

Statistics

Knowledge Organiser

Key Vocabulary

bar chart

pictogram

frequency table

tally chart

pie chart

discrete data

continuous data

line graph

sum

difference

comparison

interpret

mean average

Interpreting Data

Information can be show in tables, charts or graphs.

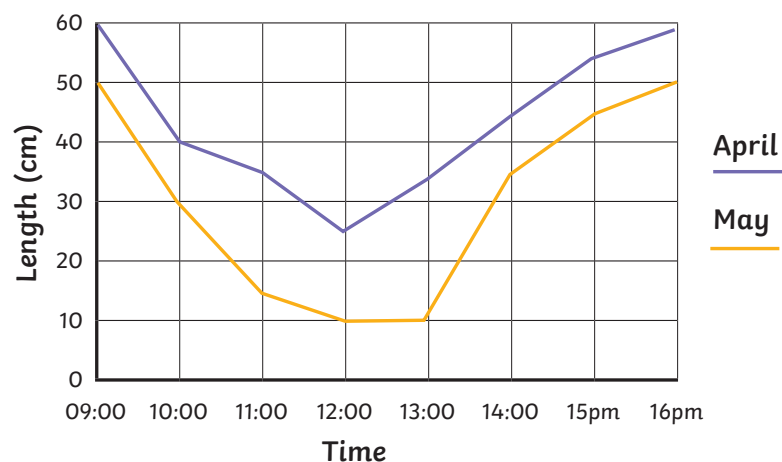
Interpreting data simply means understanding or working out what is being shown by a table, graph or chart and being able to answer questions about that information.

Line Graph

Line graphs are used to show changes to a measurement over time.

Data shown in a line graph is continuous.
Sets of points are joined together to make the line.

A line graph to show the length of shadows over time

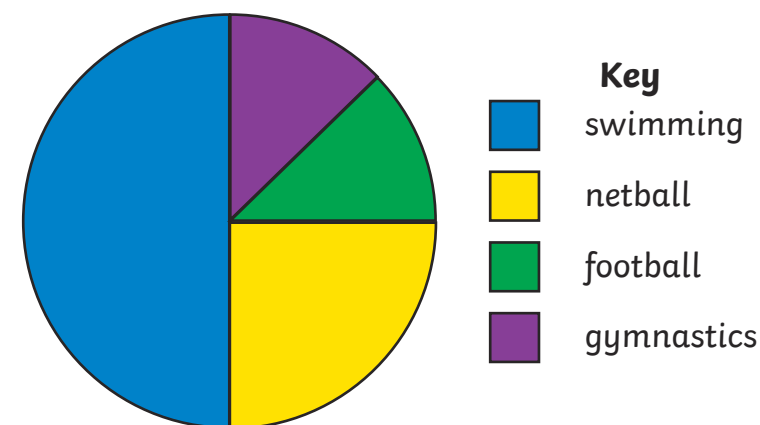


Pie Charts

Pie charts represent discrete data.

A circle is divided into segments, where each segment represents a data category. The size of each segment matches its proportion of the total amount.

A pie chart to show children's favourite sports



24 children were asked in total.

Swimming = $\frac{1}{2}$ so $\frac{1}{2}$ of 24 = 12 children

Netball = $\frac{1}{4}$ so $\frac{1}{4}$ of 24 = 6 children

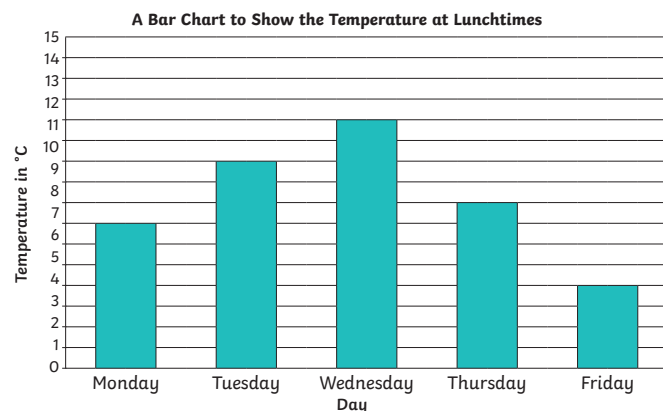
Football = $\frac{1}{8}$ so $\frac{1}{8}$ of 24 = 3 children

Gymnastics = $\frac{1}{8}$ so $\frac{1}{8}$ of 24 = 3 children

Statistics

Bar Chart

A bar chart has a horizontal axis and a vertical axis. Bars show the data value of each category. There must be a gap between each bar. The scale of the bar chart is chosen based on the data range.



Frequency Table

Eye Colour	Tally	Frequency
brown		6
blue		8
green		3
grey		4
hazel		5

Tally marks are used to help count things. Each vertical line represents one unit. The fifth tally mark goes down across the first four to make it easier to count.

The frequency column is completed after all the data has been collected.

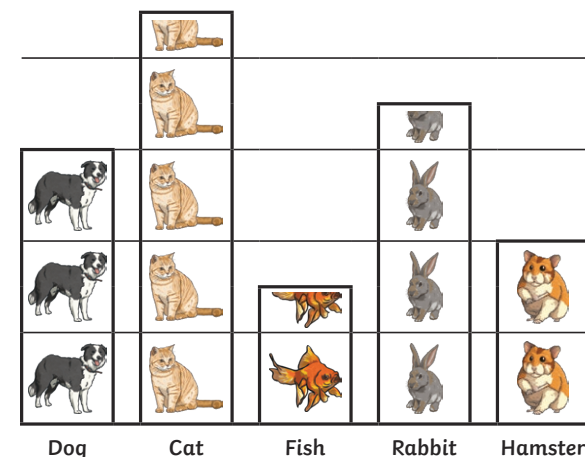
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Pictogram

This graph uses pictures or symbols to represent the data. The pictogram uses one picture or symbol to represent a value.

= 4 Children

Class 10's Pets



Mean Average

The mean is the average of a set of data.

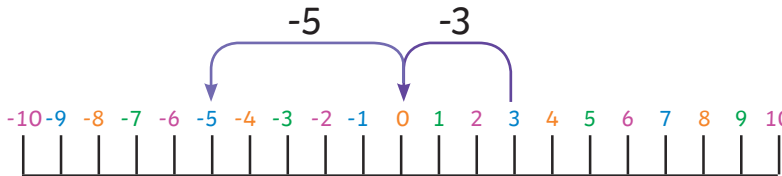
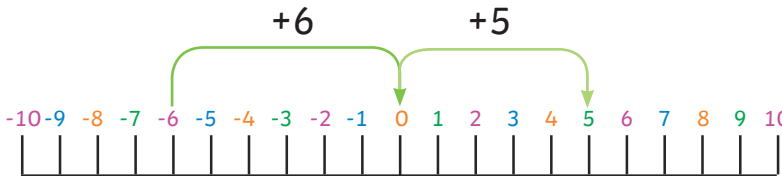
To find the mean or average, add up all of the values to find the total. Divide the total by the number of values that you added together. This will give you the mean.

12	15	10	8	15
----	----	----	---	----

$$12 + 15 + 10 + 8 + 15 = 60$$

$$60 \div 5 = 12$$

The mean of this data is 12.

Key Vocabulary	Compare and Order				
ten million	equals $26 + 38 = 8 \times 8$ Both calculations have the value 64.	greater than $223\ 873 > 98\ 256$ The number on the left has 2 hundred thousands and the number on the right has 0 hundred thousands.	less than $901\ 198 < 1\ 091\ 098$ The number on the right has 1 million and the number on the left has 0 millions.		
millions					
thousands					
hundreds					
tens					
ones					
zero					
place value	smallest	81 782 127 352 127 835 137 019 200 002			greatest
greater than					
less than					
order					
round	Negative Numbers				
rounded					
negative number	$3 - 8 = -5$		$-6 + 11 = 5$		
partition					
digit					
interval					
sequence					
linear sequence	 				
 visit twinkl.com					

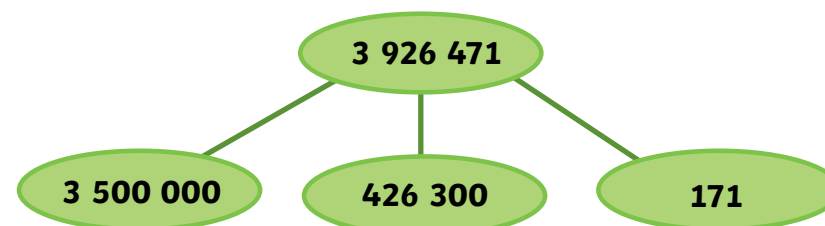
Numbers to Ten Million

3 926 471

Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	9	2	6	4	7	1

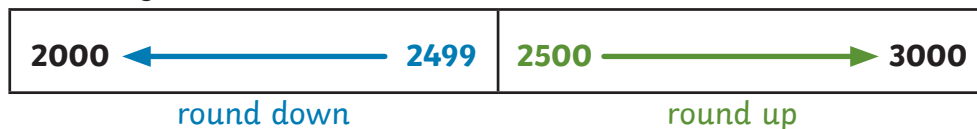
three million, nine hundred and twenty-six thousand, four hundred and seventy-one

3 926 471
3 926 000 471

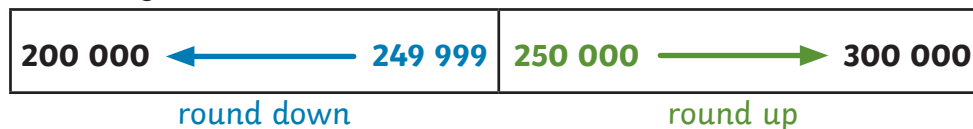


Round Any Number

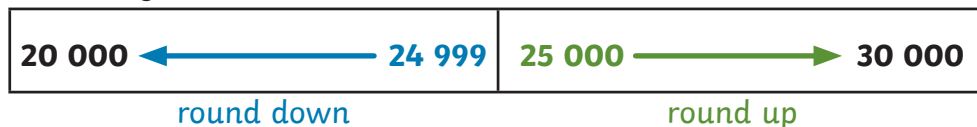
Rounding to the nearest 1000



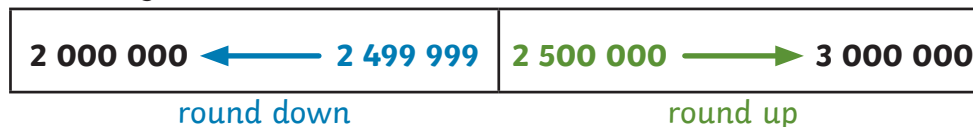
Rounding to the nearest 100 000



Rounding to the nearest 10 000



Rounding to the nearest 1 000 000



Key Vocabulary

Add

Total

Make

Plus

Sum

More

Altogether

Difference

Leave

Subtract

Difference between

Less

Minus

Take away

Mentally, Orally

Column Addition

Column Subtraction

Estimate

Inverse operation

Solve problems

Number facts

Place Value

Complex



Add and Subtract Whole Numbers

Column Method

	4	5	8	6	4
+	2	3	4	9	7
	6	9	3	6	1
		1	1	1	

Starting with the ones, add each column in turn.
Regroup tens, hundreds, thousands, ten thousands as required.

	3	5	⁶ 7	¹³ 4	¹ 2
-		3	4	7	6
	3	2	2	6	6

Starting with the ones, subtract each column in turn.
Exchange tens, hundreds, thousands and/or ten thousands as required.

Multiply up to 4-digit by 2-digit

1	3	2	
	1	5	4
×		2	6
	9	2	4
3	0	8	0
4	0	0	4
1	1		

Start with the ones.

$$154 \times 6 = 924$$

$$154 \times 20 = 3080$$

$$3080 + 924 = 4004$$

Order of Operations

B	Brackets	$10 \times (4 + 2) = 10 \times 6 = 60$
O	Order	$5 + 2^2 = 5 + 4 = 9$
D	Division	$10 + 6 \div 2 = 10 + 3 = 13$
M	Multiplication	$10 - 4 \times 2 = 10 - 8 = 2$
A	Addition	$10 \times 4 + 7 = 40 + 7 = 47$
S	Subtraction	$10 \div 2 - 3 = 5 - 3 = 2$

Four Operations

Short Division

Start from the left.

		4	4	0	5	
12	5	2	8	6	0	

$5 \div 12 = 0 \text{ r}5$
 $52 \div 12 = 4 \text{ r}4$
 $48 \div 12 = 4$
 $6 \div 12 = 0 \text{ r}6$

Long Division

		1	2	0	r	3
14	1	6	8	3		
	1	4	0	0		
		2	8	3		
		2	8	0		
				3		

Common Factors

Factors of 48

1	2	3	4	6	8	12	16	24	48
---	---	---	---	---	---	----	----	----	----

Factors of 30

1	2	3	5	6	10	15	30
---	---	---	---	---	----	----	----

Common factors: 1, 2, 3, 6

Primes

A prime number has only 1 and itself as factors: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43

A composite number has factors other than 1 and itself.

Mental Calculations and Estimation

Order of calculations:

$$50 \times 34 \times 2 = 50 \times 2 \times 34 = 100 \times 34 = 3400$$

Money: $\pounds 8.99 + \pounds 3.49 = \pounds 12.48$

Use $\pounds 9 + \pounds 3.50 = \pounds 12.50$ and subtract 2p

Estimate on a number line



Subdivide line to estimate: 17

Knowledge Organiser

Common Multiples

Multiples of 3

3	...	18	21	24	...	39	42
---	-----	----	----	----	-----	----	----

Multiples of 7

7	14	21	28	35	42
---	----	----	----	----	----

Common multiples: 21, 42...

Squares and Cubes

Square numbers result from a number being multiplied by itself (e.g. $5 \times 5 = 25$):

1, 4, 9, 16, 25, 36, 49, 64, 81, 100

Cube numbers result from a number being multiplied by itself twice ($2 \times 2 \times 2 = 8$):

1, 8, 27, 64, 125

Reason from Known Facts

$90 \div 10 = 9$ so $90 \div 20 = 4.5$ and $90 \div 5 = 18$

$16 \times 9 = 144$ so $1.6 \times 9 = 14.4$

$4352 \div 17 = 256$

so $256 \times 18 = 4352 + 256 = 4608$

$3786 + 2850 = 6636$

so $4786 + 2850 = 7636$

and $2786 + 3850 = 6636$

and $8636 - 3786 = 4850$

Key Vocabulary

numerator

denominator

proper fraction

improper fraction

factor

highest common multiple

lowest common multiple

equivalents

common numerator

common denominator

decimal equivalent

simplify

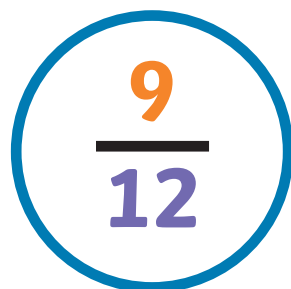
simplest form

mixed number

whole number

mixed number

Simplify Fractions

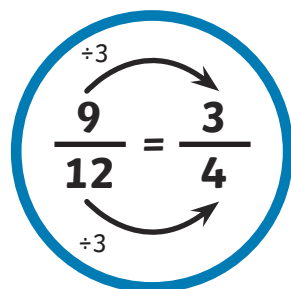


Factors of 9:

1, 3, 9

Factors of 12:

1, 2, 3, 4, 6, 12

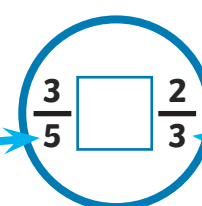


Compare and Order Fractions

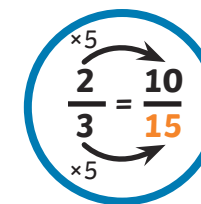
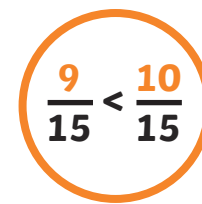
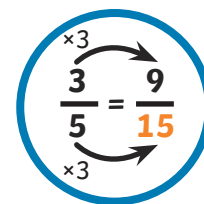
Use the Common Denominator



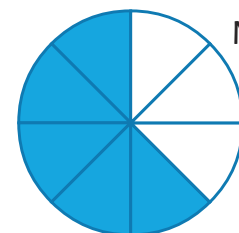
Multiples of 5:
5, 10, 15



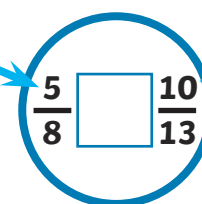
Multiples of 3:
3, 6, 9, 12, 15



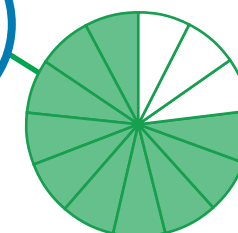
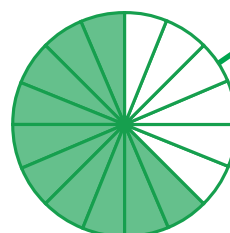
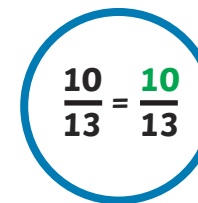
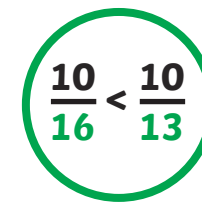
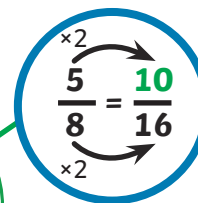
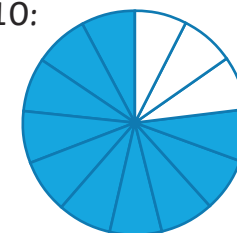
Use the Common Numerator



Multiples of 5:
5, 10, 15



Multiples of 10:
10, 20



Adding and Subtracting Proper Fractions

Same Denominators



$$\frac{4}{7} + \frac{2}{7} = \frac{6}{7}$$



$$\frac{8}{11} - \frac{3}{11} = \frac{5}{11}$$

Different Denominators

$$\frac{2}{7} \quad \frac{3}{5}$$

Multiples of 7: 7, 14, 21, 28, **35**

Multiples of 5: 5, 10, 15, 20, 25, 30, **35**

$$\frac{2}{7} = \frac{10}{35}, \quad \frac{3}{5} = \frac{21}{35}$$

$$\frac{10}{35} + \frac{21}{35} = \frac{31}{35}$$

$$\frac{9}{10} \quad \frac{1}{4}$$

Multiples of 10: 10, **20**

Multiples of 4: 4, 8, 12, 16, **20**

$$\frac{9}{10} = \frac{18}{20}, \quad \frac{1}{4} = \frac{5}{20}$$

$$\frac{18}{20} - \frac{5}{20} = \frac{13}{20}$$

Multiplying Proper Fractions

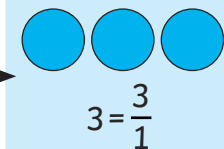
Multiplying Fractions by Fractions

$$\frac{1}{2} \times \frac{1}{3} = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

Multiplying Fractions by Whole Numbers



$$\frac{2}{5} \times 3$$



$$3 = \frac{3}{1}$$

$$\frac{2}{5} \times \frac{3}{1} = \frac{6}{5} = 1 \frac{1}{5}$$

Adding and Subtracting Mixed Numbers

Add or subtract the whole numbers and fractions separately.

$$2 \frac{2}{5} + 1 \frac{3}{10}$$

$$2 + 1 = 3$$

$$\frac{2}{5} + \frac{3}{10} = \frac{4}{10} + \frac{3}{10} = \frac{7}{10}$$

$$3 + \frac{7}{10} = 3 \frac{7}{10}$$

$$2 \frac{1}{2} - 1 \frac{1}{4}$$

$$2 - 1 = 1$$

$$\frac{1}{2} - \frac{1}{4} = \frac{2}{4} - \frac{1}{4} = \frac{1}{4}$$

$$1 + \frac{1}{4} = 1 \frac{1}{4}$$

Convert the mixed numbers to improper fractions.

$$2 \frac{2}{5} + 1 \frac{3}{10}$$

$$2 \frac{1}{2} - 1 \frac{1}{4}$$

$$2 \frac{2}{5} = \frac{12}{5}$$

$$1 \frac{3}{10} = \frac{13}{10}$$

$$2 \frac{1}{2} = \frac{5}{2}$$

$$1 \frac{1}{4} = \frac{5}{4}$$

$$\frac{12}{5} + \frac{13}{10} = \frac{24}{10} + \frac{13}{10} = \frac{37}{10}$$

$$\frac{37}{10} = 3 \frac{7}{10}$$

$$\frac{5}{2} - \frac{5}{4} = \frac{10}{4} - \frac{5}{4} = \frac{5}{4}$$

$$\frac{5}{4} = 1 \frac{1}{4}$$

Dividing Fractions by Whole Numbers

$$\frac{2}{5} \div 2 = \frac{1}{5}$$

Multiplication and division are the inverse of one another so:

$\div 2$ is the same as $\times \frac{1}{2}$

$$\frac{2}{5} \times \frac{1}{2} = \frac{2}{10}$$

Key Vocabulary

translate

translation

reflect

reflection

up

down

right

left

coordinates

quadrant

x-axis

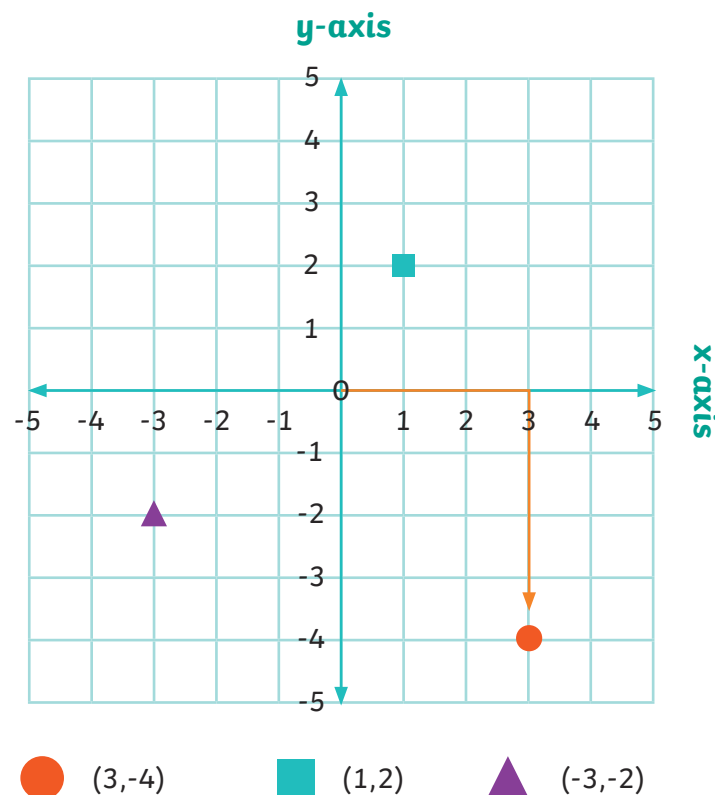
y-axis

horizontal

vertical

Four Quadrants

Coordinates can use positive and negative numbers. Whether positive or negative, the x-axis coordinate is written first, followed by the y-axis coordinate.

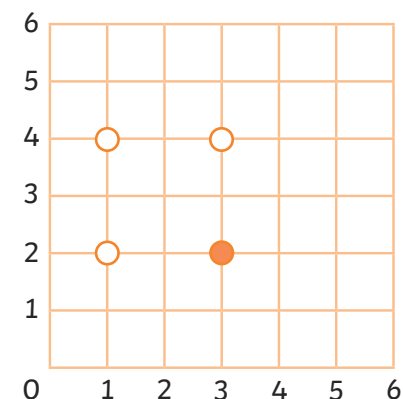


Look at the circle. It is 3 units along the x-axis and 4 down the y-axis. Its coordinates are $(3, -4)$.

Completing Shapes

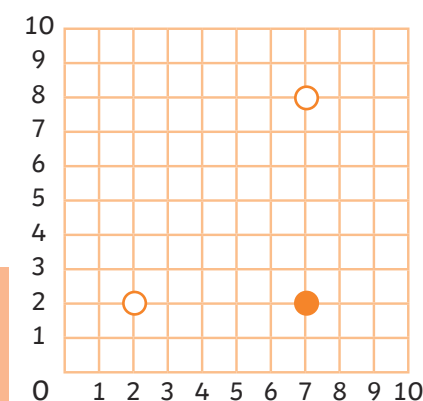
Using the properties of a shape, a polygon can be completed on a grid.

To make a square, think of the square's properties.



All of a square's sides are the same length. If the completed sides are 2 units in length, the missing point must complete two more sides of 2 units.

To make a right-angled triangle, think of the triangle's properties.



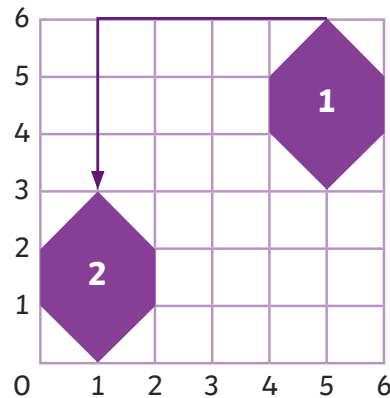
A right-angled triangle should have three sides with one 90° angle.

Translation

A shape is translated when it is moved without being rotated or resized. Every point of the shape moves the same distance and in the same direction.

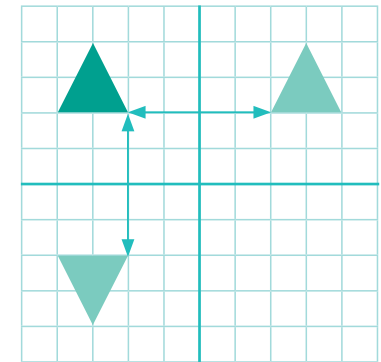
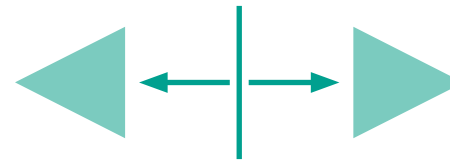


Shape 1 has been translated 4 units left and 3 units down.



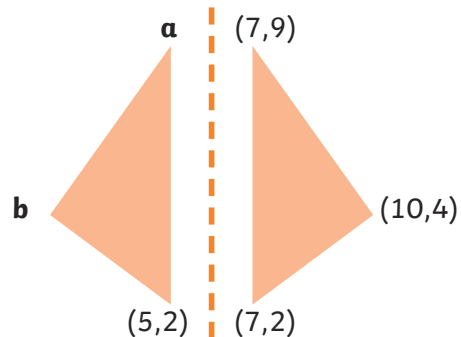
Reflections

A shape is reflected when it is flipped over a line which acts as a mirror. Every point on the original shape is the same distance from the mirror line as the same point on the reflected shape. The original triangle has been reflected in the x-axis and in the y-axis.



Missing Coordinates

Shapes can be shown on unmarked grids.



Point a is in the same position along the x-axis as (5, 2) and in the same position on the y-axis as (7, 9).

Point a (5, 9)

Point b is in the same position on the y-axis as (10, 4). Both triangles will have the same width. The width of the right-hand triangle is 3. This means that the width of the left-hand triangle is also 3.

Point b (2, 4)

Decimals

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Key Vocabulary

decimal place

decimal fraction

recurring decimal

equivalent fraction

tenth

sharing

partitioning

exchanging

rounding to 3d.p.

hundredth

thousandth

equal to

remainder

grouping

Place Value

Tens	Ones	tenths	hundredths	thousandths
	1 1 1	0.1 0.1 0.1 0.1	0.01 0.01	0.001 0.001 0.001 0.001 0.001 0.001

$$3 + \frac{4}{10} + \frac{2}{100} + \frac{6}{1000} \longleftrightarrow 3.426 \longleftrightarrow 3 + 0.4 + 0.02 + 0.006$$

1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009

Fractions to Decimals

$$\frac{7}{20} = \frac{35}{100} \text{ or } 0.35$$

$$\frac{7}{25} = \frac{28}{100} \text{ or } 0.28$$

$$\frac{7}{50} = \frac{14}{100} \text{ or } 0.14$$

$$\frac{8}{200} = \frac{4}{100} \text{ or } 0.04$$

When the denominator is not a factor or multiple of 100

$$\frac{7}{8} = 7 \div 8$$

	0	8	7	5
8	7	0	0	0

Dividing Decimals by Integers

$$8.12 \div 4$$

	2	0	3
4	8	1	2

$$6.93 \div 3 = 2.31$$

Ones	tenths	hundredths
1 1	0.1 0.1 0.1	0.01
1 1	0.1 0.1 0.1	0.01
1 1	0.1 0.1 0.1	0.01

Decimals

Knowledge Organiser

Multiplying and Dividing by 10, 100 and 1000

Thousands	Hundreds	Tens	Ones	tenths	hundredths	thousandths
			2	0	8	
		$\times 10$	2	0	8	
			2	0	8	
			2	0	8	

Thousands	Hundreds	Tens	Ones	tenths	hundredths	thousandths
		4	3	5		
$\times 100$	4	3	5	0		
		4	3	5		
		4	3	5		

Thousands	Hundreds	Tens	Ones	tenths	hundredths	thousandths
			1	3	5	1
$\times 1000$	1	3	5	1		
			1	3	5	1
			1	3	5	1

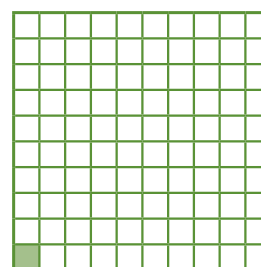
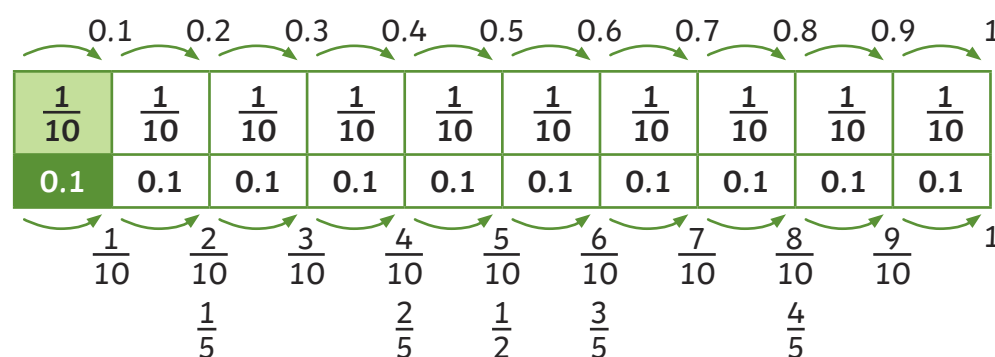
Multiplying Decimals by Integers

	3	4	5
$\times$			3
1	0	3	5
1	1		

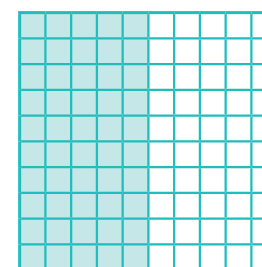
$$3.21 \times 3 = 9.63$$

Ones	tenths	hundredths
1 1 1	0.1 0.1	0.01
1 1 1	0.1 0.1	0.01
1 1 1	0.1 0.1	0.01

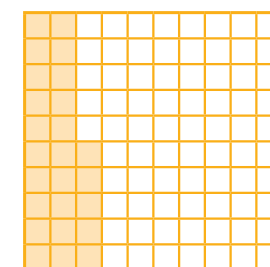
Decimal Numbers as Fractions



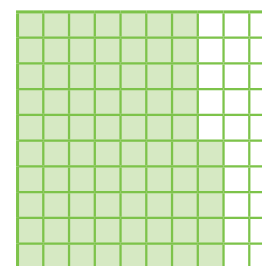
$$\frac{1}{100} = 0.01$$



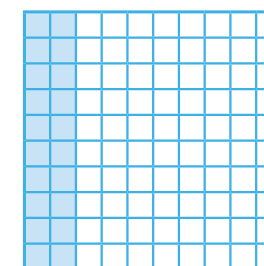
$$\frac{50}{100} = \frac{1}{2} = 0.5$$



$$\frac{25}{100} = \frac{1}{4} = 0.25$$



$$\frac{75}{100} = \frac{3}{4} = 0.75$$



$$\frac{20}{100} = \frac{1}{5} = 0.2$$

$$\frac{1}{3} = 0.33$$

$$\frac{1}{8} = 0.125$$

$$\frac{1}{1000} = 0.001$$

Key Vocabulary

mass

gram

kilogram

capacity

volume

millilitre

litre

millimetre

centimetre

kilometre

foot

inch

ounce

pound

stone

pint

gallon

Converting Mass

$$1 \text{ tonne} = 1000\text{kg}$$

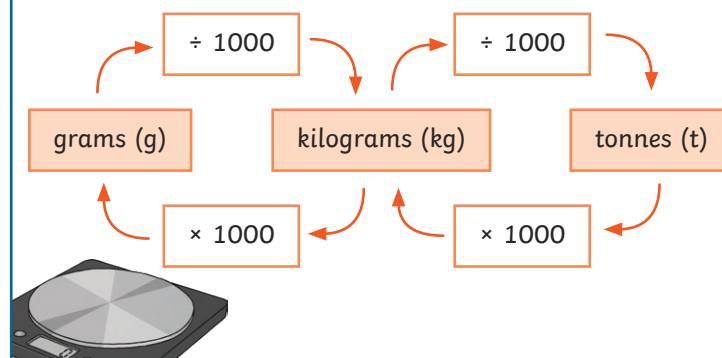
$$1000\text{g} = 1\text{kg}$$

$$\frac{1}{10} \text{ kg} = 0.1\text{kg} = 100\text{g}$$

$$\frac{1}{4} \text{ kg} = 0.25\text{kg} = 250\text{g}$$

$$\frac{1}{2} \text{ kg} = 0.5\text{kg} = 500\text{g}$$

$$\frac{3}{4} \text{ kg} = 0.75 = 750\text{g}$$



Converting Capacity

$$1000\text{ml} = 1\text{l}$$

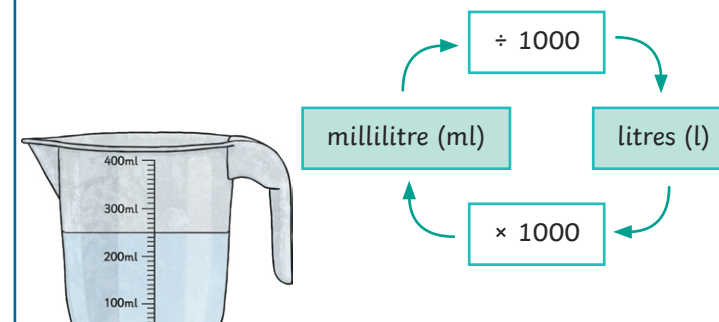
$$\frac{1}{10} \text{ l} = 0.1\text{l} = 100\text{ml}$$

$$\frac{1}{4} \text{ l} = 0.25\text{l} = 250\text{ml}$$

$$\frac{1}{2} \text{ l} = 0.5\text{l} = 500\text{ml}$$

$$\frac{3}{4} \text{ l} = 0.75\text{l} = 750\text{ml}$$

$$\frac{1}{100} \text{ l} = 0.01\text{l} = 10\text{ml}$$



Converting Length

$$1000\text{m} = 1\text{km}$$

$$100\text{cm} = 1\text{m}$$

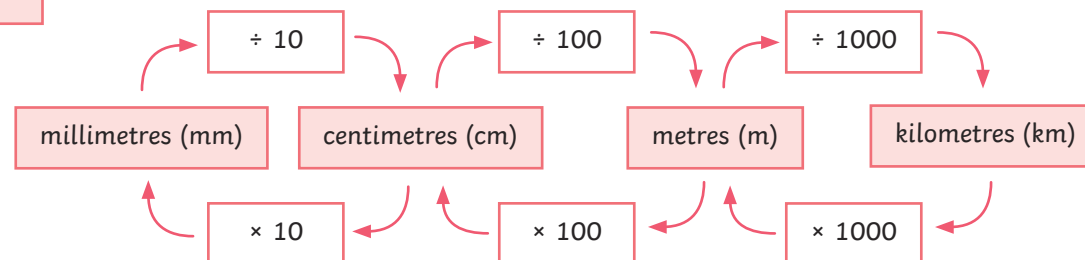
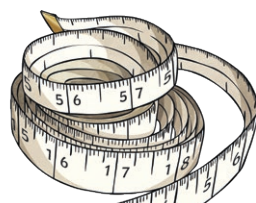
$$10\text{mm} = 1\text{cm}$$

$$\frac{1}{2} \text{ m} = 0.5\text{m} = 50\text{cm}$$

$$\frac{1}{4} \text{ m} = 0.25\text{m} = 25\text{cm}$$

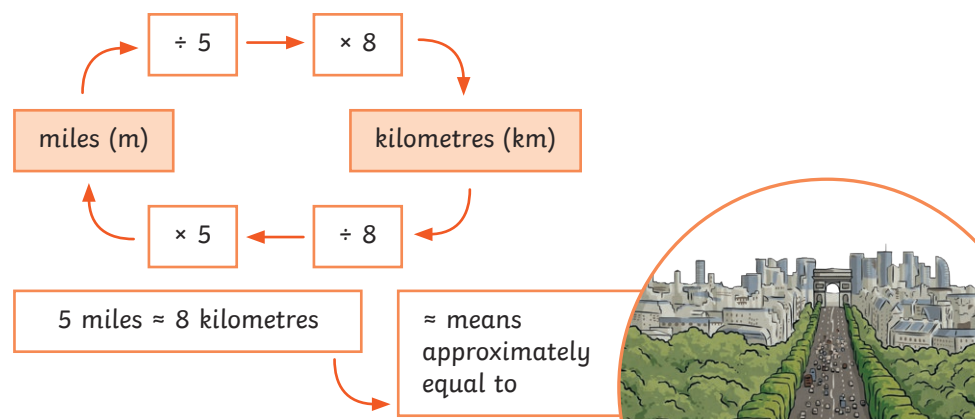
$$\frac{3}{4} \text{ m} = 0.75\text{m} = 75\text{cm}$$

$$\frac{1}{10} \text{ m} = 0.01\text{m} = 10\text{cm}$$



Miles to Kilometres

You might measure the length of a road or the distance between two cities in miles or kilometres.



Imperial Measures

Things that could be measured using imperial units:

- Someone's height in feet and inches
- The mass of a bag of sugar in ounces
- The mass of a sack of potatoes in pounds
- A person's mass in stones
- A carton of milk in pints
- The amount of water in a bath in gallons

1 foot = 12 inches
1 pound = 16 ounces
1 stone = 14 pounds
1 gallon = 8 pints

Time

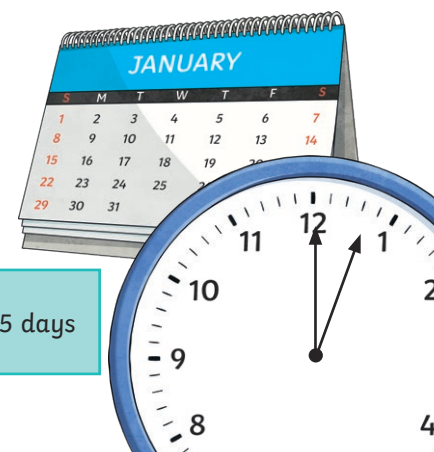
Minute 1 minute = 60 seconds

Hour 1 hour = 60 minutes

Day 1 day = 24 hours

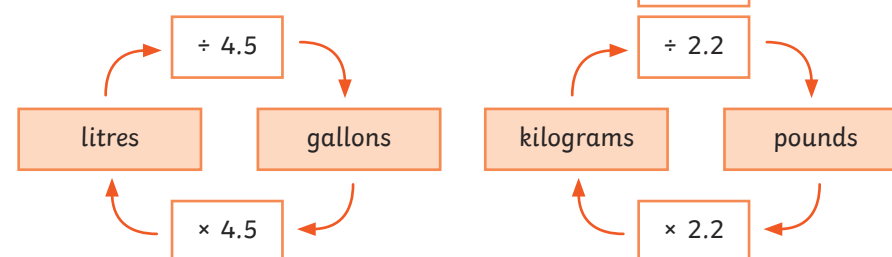
Week 1 week = 7 days

Year 1 year = 12 months = 52 weeks = 365 days



Metric to Imperial Conversions

metric (new)	imperial (old)
2.5 centimetres	1 inch
1 kilogram	2.2 pounds
4.5 litres	1 gallon



Key Vocabulary

term to term rule

variable

unknown

expression

equation

formula

one-step equation

two-step equation

substitution

pairs of unknowns

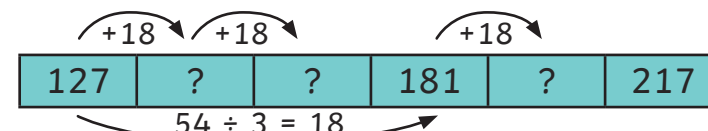
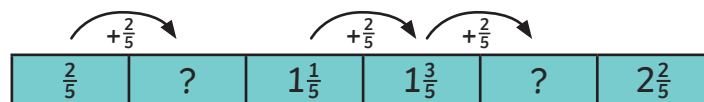
enumerate



Linear Number Sequences

A linear number sequence is a sequence where each value increases or decreases by the same amount each time. Each number in a linear number sequence is called a **term**. The constant change between each number is called the term to term rule. To identify the **term to term rule**, find the difference between two adjacent terms.

When you know the term to term rule, you can use it to find the next number in the sequence. It can also be used to find a missing number within a sequence.



Forming Expressions

An expression is a group of numbers, letters and operation symbols.

Add 14 to a

$$a + 14$$

Subtract 20 from b

$$b - 20$$

Multiply c by 4

$$4c$$

12 more than d

$$d + 12$$

Multiply e by 3 and subtract 5

$$3e - 5$$

Add 12 to f and then multiply by 2

$$2(f + 12)$$

Forming Equations

$$a + 14 = 20$$

$$b - 20 = 15$$

$$4c = 28$$

$$d + 12 = 30$$

$$3e - 5 = 10$$

$$2(f + 12) = 44$$

An equation is a number statement with an equal sign (=). Expressions on either side of the equal sign are of equal value.

Formulas / Formulae

(The word formula has two possible plural forms, formulae and formulas.)

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

Equations with Pairs of Unknowns

In an equation with two unknown numbers, there may be **several** possible values for the unknowns that will balance the equation.

$ab = 18$	
a	b
1	18
2	9
3	6
6	3
9	2
18	1

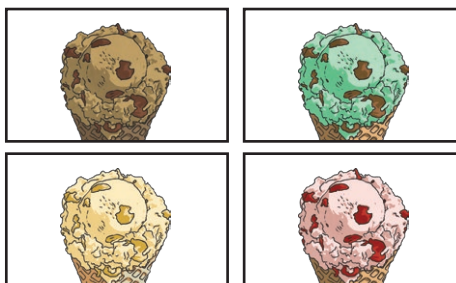
$2a + b = 10$	
a	b
2	6
3	4
4	2
5	0

Enumerating Possibilities

Enumerating means making a complete list of answers to a problem.

- Use a system for finding the possibilities.
- Organise your findings in an ordered list or table.
- Have a way of deciding when all possibilities have been found.

There are four ice cream flavours.



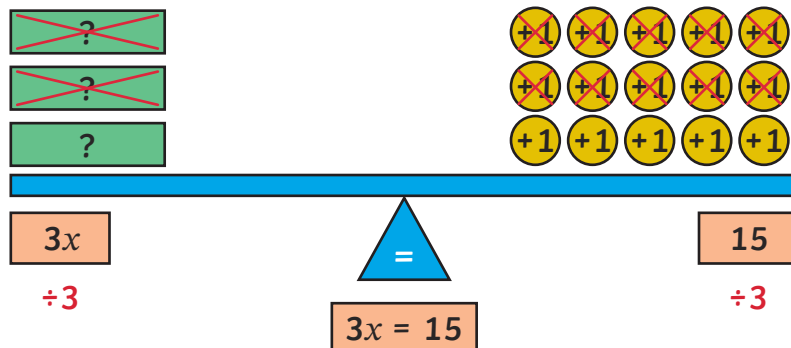
Two scoops of two different flavours give six possible combinations.

- chocolate and strawberry
- chocolate and vanilla
- chocolate and mint
- strawberry and vanilla
- strawberry and mint
- vanilla and mint

Solving One-Step and Two-Step Equations

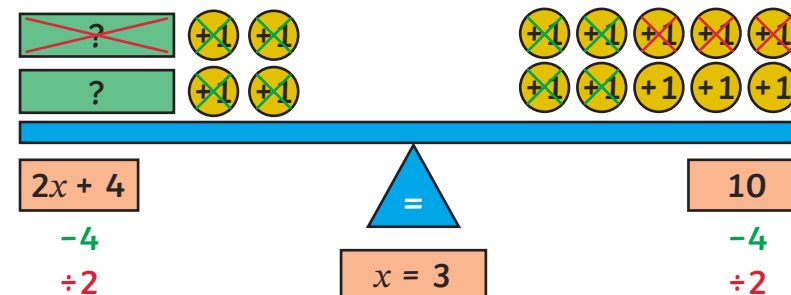
In algebra, missing numbers in equations are represented by letters. Any letter can be used but often the letter x is used. An algebraic x is written to look different to a normal letter 'x' to avoid confusion.

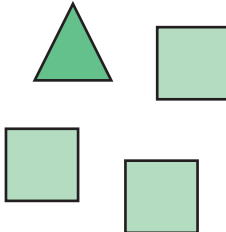
$$3x = 15$$



The multiplication sign is not used in algebra to avoid confusing it with the algebraic x used to show a missing number. Inverse operations are used to isolate the letter on one side of the equation.

$$2x + 4 = 10$$



Key Vocabulary	Ratio Language	The Ratio Symbol	
ratio	For every 1 circle, there are 2 triangles.	 The ratio of footballs to rugby balls: 1:4 The ratio of rugby balls to footballs: 4:1	
proportion			
“for every... there are...”	For every 2 bananas, there are 3 apples. 		
part			
whole	For every 1 football, there are 3 rugby balls. 	 The ratio of circles to triangles: 2:3 The ratio of triangles to circles: 3:2	
scale factor			
enlargement	Ratio and Fractions		
similar shapes	 For every 1 rugby ball, there are 2 footballs. Ratio of rugby balls to footballs: 1:2 $\frac{1}{3}$ of the balls are rugby balls.		 The ratio of apples to bananas: 1:2 The ratio of bananas to oranges: 2:3 The ratio of apples to bananas to oranges: 1:2:3 The ratio of oranges to bananas to apples: 3:2:1
length			
width			
perimeter	 For every 1 triangle, there are 3 squares. Ratio of triangles to squares: 1:3 $\frac{1}{4}$ of the shapes are triangles.		

 visit [twinkl.com](https://www.twinkl.com)

Ratio and Proportion Problem-Solving

To use the ingredients for 1 person, you divide all the quantities by 10 ($\div 10$).

Ingredients for Fruit Smoothie
(serves 10 people)

800g of bananas
500g of strawberries
200g of raspberries
700ml of milk
300ml of natural yogurt

To use the ingredients for 5 people, you halve all the quantities ($\div 2$).

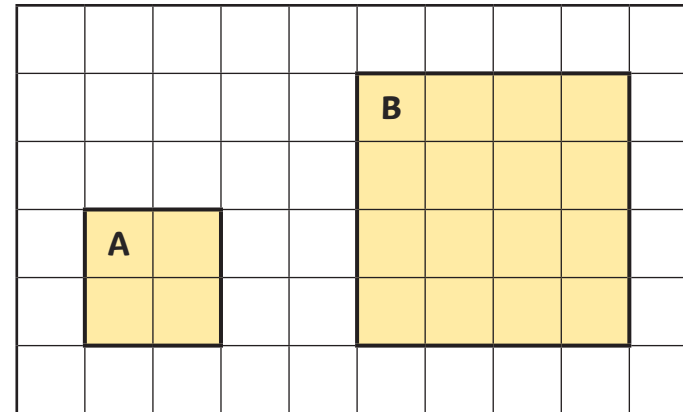
To use the ingredients for 20 people, you double all the quantities ($\times 2$).

In a bag of 15 sweets, there is 1 smiley face sweet for every 4 love heart sweets.

Therefore, there will be 3 smiley face sweets and 12 love heart sweets in the bag.



Scale Factors

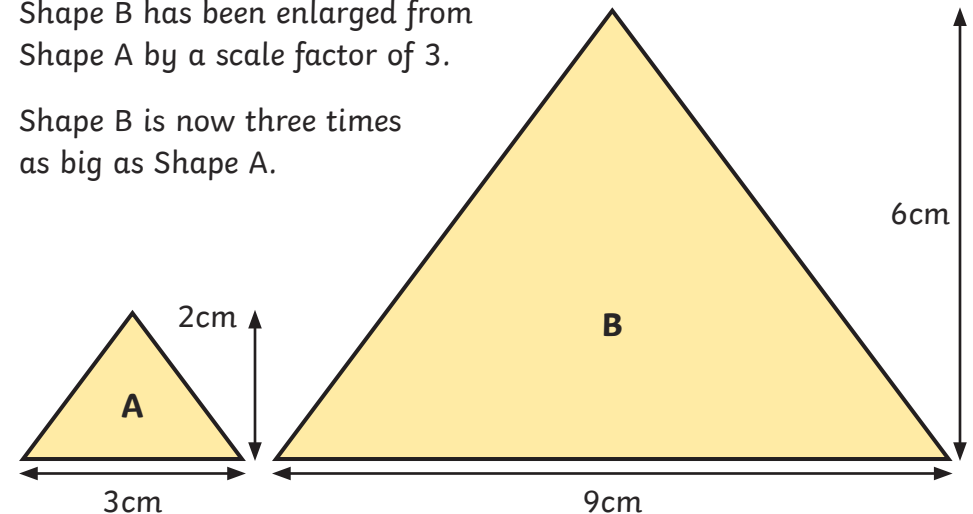


Shape A has been enlarged by a scale factor of 2 to make Shape B.

Shape B is now two times as big as Shape A.

Shape B has been enlarged from Shape A by a scale factor of 3.

Shape B is now three times as big as Shape A.



Key Vocabulary

perimeter

area

volume

cubic units (e.g. cm^3)

cuboid

width

length

rectangle

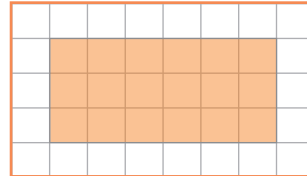
rectilinear

parallelogram

perpendicular height

Area of Rectangles

length $\times$ width = area of a rectangle



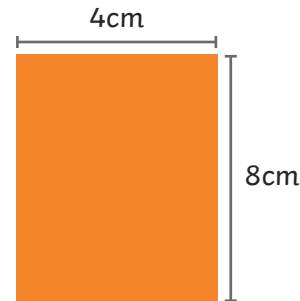
Counting squares:

area = 18cm^2

Use formula:

$6\text{cm} \times 3\text{cm}$

area = 18cm^2



$8\text{cm} \times 4\text{cm}$ area = 32cm^2

Perimeter of Rectangles

perimeter = length + width + length + width or (length + width) $\times$ 2

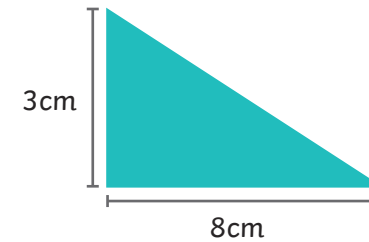


$5\text{cm} + 4\text{cm} + 5\text{cm} + 4\text{cm}$
area = 18cm^2

$(6 + 2) \times 2$
area = 16cm^2

Area of Triangles

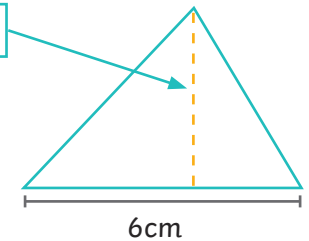
base $\times$ perpendicular height $\div$ 2 = area of a triangle



$8\text{cm} \times 3\text{cm} \div 2$
area = 12cm^2

perpendicular height = 5cm

$6\text{cm} \times 5\text{cm} \div 2$
area = 15cm^2



Counting squares:

6 whole squares = 6cm^2

6 half squares = 3cm^2

$6\text{cm}^2 + 3\text{cm}^2 = 9\text{cm}^2$

area = 9cm^2

Using formula:

$6\text{cm} \times 3\text{cm}$

$\div 2 = 9\text{cm}^2$

Perimeter and Area

Shapes with the same area can have different perimeters.

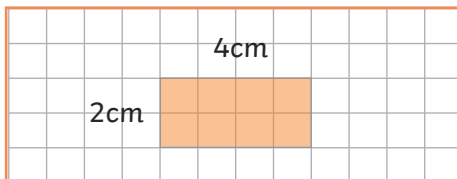


area = 8cm^2 perimeter = 12cm

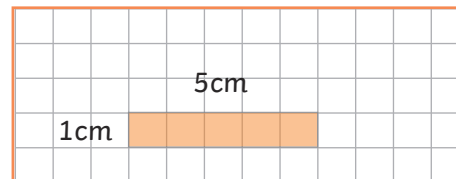


area = 8cm^2 perimeter = 18cm

Shapes with the same perimeter can have different areas.

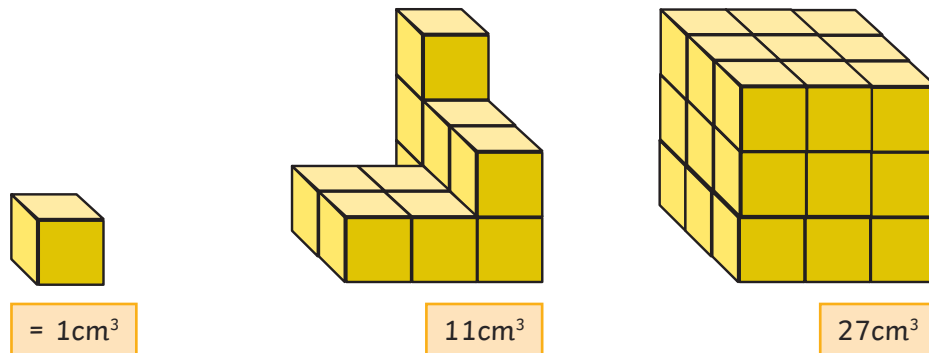


area = 8cm^2 perimeter = 12cm



area = 5cm^2 perimeter = 12cm

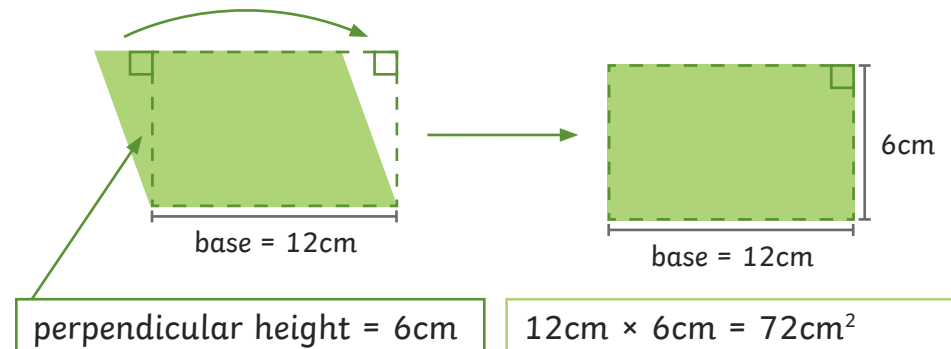
Volume - Counting Cubes



Area of Parallelograms

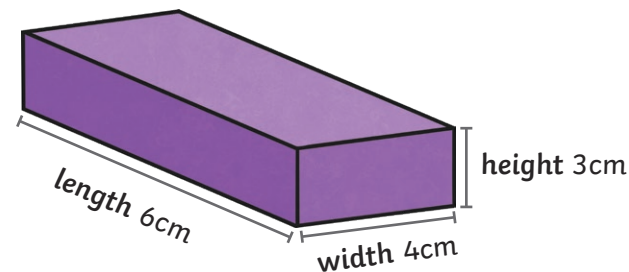
base $\times$ perpendicular height = area of a parallelogram

A parallelogram can be transformed into a rectangle.



Volume of Cuboids

length $\times$ width $\times$ height = volume of a cuboid



Multiply dimensions in **any** order:

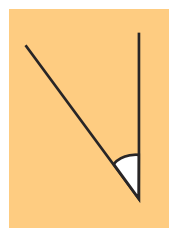
$3\text{cm} \times 6\text{cm} \times 4\text{cm}$

volume = 72cm^3

Key Vocabulary

angle
right angle
acute
obtuse
reflex
protractor
horizontal
vertical
parallel
perpendicular
polygon
regular
irregular
two-dimensional
three-dimensional
flat face
curved surface
edge
curved edge
vertex
vertices
apex
radius
diameter
circumference

Angle Types



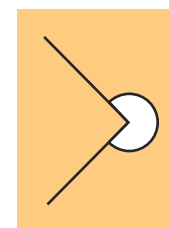
Acute Angles

Any angle that measures less than 90° is called an **acute** angle.



Obtuse Angles

Any angle that measures greater than 90° and less than 180° is called an **obtuse** angle.



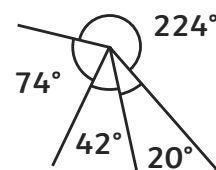
Reflex Angles

Any angle that measures greater than 180° is called a **reflex** angle.

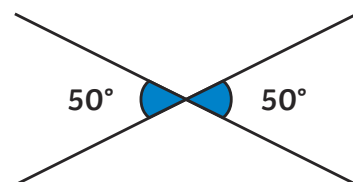
Calculating Angles



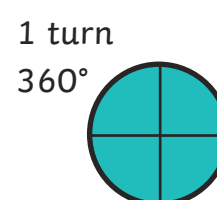
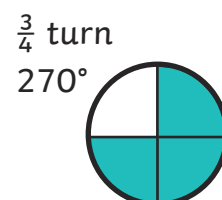
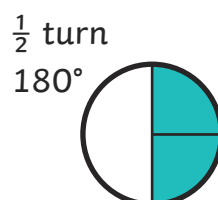
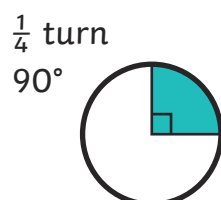
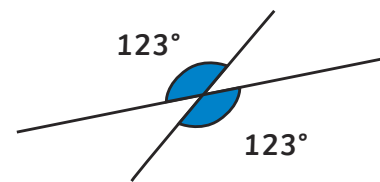
Angles on a straight line always total 180° .



Angles around a point always total 360° .

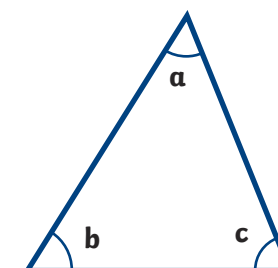


Opposite angles that share a vertex are equal.



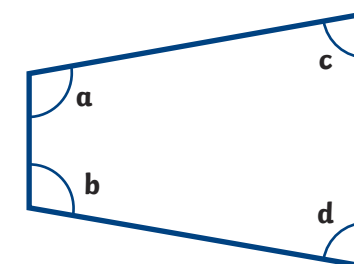
Multiples of 90° can be used as descriptions of a turn.

Angles in a Triangle



$$a + b + c = 180^\circ$$

Angles in a Quadrilateral



$$a + b + c + d = 360^\circ$$

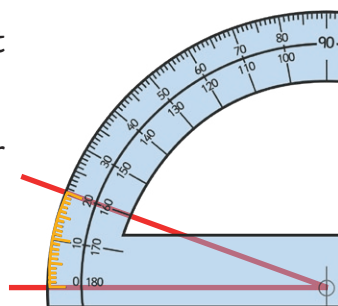
Properties of Shapes

Using a Protractor

Place the cross or circle at the point of the angle you are measuring.

Read from the zero on the outer scale of your protractor.

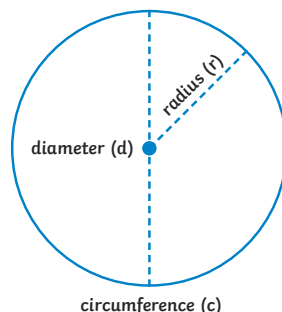
Count the degree lines carefully.



Parts of Circles

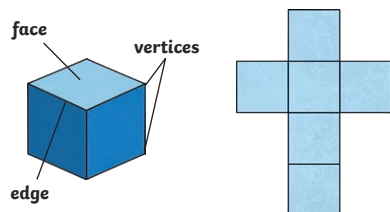
A circle is a 2D shape. The perimeter of a circle is called the **circumference** (c). The distance across the circle, passing through the centre, is called the **diameter** (d).

The distance from the centre of the circle to the circumference is called the **radius** (r).



$$r \times 2 = d \quad \frac{d}{2} = r$$

Nets of 3D Shapes



A shape net shows which 2D shapes can be folded and joined to make a 3D shape. When you are drawing a net, or solving a problem involving a shape net, think carefully about where the edges of the faces meet.

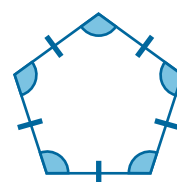
Knowledge Organiser

Angles in Regular Polygons

As the number of sides of a polygon increases by one, the total of the interior angles increases by 180° . When n = number of sides, this formula can be used to find the size of each angle in a **regular polygon**:

$$\text{Sum of Interior Angles} = (n - 2) \times 180^\circ$$

$$\text{Each Angle} = \frac{(n - 2) \times 180^\circ}{n}$$

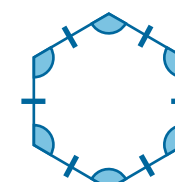


Pentagon

$$n = 5$$

$$(5 - 2) \times 180^\circ = 540^\circ$$

$$540^\circ \div 5 = 108^\circ$$



Hexagon

$$n = 6$$

$$(6 - 2) \times 180^\circ = 720^\circ$$

$$720^\circ \div 6 = 120^\circ$$

Properties of 3D Shapes

3D shapes have three dimensions – **length**, **width** and **depth**.

A **polyhedron** is a 3D shape with flat faces. Spheres, cylinders and cones are not polyhedrons as they have curved surfaces.

Cube 6 square faces 12 edges 8 vertices	Tetrahedron 4 triangular faces 6 edges 4 vertices	Sphere 1 curved surface 0 edges 0 vertices
Cuboid 6 faces 12 edges 8 vertices	Octahedron 8 faces 12 edges 6 vertices	Triangular prism 5 faces 9 edges 6 vertices
Square-based pyramid 5 faces 8 edges 5 vertices	Cone 1 circular face 1 curved surface 1 curved edge 1 apex	Cylinder 2 circular faces 1 curved surface 2 curved edges 0 vertices