Number and Place Value — Knowledge Organiser

Key Vocabulary

- ten million
- millions
- thousands
- hundreds
- tens
- ones
- zero
- place value
- greater than
- less than
- order
- round
- rounded
- negative number
- partition
- digit
- interval
- sequence
- linear sequence

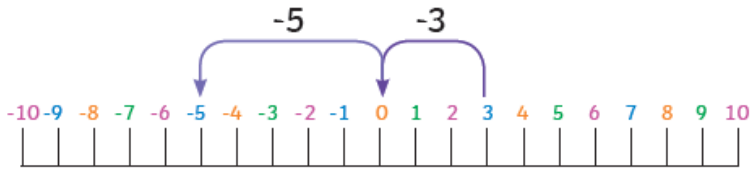
Compare and Order

equals	greater than	less than
26 + 38 = 8 × 8	223 873 > 98 256	901 198 < 1 091 098
Both calculations have the value 64.	The number on the left has 2 hundred thousands and the number on the right has 0 hundred thousands.	The number on the right has 1 million and the number on the left has 0 millions.

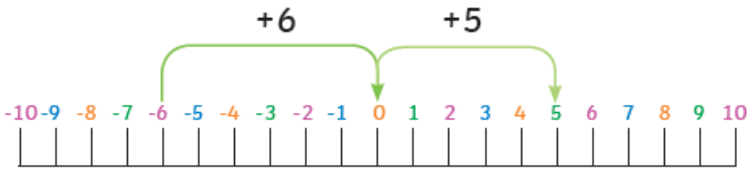
smallest — 81 782 — 127 352 — 127 835 — 137 019 — 200 002 — greatest

Negative Numbers

3 - 8 = -5



-6 + 11 = 5



Four Operations — Knowledge Organiser

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	$^{6}\not{7}$	$^{13}\not{4}$	$^{1}\not{2}$
-		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	$\not{3}$	$\not{2}$	
	1	5	4
×		2	6
	9	2	4
3	0	8	0
4	0	0	4
1	1		

Start with the ones.

154 × 6 = 924

154 × 20 = 3080

3080 + 924 = 4004

Order of Operations

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

Algebra — Knowledge Organiser

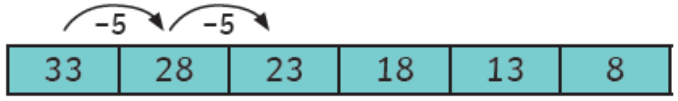
Key Vocabulary

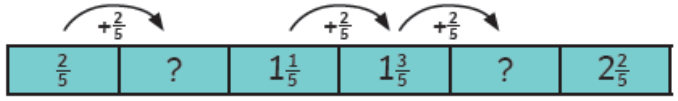
- term to term rule
- variable
- unknown
- expression
- equation
- formula
- one-step equation
- two-step equation
- substitution
- pairs of unknowns
- enumerate

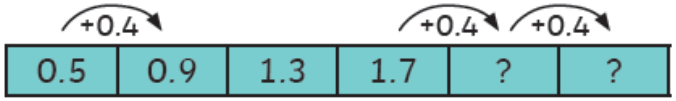
Linear Number Sequences

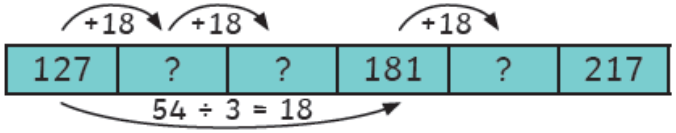
A linear number sequence is a sequence where each value increases or decreases by the same amount each time. Each number in a linear number sequence is called a **term**. The constant change between each number is called the term to term rule. To identify the **term to term rule**, find the difference 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 triangle = (base × height) ÷ 2

Area of rectangle = length × width

(12.5 × hours worked) + 25 = cost of job

Converting Units

Knowledge Organiser

Key Vocabulary

- mass
- gram
- kilogram
- capacity
- volume
- mililitre
- litre
- millimetre
- centimetre
- kilometre
- foot
- inch
- ounce
- pound
- stone
- pint
- gallon

Converting Mass

1 tonne = 1000kg

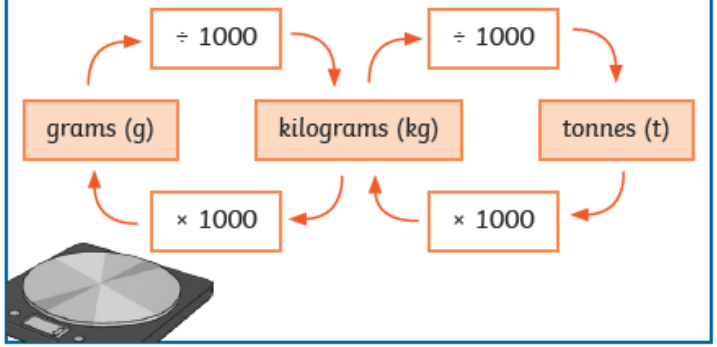
1000g = 1kg

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

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

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

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



Converting Capacity

1000ml = 1l

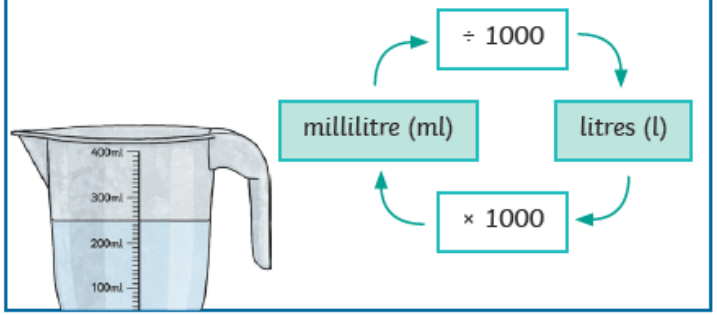
$\frac{1}{10}$ l = 0.1l = 100ml

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

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

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

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



Converting Length

1000m = 1km

100cm = 1m

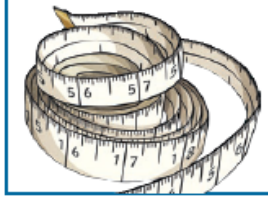
10mm = 1cm

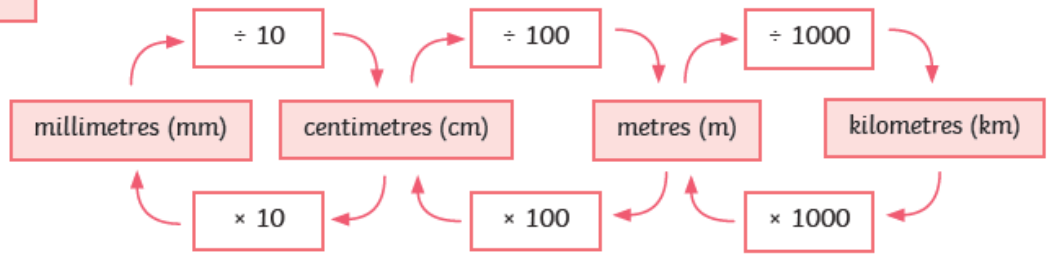
$\frac{1}{2}$ m = 0.5m = 50cm

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

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

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





Decimals

Knowledge Organiser

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

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

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

$\frac{7}{20} = \frac{35}{100}$ or 0.35 (×5)

$\frac{7}{25} = \frac{28}{100}$ or 0.28 (×4)

$\frac{7}{50} = \frac{14}{100}$ or 0.14 (×2)

$\frac{8}{200} = \frac{4}{100}$ or 0.04 (÷2)

When the denominator is not a factor or multiple of 100

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

	0	.	8	7	5
8	7	.	$^{7}0$	$^{6}0$	$^{4}0$

Dividing Decimals by Integers

8.12 ÷ 4

	2	. 0	3
4	8	. $^{1}\not{1}$	$^{1}2$

6.93 ÷ 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

Fractions

Knowledge Organiser

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

$\frac{9}{12}$

Factors of 9:
1, 3, 9

Factors of 12:
1, 2, 3, 4, 6, 12

$\frac{9}{12} = \frac{3}{4}$ (÷3 above, ÷3 below)

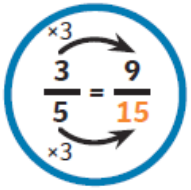
Compare and Order Fractions

Use the Common Denominator

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

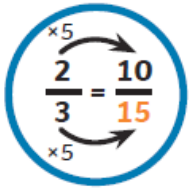
Multiples of 5: 5, 10, **15**

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



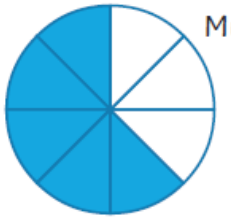
$\frac{3}{5} = \frac{9}{15}$ (×3 above, ×3 below)

$\frac{9}{15} < \frac{10}{15}$



$\frac{2}{3} = \frac{10}{15}$ (×5 above, ×5 below)

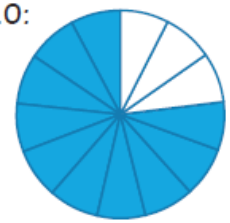
Use the Common Numerator



Multiples of 5: 5, **10**, 15

$\frac{5}{8} \square \frac{10}{13}$

Multiples of 10: **10**, 20



$\frac{5}{8} = \frac{10}{16}$ (×2 above, ×2 below)

$\frac{10}{16} < \frac{10}{13}$

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

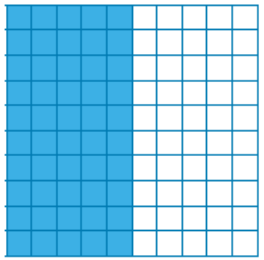
Percentages

Knowledge Organiser

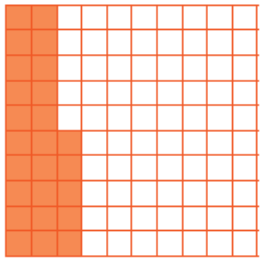
Key Vocabulary

- per cent (%) = 'out of 100'
- percentage
- discount
- equivalent fraction
- equivalent decimal
- convert
- compare
- order
- the whole

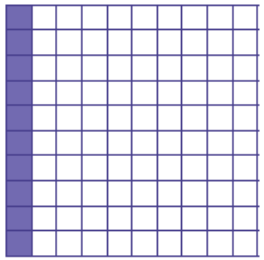
Equivalent Fractions, Decimals and Percentages



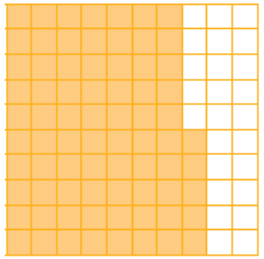
$\frac{50}{100} = \frac{1}{2} = 0.5 = 50\%$



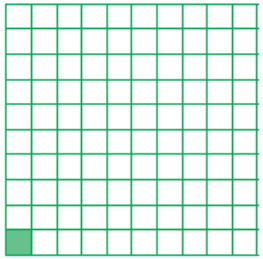
$\frac{25}{100} = \frac{1}{4} = 0.25 = 25\%$



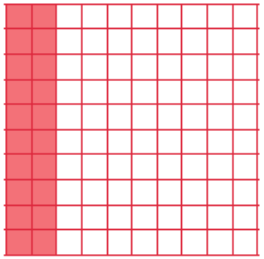
$\frac{10}{100} = \frac{1}{10} = 0.1 = 10\%$



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



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



$\frac{20}{100} = \frac{2}{10} = 0.2 = 20\%$

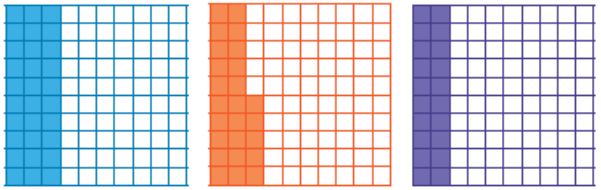
Fractions to Percentages

$\frac{15}{50} \xrightarrow{\times 2} \frac{30}{100} = 0.3 = 30\%$

$\frac{60}{200} \xrightarrow{\div 2} \frac{30}{100} = 0.3 = 30\%$

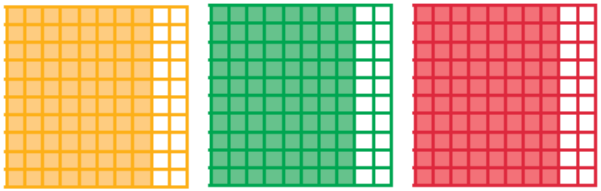
Order Fractions, Decimals and Percentages

$\frac{3}{10} > 25\% > 0.2$



$\frac{30}{100} = 30\%$ $\quad \frac{25}{100} = 25\%$ $\quad \frac{20}{100} = 20\%$

$80\% = 0.8 = \frac{4}{5}$



$\frac{80}{100} = 80\%$ $\quad \frac{80}{100} = 80\%$ $\quad \frac{80}{100} = 80\%$

Perimeter, Area and Volume

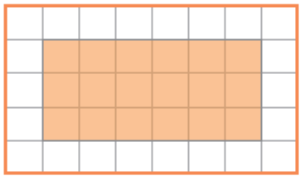
Knowledge Organiser

Key Vocabulary

- perimeter
- area
- volume
- cubic units (e.g. cm^3)
- cuboid
- width
- length
- rectangle
- rectilinear
- parallelogram
- perpendicular height

Area of Rectangles

length × width = area of a rectangle



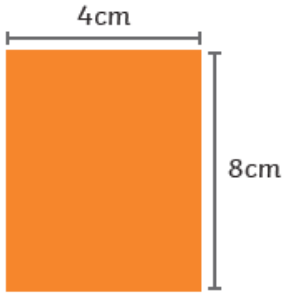
Counting squares:

area = $18cm^2$

Use formula:

6cm × 3cm

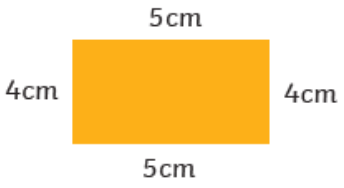
area = $18cm^2$



8cm × 4cm area = $32cm^2$

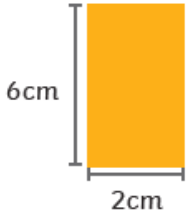
Perimeter of Rectangles

perimeter = length + width + length + width or (length + width) × 2



5cm + 4cm + 5cm + 4cm

area = $18cm^2$

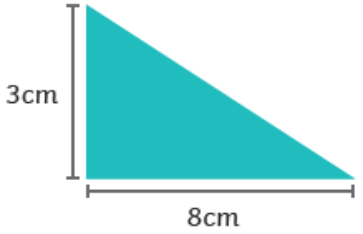


(6 + 2) × 2

area = $16cm^2$

Area of Triangles

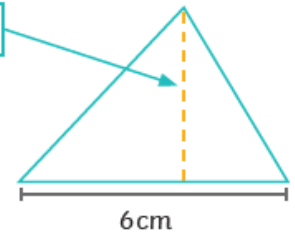
base × perpendicular height ÷ 2 = area of a triangle



8cm × 3cm ÷ 2

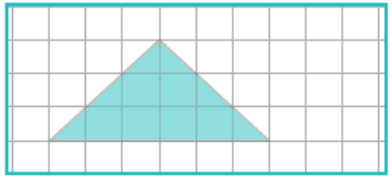
area = $12cm^2$

perpendicular height = 5cm



6cm × 5cm ÷ 2

area = $15cm^2$



Counting squares:

6 whole squares = $6cm^2$

6 half squares = $3cm^2$

$6cm^2 + 3cm^2 = 9cm^2$

area = $9cm^2$

Using formula:

6cm × 3cm

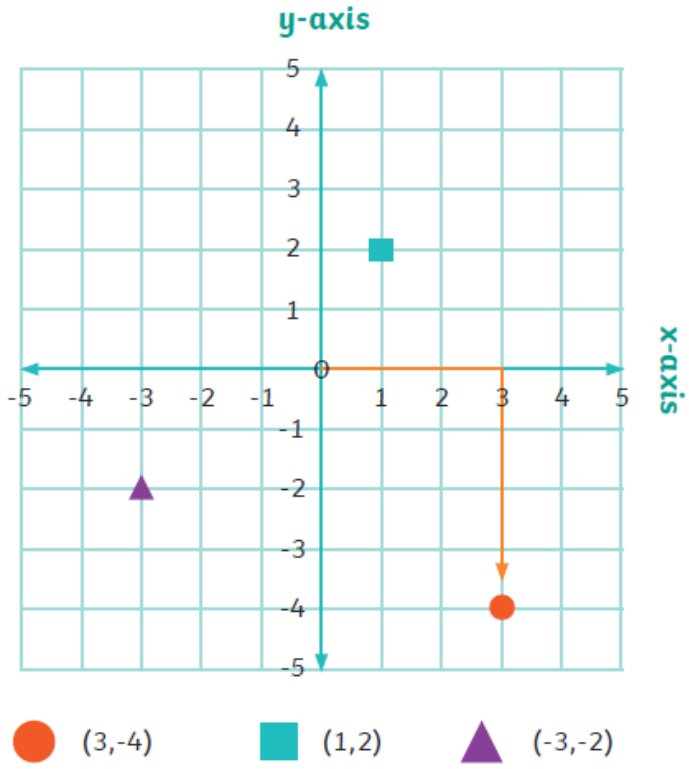
÷ 2 = $9cm^2$

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.

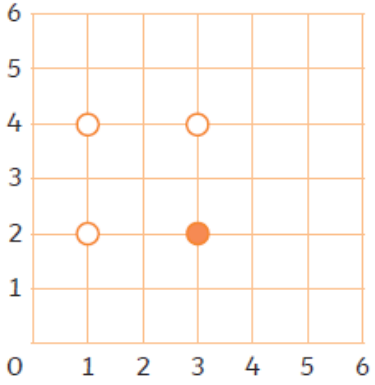


Look at the circle. It is 3 units along the x-axis and 4 down the y-axis. Its coordinates are (3,-4).

Completing Shapes

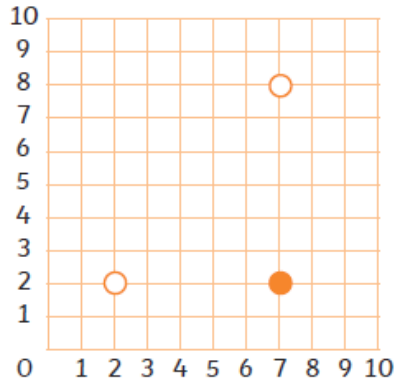
Using the properties of a shape, a polygon can be completed on a grid.

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.



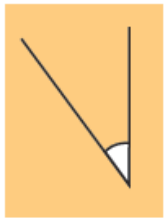
A right-angled triangle should have three sides with one 90° angle.

Properties of Shapes — Knowledge Organiser

Key Vocabulary

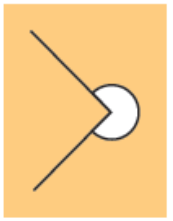
- angle
- right angle
- acute
- obtuse
- reflex
- protractor
- horizontal
- vertical
- parallel
- perpendicular
- polygon
- regular
- irregular
- two-dimensional
- three-dimensional
- flat face
- curved surface
- edge
- curved edge
- vertex
- vertices
- apex
- radius
- diameter
- circumference

Angle Types



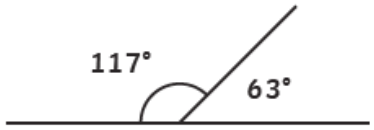
Acute Angles
Any angle that measures less than 90° is called an **acute** angle.

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

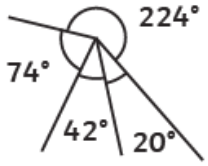


Reflex Angles
Any angle that measures greater than 180° is called a **reflex** angle.

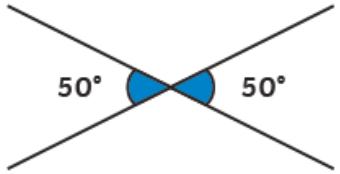
Calculating Angles

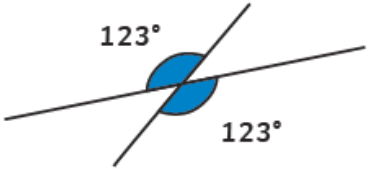


Angles on a straight line always total 180°.

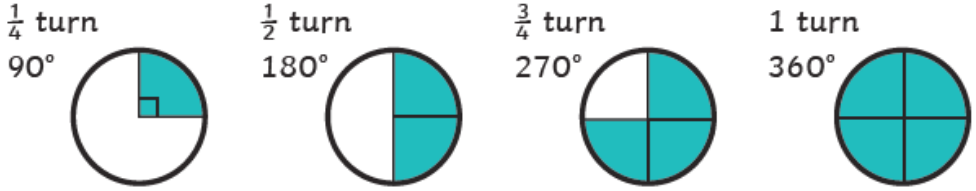


Angles around a point always total 360°.



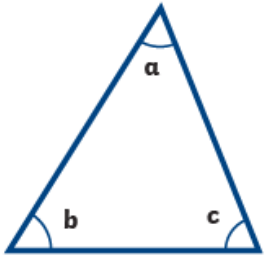


Opposite angles that share a vertex are equal.



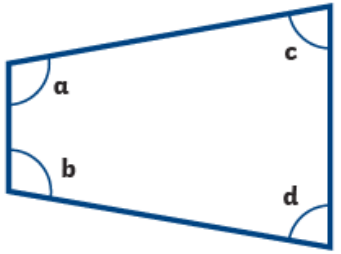
Multiples of 90° can be used as descriptions of a turn.

Angles in a Triangle



a + b + c = 180°

Angles in a Quadrilateral



a + b + c + d = 360°

Ratio Knowledge Organiser

Key Vocabulary

- ratio
- proportion
- "for every... there are..."
- part
- whole
- scale factor
- enlargement
- similar shapes
- length
- width
- perimeter

Ratio Language

For every 1 circle, there are 2 triangles.

For every 2 bananas, there are 3 apples.

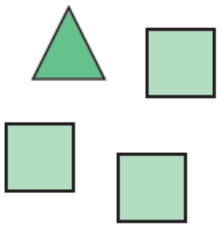
For every 1 football, there are 3 rugby balls.

Ratio and Fractions

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.



For every 1 triangle, there are 3 squares.

Ratio of triangles to squares: 1:3

$\frac{1}{4}$ of the shapes are triangles.

The Ratio Symbol

The ratio of footballs to rugby balls: 1:4

The ratio of rugby balls to footballs: 4:1

The ratio of circles to triangles: 2:3

The ratio of triangles to circles: 3:2

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

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.

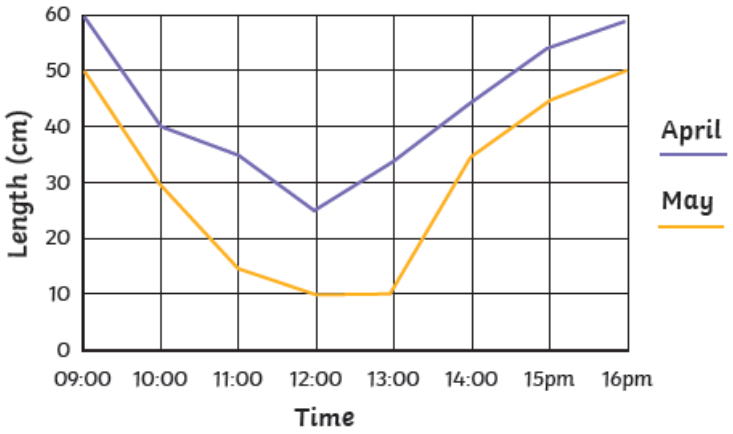
Interpreting data simply means understanding or working out what is being shown by a table, graph or chart and being able to answer questions about that information.

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

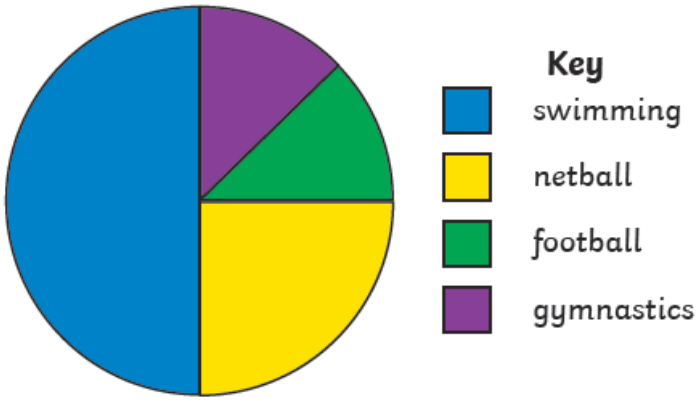


Pie Charts

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