appears twice you will need to factorise

$$\begin{array}{l}
 \boxed{\div (v - u)} \quad l = m(v - u) \quad \boxed{\div (v - u)} \\
 l \div (v - u) = m
 \end{array}$$

$$m = \frac{l}{v - u}$$

e.g. make c the subject of the formula

$$m = 5(c - 1)$$

There are 2 options here:

Method 1: expand the bracket first

$$\begin{array}{lcl}
 \text{expand} \downarrow & m = 5(c - 1) & \text{expand} \downarrow \\
 + 5 \downarrow & m = 5c - 5 & + 5 \downarrow \\
 \div 5 \downarrow & m + 5 = 5c & \div 5 \downarrow \\
 & \frac{m + 5}{5} = c &
 \end{array}$$

Method 2: divide by the coefficient first

$$\begin{array}{lcl}
 \div 5 \downarrow & m = 5(c - 1) & \div 5 \downarrow \\
 + 1 \downarrow & \frac{m}{5} = c - 1 & + 1 \downarrow \\
 & \frac{m}{5} + 1 = c &
 \end{array}$$

Tip - examiners tell schools that method 1 usually has a higher success rate in an exam than method 2 does!

When the subject appears more than once in a formula, collect like terms together and factorise using the subject as the factor

Online clips

U675, U181

Finding and using



the nth term

Component Knowledge

- Find the common difference between terms in a sequence
- Using the common difference to find the nth term
- Using the nth term to find terms in a sequence

Key Vocabulary

Sequence	A list of numbers or objects in a special order
Linear	A sequence where each term is added, or subtracted, by the same amount each time.
Pattern	Objects or numbers that are arranged following a rule or rules
Nth Term	A formula that enables us to find any term in a sequence
Term	In algebra, a term is either a single number or variable, or numbers and variables multiplied together.

How to find common differences & the nth term of a linear sequence

The nth term is the general rule for a sequence. We can use the nth term to then calculate any term in the sequence.

Here is a sequence: 5, 8, 11, 14, ...

1. Find the difference between the numbers.

5, 8, 11, 14

+3 +3 +3 = 3n

A difference of +3 means we need to look at the +3 times table.

2. Calculate how you get from the times table to the original sequence.

3, 6, 9, 12, ...

5, 8, 11, 14, ...

We can also write this as $t_n = 3n + 2$

The nth term is $3n + 2$.

Decreasing sequences – follow the same steps but your nth term will be negative

A difference of -3 means we need to look at the -3 times table.

-5, -8, -11, -14, -17

-3n: -3 -6 -9 -12 -15

Calculate how you get from the times table to the original sequence

$-3n - 2$

Using the nth term to create a sequence

Write the first five terms of the sequence $3n + 4$.

n represents the position in the sequence. The first term in the sequence is when $n = 1$, the second term in the sequence is when $n = 2$, and so on.

To find the terms, **substitute** n for the position number:

- when $n = 1$, $3n + 4 = 3 \times 1 + 4 = 3 + 4 = 7$
- when $n = 2$, $3n + 4 = 3 \times 2 + 4 = 6 + 4 = 10$
- when $n = 3$, $3n + 4 = 3 \times 3 + 4 = 9 + 4 = 13$
- when $n = 4$, $3n + 4 = 3 \times 4 + 4 = 12 + 4 = 16$
- when $n = 5$, $3n + 4 = 3 \times 5 + 4 = 15 + 4 = 19$

The first five terms of the sequence: $3n + 4$ are 7, 10, 13, 16, 19, ...

Using the nth term to find if a number is in a sequence

Is the number 14 in the sequence $4n + 2$?

$$\begin{array}{r|l} 4n + 2 & = 14 \\ -2 & -2 \\ \hline 4n & = 12 \\ \div 4 & \div 4 \\ \hline n & = 3 \end{array}$$

If you get a decimal here, then the term isn't in the sequence

Yes, 14 is the 3rd term in the sequence.

Online clips

M381, M241, M166, M991

Pie charts



Component Knowledge

- Calculate angles in a pie chart
- Draw a pie chart from a table
- Interpret pie charts using fractions
- Interpret pie charts using angles

Key Vocabulary

Angle	The amount of turn between 2 lines.
Pie chart	A chart that displays data proportionally.
Protractor	Equipment used to measure and draw angles

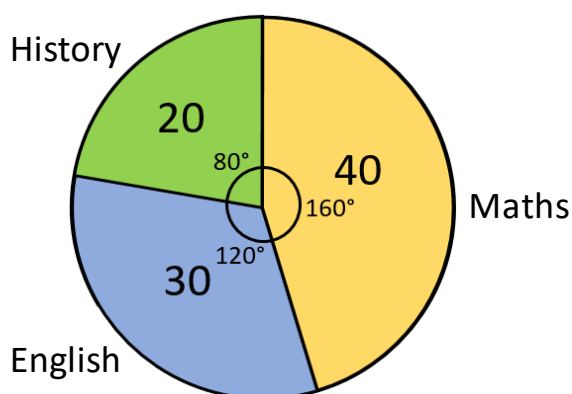
Drawing pie charts

How many degrees for one person? $\frac{360}{90} = 4^\circ$

$360 \div \text{total} = \text{degrees for one person}$. In this example one person is 4° .

Subject	Number of Students	Calculation	Angle
Maths	40	$40 \times 4^\circ$	160°
English	30	$30 \times 4^\circ$	120°
History	20	$20 \times 4^\circ$	80°
Total	90		360°

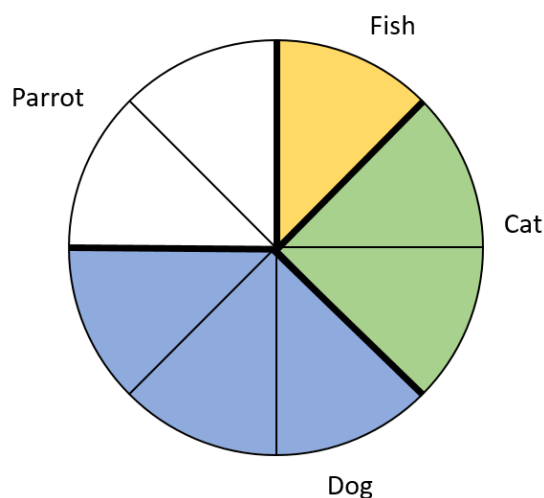
Multiply number of students by 4° to get the angle.



Draw the angles onto the pie chart. Label each part with what it is (subject in this example) and how many it represents (40 for Maths in this example).

Interpret pie charts (fractions)

A class of **32 students** were surveyed to find their **favourite pet**.
The **pie chart** shows the total answers. How popular was each animal?



The pie chart is split into 8 pieces,
so each sector is worth $\frac{1}{8}$ of $32 = 4$

$$\text{Fish: } \frac{1}{8} \text{ of } 32 = 4$$

$$\text{Cat: } \frac{2}{8} \text{ of } 32 = 8$$

$$\text{Dog: } \frac{3}{8} \text{ of } 32 = 12$$

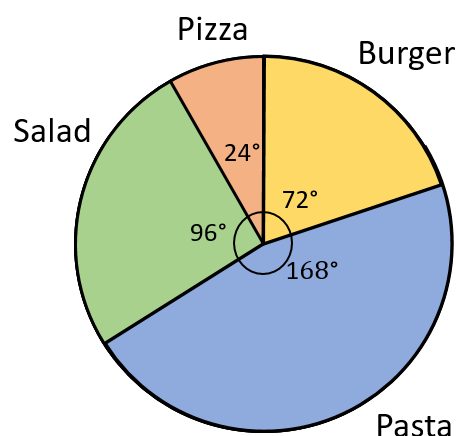
$$\text{Parrot: } \frac{2}{8} \text{ of } 32 = 8$$

Check that the totals add up to the original total in the question.
($4 + 8 + 12 + 8 = 32$)

Interpret pie charts (angles)

150 students were surveyed about their favourite food.

Favourite Food	Angle	Calculation	Frequency
Burger	72°	$\frac{72}{360} \times 150$	30
Pasta	168°	$\frac{168}{360} \times 150$	70
Salad	96°	$\frac{96}{360} \times 150$	40
Pizza	24°	$\frac{24}{360} \times 150$	10



To calculate the frequency from a pie chart when you are given the angle,
you do the opposite of what you do to calculate the angle.

$$\text{Angle} \div 360 \times \text{total frequency}$$

Online clips

M574, M165