

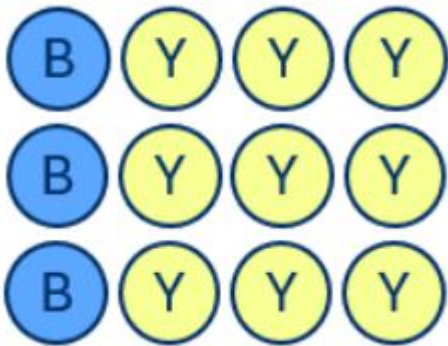


Autumn Block 1

Ratio



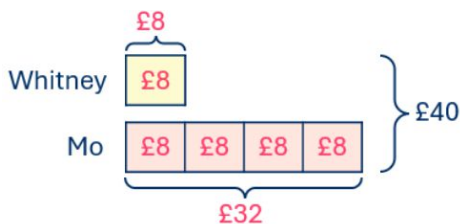
The ratio of cookies to doughnuts is 2 : 3



Write the ratio of blue counters to yellow counters in its simplest form.



Whitney and Mo share £40 in the ratio 1 : 4
 Work out how much money they each receive.



$$1 + 4 = 5$$

$$£40 \div 5 = £8$$

$$1 \times £8 = £8$$

$$4 \times £8 = £32$$

Whitney receives £8

Mo receives £32

Step 1

Understand ratio

Step 2

Ratio problems (whole given)

Step 3

Ratio problems (part given)

Step 4

Ratio problems (difference given)

Step 5

Simplify ratios

Step 6

Express ratios in the form 1:n and n:1 **E**

Step 7

Compare ratios and fractions

Step 8

Solve problems with ratio

Key vocabulary

ratio

comparison of two or more values

proportion

relationship between two or more quantities in which the ratio of one quantity to another is the same

equal parts

parts of a whole with the same value

bar model

visual representation used to show a mathematical relationship

whole

total or complete amount

parts

quantities being compared in a ratio, for example the ratio 3 : 2 has 5 parts

difference

positive result of subtracting two values

simplify

write a ratio in a simpler equivalent integer form

simplest form

when the highest common factor of the values in a ratio is 1

equivalent

two ratios are equivalent if they simplify to the same ratio

factor

integer or term that divides exactly into another integer or term

common factor

integer or term that is a factor of two or more numbers or expressions

highest common factor

common factor of two or more integers or terms that has the greatest value or power

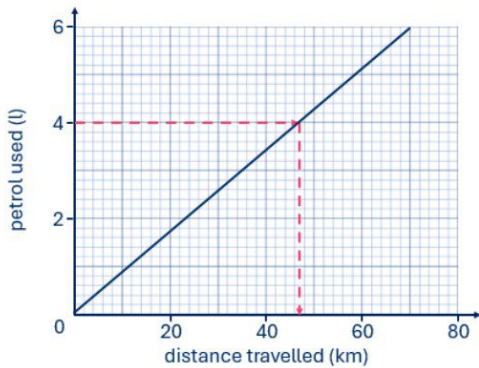
unit ratio

ratio written in the form $n:1$ or $1:n$



Autumn Block 2

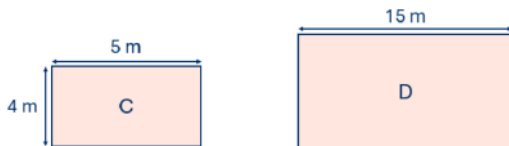
Proportion and scale



How far can the car travel with 4 litres of petrol?

47 km

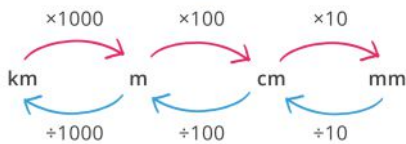
Rectangles C and D are similar.



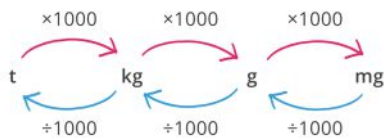
$$15 \div 5 = 3$$

The scale factor is 3

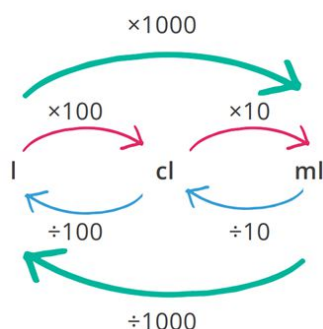
Converting between Metric Units:
Length



Converting between Metric Units:
Mass



Converting between
Metric Units: **Capacity**



Step 1

Direct proportion

Step 2

Conversion graphs

Step 3

Convert between currencies

Step 4

Direct proportion graphs

Step 5

Similar shapes

Step 6

Convert metric units

Step 7

Scale diagrams

Step 8

Interpret maps using scale and ratios

Key vocabulary

direct proportion	relationship between two quantities where they increase or decrease at the same rate
scaling	multiplication of each value by a constant to proportionally increase or decrease the size
unit price	cost of a single unit of a product, found by dividing the total price by the number of units
linear	where a relationship or pattern changes at a constant rate, forming a straight line when graphed
axes	two perpendicular lines (horizontal x-axis and vertical y-axis) that define the coordinate plane and are used to plot points and graphs
conversion	process of changing a quantity from one unit or form to another
approximate	as close to the actual value as possible, but not completely accurate
unit	standard measurement used to express a quantity
origin	where the axes of a graph intersect, at coordinates (0, 0)
exchange rate	value at which one currency can be exchanged for another
exchange	swap an amount for another equal amount
estimate	number or result that is not exact, but is suitably close to the actual value
currency	system of money used in a particular country
convert	change a quantity from one unit or form to another
similar shapes	shapes that have the same angles in corresponding positions and proportional side lengths
corresponding	elements, such as angles or sides, that are in the same relative position
orientation	position or arrangement of a shape or object in relation to its surroundings or a specific direction
scale factor of enlargement	number used to multiply the dimensions of a shape or object to enlarge or reduce it while maintaining its proportion



Autumn Block 3

Algebraic manipulation

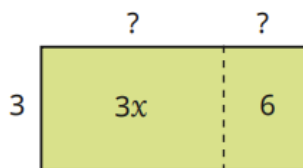
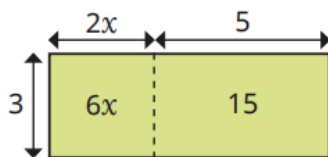
Equation	Expression	Formula	Identity
$2a + 4 = 10$	$2a$	$2a + 4b = c$	$2a + 4a \equiv 6a$
$2a + 3 = 10$	$2a + 4b$		

If $x = -5$, what is the value of $3x + 4$?

$$\begin{aligned}
 3x + 4 &= 3 \times -5 + 4 \\
 &= -15 + 4 \\
 &= -11
 \end{aligned}$$

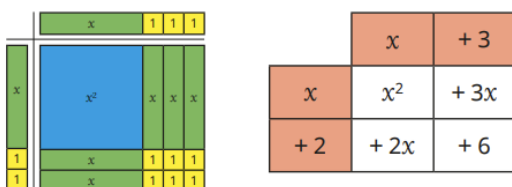
$$3(x + 2)$$

x	2
x	2
x	2



- What is multiplied by 3 to give $3x$?
- What is multiplied by 3 to give 6?

$$(x + 2)(x + 3)$$



$$x^2 + 3x + 2x + 6 \equiv x^2 + 5x + 6$$

Step 1

Form algebraic expressions

Step 2

Identify and use formulae, expressions, identities and equations

Step 3

Simplify expressions

Step 4

Use directed number with algebra

Step 5

Substitution with directed number

Step 6

Expand a single bracket

Step 7

Factorise into a single bracket

Step 8

Expand single brackets and simplify

Step 9

Expand double brackets **E**

Step 10

Factorise quadratic expressions **E**

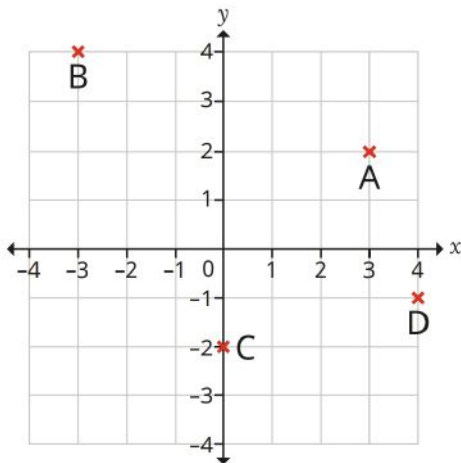
Key vocabulary

term	number or variable or any combination of number and variable combined by multiplication or division
expression	collection of terms involving variables and numbers
substitute	replace letters with numerical values
simplify	write an expression in a simpler equivalent form
coefficient	number in front of a variable indicating the multiple of the variable
identity	equation that is true for all values of the variable, for example $a + b \equiv b + a$
equation	statement to show that two expressions are equal
formula	mathematical rule or equation that shows the relationship between different variables or quantities (plural: formulae)
variable	symbol, usually a letter, that can represent any value in mathematical expressions, identities and formulae
expand	multiply each term inside the bracket by the expression outside the bracket
product	result of a multiplication
factor	integer or term that divides exactly into
factorise	express an algebraic expression as a product of its factors using brackets; the reverse process of expanding brackets



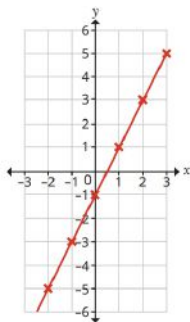
Autumn Block 4

Coordinates and graphs



$$A = (3, 2) \quad B = (-3, 4)$$

$$C = (0, -2) \quad D = (4, -1)$$



$$y = 2x - 1$$

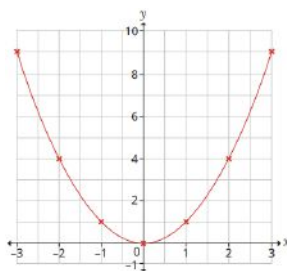
Linear graph

Gradient = 2

y-intercept = -2

$$y = x^2$$

**Quadratic
graph**



Key vocabulary

midpoint	halfway between two intervals on a number line or two numbers
mean	type of average found by dividing the total of the values by the number of values in the set
reflect	create a mirror image of a shape
line of symmetry	straight line that divides a shape in half where both sides are a reflection of each other
quadratic	involving the second (and no higher) power of a variable or unknown, typically in the form $ax^2 \pm bx + c$

Step 1 Coordinates in all four quadrants

Step 2 Lines parallel to the axes

Step 3 Tables of values

Step 4 Recognise and use the line $y = x$

Step 5 Lines of the form $y = mx$

Step 6 Link $y = mx$ to direct proportion **E**

Step 7 Introduce gradient ($y = mx$)

Step 8 Lines with a negative gradient

Step 9 Lines of the form $y = x + c$

Step 10 Lines of the form $y = mx + c$

Step 11 Find the midpoint of a line segment **E**

Step 12 Solve problems with coordinates and graphs **E**

Step 13 Quadratic graphs **E**

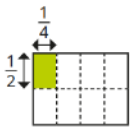
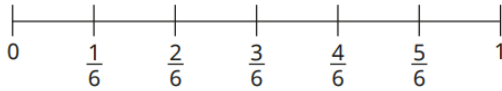
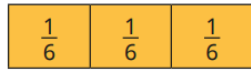
Key vocabulary

quadrant	one of four sections on a grid created by the x-axis and y-axis intersecting
coordinates	pair of numbers that shows the horizontal and vertical position of a point
axes	two perpendicular lines (horizontal x-axis and vertical y-axis) that define the coordinate plane and are used to plot points and graphs
origin	where the axes of a graph intersect, at coordinates (0, 0)
parallel lines	lines that maintain a constant distance from each other
linear	describes a relationship or pattern that changes at a constant rate, forming a straight line when graphed
scale	space between marks that split an axis into equal parts
origin	where the axes of a graph intersect, at coordinates (0, 0)
direct proportion	relationship between two quantities where they increase or decrease at the same rate
gradient	measure of how steep a line is, showing the rate of change between two points on a graph
intercept	point where a line or curve crosses an axis on a graph

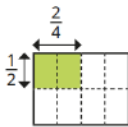


Autumn Block 5

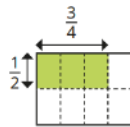
Multiply and divide fractions



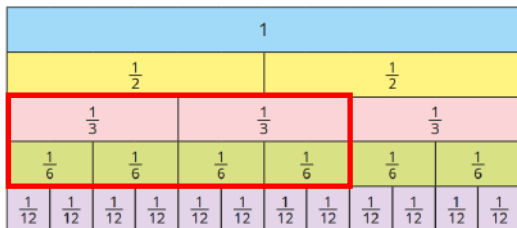
$$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$



$$\frac{1}{2} \times \frac{2}{4} = \frac{2}{8}$$



$$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$$



$$\frac{2}{3} \div \frac{1}{6} = 4$$

Ron

$$\frac{2}{5} \div \frac{3}{4} = \frac{8}{20} \div \frac{15}{20} = \frac{8}{15}$$

Sam

$$\frac{2}{5} \div \frac{3}{4} = \frac{2}{5} \times \frac{4}{3} = \frac{8}{15}$$

$$\frac{2}{3} \times 4 = \frac{8}{3} \text{ and } \frac{x}{3} \times 4 = \frac{4x}{3}$$

$$5 \div \frac{1}{3} = 15 \text{ and } 5 \div \frac{1}{x} = 5x$$

$$\frac{2}{3} \times \frac{4}{5} = \frac{2 \times 4}{3 \times 5} = \frac{8}{15} \text{ and } \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d} = \frac{ac}{bd}$$

Step 1

Multiply a fraction by an integer

Step 2

Multiply fractions

Step 3

Understand reciprocals

Step 4

Divide an integer by a fraction

Step 5

Divide a fraction by an integer

Step 6

Divide a fraction by a unit fraction

Step 7

Divide fractions

Step 8

Multiply and divide mixed numbers

Step 9

Multiply and divide algebraic fractions **E**

Key vocabulary

unit fraction

fraction with 1 as its numerator

non-unit fraction

fraction with a numerator greater than 1

numerator

top number in a fraction that indicates the number of equal parts out of a whole

denominator

bottom number in a fraction that indicates the number of equal parts a whole has been divided into

mixed number

integer and a proper fraction represented together to form a number

improper fraction

fraction in which the numerator is greater than the denominator

simplify

write an equivalent fraction by dividing the numerator and denominator by a common factor

reciprocal

one of a pair of numbers whose product is equal to 1

common denominator

denominator that is the same for two or more fractions

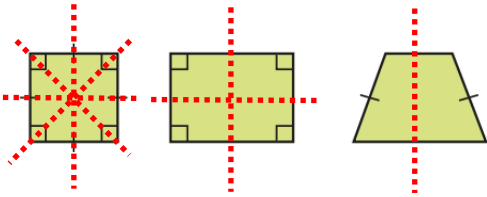
algebraic fraction

fraction in which the numerator, the denominator or both are algebraic expressions

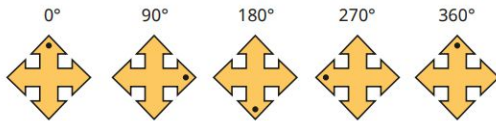


Autumn Block 6

Symmetry and reflection

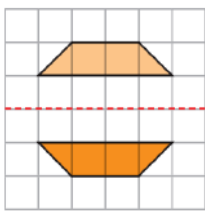


Lines of symmetry are lines which split a shape into two identical halves.



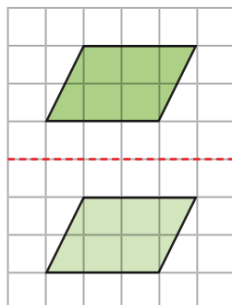
Rotational symmetry is a measure of how many times a shape “fits into itself” during a full rotation.

This shape has a rotational symmetry of order 4.



This is a **reflection**. Each corner (vertex) in the object is an equal distance from the mirror line as the corresponding corner in the image.

This is **not** a **reflection**. The corresponding corners are not equal distances from the mirror line.



Step 1

Line symmetry

Step 2

Rotational symmetry

Step 3

Reflect a shape in a horizontal or vertical line

Step 4

Reflect a shape in a diagonal line

Step 5

Reflect a shape given the equation of the line **E**

Step 6

Describe a reflection **E**

Key vocabulary

line of symmetry straight line that divides a shape in half, where both halves are a reflection of each other

polygon closed 2-D shape made of straight lines

regular polygon polygon where all the sides are the same length and all the angles are of equal size

vertical positioned up and down, perpendicular to the ground or a horizontal surface

horizontal parallel to the horizon (flat or level)

diagonal straight line that is not completely vertical or horizontal

rotational symmetry when a shape looks the same after being rotated around its centre

order of rotational symmetry number of times a shape looks exactly the same during a full 360° rotation

reflection type of geometrical transformation where an object is flipped to create a mirror image

mirror line line over which a shape is reflected to create a symmetrical image

object original shape before a transformation

image shape that has been transformed from an object

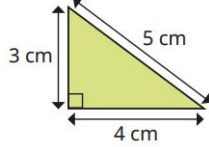
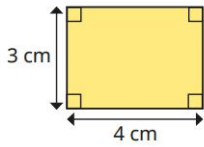
invariant point point on a line or shape that does not move when a specific transformation is applied

parallel relationship between two or more objects (such as lines or planes) that remain equidistant from each other and never intersect

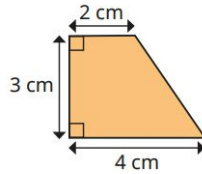
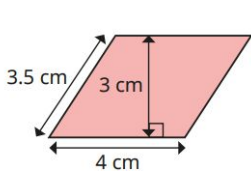


Spring Block 1

Area, volume and density



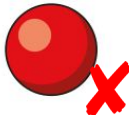
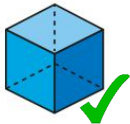
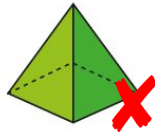
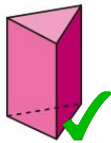
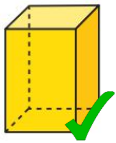
area = length $\times$ width area = base $\times$ height $\div 2$



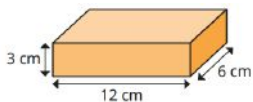
area = base $\times$ height

area = $\frac{a+b}{2} \times h$

Which shapes are prisms?



Why do all of these calculations find the volume of the cuboid?



volume = length $\times$ width $\times$ height

volume = cross-section $\times$ depth

$$18 \times 12$$

$$6 \times 36$$

$$6 \times 3 \times 12$$

$$72 \times 3$$

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

$$\begin{array}{ccc} & \times 1000 & \\ 3.5 \text{ kg} & \longrightarrow & 3500 \text{ g} \\ & \div 1000 & \end{array}$$

$$\begin{array}{ccc} & \div 1000 & \\ 40 \text{ g} & \longrightarrow & 0.04 \text{ kg} \\ & \times 1000 & \end{array}$$

Step 1

Name 2-D and 3-D shapes

Step 2

Area of a 2-D shape

Step 3

Area of a compound shape

Step 4

Recognise prisms

Step 5

Volume of cubes and cuboids

Step 6

Convert metric units of mass and capacity

Step 7

Understand the units of density, mass and volume

Step 8

Solve problems with density, mass and volume

Key vocabulary

polygon	closed 2-D shape made of straight lines
edge	straight line between two vertices or faces of a shape
vertex	point at which two or more edges (3-D) or sides (2-D) meet
face	flat surface on a 3-D shape
area	amount of space taken up by a shape or surface, measured in square units
perpendicular height	height of a shape, measured at a right angle from the base to a vertex
prism	3-D shape with a constant polygon cross-section
volume	amount of space a 3-D object takes up, measured in cubic units
cube	3-D shape with six equal square faces, twelve edges and eight vertices
cuboid	3-D shape with six rectangular faces, twelve edges and eight vertices, where opposite faces are equal
capacity	maximum amount of space that an object can contain
density	amount of mass per unit of a certain volume
mass	measure of the amount of matter in a substance or an object
volume	amount of space a 3-D object takes up, measured in cubic units



Spring Block 2

Equations and inequalities

x	x	x	7
25			

x	x	x
18		

x
6

$$\begin{array}{l}
 3x + 7 = 25 \\
 -7 \quad \quad -7 \\
 \hline
 3x = 18 \\
 \div 3 \quad \quad \div 3 \\
 \hline
 x = 6
 \end{array}$$

8 cm

area = 96 cm^2

$x - 9 \text{ cm}$

$8(x - 9) = 96$

x	x	7
12		

x	7
12	

x
5

$$\begin{array}{l}
 x + 12 = 2x + 7 \\
 -x \quad \quad -x \\
 \hline
 12 = x + 7 \\
 -7 \quad \quad -7 \\
 \hline
 5 = x
 \end{array}$$



Step 1 Solve 1- and 2-step equations

Step 2 Solve more complex equations

Step 3 Solve fractional equations

Step 4 Form and solve equations

Step 5 Solve equations with unknowns on both sides

Step 6 Understand and use inequalities

Step 7 Inequalities on a number line

Step 8 Solve inequalities

Step 9 Form and solve inequalities

Step 10 Solve inequalities with unknowns on both sides **E**

Key vocabulary

equation statement to show that two expressions are equal

expression collection of terms involving variables and numbers

inverse opposite effect of

solution value of an unknown that satisfies an equation or inequality

coefficient number in front of a variable indicating the multiple
form create an equation based on a given problem or situation

solve find the value(s) or set of values of an unknown in an equation or inequality

inequality statement that shows the relationship between two expressions where one is greater than, less than or not equal to the other

satisfy find a value that makes the inequality true when substituted into the inequality

integer whole number that can be positive or negative



Spring Block 3

Percentages

Fraction	Decimal	Percentage
40	$12 \div 40 = 0.3$	$0.3 \times 100 = 30\%$

Calculate 12% of 40.

A

$$40 \times 0.12$$

B

$$40 \div 100 \times 12$$

Increase £240 by 20%.

A

$$\begin{aligned} 10\% \text{ of } £240 &= £24 \\ 20\% \text{ of } £240 &= £48 \\ £240 + £48 &= £288 \end{aligned}$$

B

$$£240 \times 1.2 = £288$$

Percentage change = $\frac{\text{change}}{\text{original}} \times 100$

A ticket cost £4 last year. Now it costs £5. Work out the percentage increase in price.

$$5 - 4 = 1$$

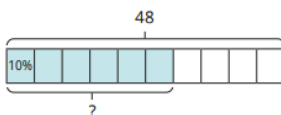
$$1 \times 100 = 25\% \text{ increase}$$

4

—

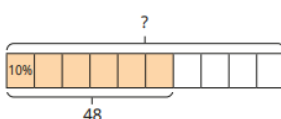
A

$$60\% \text{ of } 48 = \underline{\quad}$$



B

$$60\% \text{ of } \underline{\quad} = 48$$



- What is the same and what is different?
- What percentage does 48 represent in A/B?
- What value does 10% represent in A/B?
- What value is equivalent to 100% in A/B?

Step 1

Percentage of an amount

Step 2

Convert between percentages and decimals

Step 3

Use multipliers to calculate percentages

Step 4

Convert between percentages and decimals greater than 1

Step 5

Percentage increase using a multiplier

Step 6

Percentage decrease using a multiplier

Step 7

Percentage increase and decrease using a multiplier

Step 8

Express one number as a fraction or a percentage of another (non-calculator)

Step 9

Express one number as a fraction or a percentage of another (calculator)

Step 10

Percentage change

Step 11

Find the original value given a percentage

Step 12

Choose appropriate methods to solve percentage problems

Key vocabulary

percentage expressing a part of a whole as a number out of 100

decimal number number with a whole and fractional part, for example 3.2, 5.43

equivalent equal in value

multiplier number that is multiplied with another number to increase or decrease its value

increase make a number greater

decrease make a number smaller

depreciate decrease in value over time

original value initial value or quantity before any changes

scale relationship between two proportional quantities, showing how many times one quantity is greater or smaller than the other

equivalent equal in value



Spring Block 4

Indices

$$\begin{aligned}
 5^3 &= 5 \times 5 \times 5 \\
 \times 5 &\quad \quad \quad \div 5 \\
 5^2 &= 5 \times 5 \\
 5^1 &= 5 \\
 5^0 &= 1 \\
 5^{-1} &= \frac{1}{5} \\
 5^{-2} &= \frac{1}{5 \times 5}
 \end{aligned}$$

$$4^5 \times 4^3 = 4^8$$

$$4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^8$$

$$\frac{4^5}{4^3} = 4^2$$

$$\frac{\cancel{4} \times \cancel{4} \times \cancel{4} \times 4 \times 4}{\cancel{4} \times \cancel{4} \times \cancel{4}} = 4^2$$

$$(4^5)^3 = 4^{15}$$

$$\begin{aligned}
 4^5 \times 4^5 \times 4^5 &= 4^{5+5+5} \\
 &= 4^{3 \times 5} \\
 &= 4^{15}
 \end{aligned}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m \text{ or } \sqrt[n]{a^m}$$

In a fractional power, the numerator acts like an ordinary power. The denominator acts like a root.

$$\begin{aligned}
 a^{\frac{1}{2}} &= \sqrt{a} \\
 a^{\frac{1}{3}} &= \sqrt[3]{a} \\
 a^{\frac{3}{4}} &= (\sqrt[4]{a})^3
 \end{aligned}$$

Step 1

Add and subtract expressions with indices

Step 2

Multiply and divide expressions with indices

Step 3

Addition law for indices

Step 4

Subtraction law for indices

Step 5

Addition and subtraction laws for indices

Step 6

Powers of powers **E**

Step 7

Negative indices **E**

Step 8

Fractional indices **E**

Key vocabulary

power way to express repeated multiplication of a number or variable using a base and an index

exponent another word for index

coefficient number in front of a variable indicating the multiple of the variable

term number or variable or any combination of number and variable combined by multiplication or division

expression collection of terms involving variables and numbers

base number that is multiplied when using an index

index small number to the right and above the base number or variable that shows how many times the base is multiplied by itself

reciprocal one of a pair of numbers whose product is equal to 1



Spring Block 5

Standard form

Power of 10	Answer
10^3	1000
10^2	100
10^1	10
10^0	1
10^{-1}	0.1
10^{-2}	0.01
10^{-3}	0.001

To convert to **standard form**, move the decimal place so the **base** is at least 1, but less than 10. To account for the change in place value, we multiply the base by a **power** of 10. The index used should be the number of places we move the decimal point. Notice that numbers less than 1 have a negative index.

$$90,000 = 9 \times 10^4$$

$$3,460,000 = 3.46 \times 10^6$$

$$0.0341 = 3.41 \times 10^{-2}$$

To convert numbers from **standard form** back into ordinary numbers, we follow the opposite process.

$$6.2 \times 10^5 = 620,000$$

$$5.102 \times 10^{-3} = 0.005102$$

Step 1

Positive and negative powers of 10

Step 2

Numbers greater than 1 in standard form

Step 3

Numbers between 0 and 1 in standard form

Step 4

Standard form on a calculator

Key vocabulary

power	using indices to indicate repeated multiplication
power of 10	repeated multiplication by 10. For example, 100 (10^2 or 10×10) is the second power of 10
base	number that is multiplied when using an index
index	written as a small number to the right and above the base number that indicates how many times the base has been multiplied by itself
place value	value of a digit that relates to its position in a number
standard form	number that is written in the form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer
ordinary number	number written in digits rather than in standard form or words
expression	collection of terms involving variables (letters) and numbers

Standard form is a convenient way of writing exceptionally small and large numbers. It saves time, makes calculations easier to perform, and makes numbers easier to read.

Standard form is used in lots of different areas of maths and science. Your calculator might output answers in standard form, too. It's vital that you understand how to read and convert numbers in standard form.

$$A \times 10^n$$

*A is the **base**, a value such that $1 \leq A < 10$
n is the **index**, an integer of any size*



Spring Block 6

Interpret and represent data

An **average** is a measure that calculates a number to represent a set of numbers. The **mean**, **median**, and **mode** are averages.

The **mean** is calculated by adding all the data points and dividing by the number of values.

1, 3, 3, 3, 5

$$1 + 3 + 3 + 3 + 5 = 15$$

$$15 \div 5 = 3$$

The **median** is the middle value, once the data is arranged in order.

4, 1, 2, 3, 11

~~1~~, ~~2~~, ~~3~~, ~~4~~, ~~11~~

The **mode** is the most common value in the data set.

1, 3, **7**, **7**, **7**, 9, 9

7 is the **mode**

Qualitative data: favourite animal, hair colour, name.

Quantitative data: length, price, time, number of trees.

Discrete data: number of siblings, shoe size, goals scored.

Continuous data: height, length, time.

Step 1

Types of data

Step 2

Averages and range

Step 3

Outliers and errors

Step 4

Choose the most appropriate average

Step 5

Compare distributions using averages and the range

Step 6

Averages from an ungrouped frequency table

Step 7

Represent and interpret grouped discrete data

Step 8

Represent and interpret continuous data grouped into equal classes

Step 9

Mean and mode from a grouped frequency table **E**

Key vocabulary

data	information in any form
discrete data	data that can be counted
continuous data	measured data that can take any value, including decimals
qualitative data	non-numerical data
quantitative data	numerical data
average	number or item representing the typical value of a set of data
mean	type of average found by dividing the total of the values by the number of values in the set
mode	type of average found by identifying the item that appears most often in a set of data
median	type of average found by identifying the middle number in an ordered list
range	difference between the greatest and smallest pieces of data in a set
outlier	data point that significantly differs from the rest of the data set
frequency	number of times that a value appears in a data set
cumulative frequency	running total of frequencies

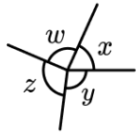
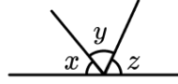


Summer Block 1

Angles in parallel lines and polygons

The sum of angles on a straight line is 180° .

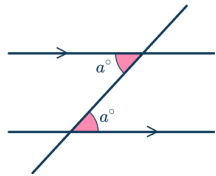
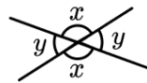
$$x + y + z = 180$$



The sum of angles at a point is 360° .

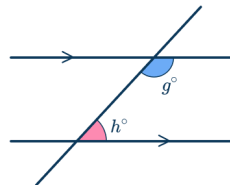
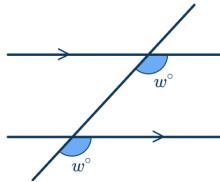
$$w + x + y + z = 360$$

Vertically opposite angles are equal in size.



Alternate angles are equal (z-shape).

Corresponding angles are equal (f-shape).



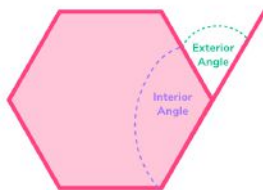
Co-interior angles add to 180° (c-shape).

Interior angles in a triangle add to 180° .



Interior angles in a quadrilateral add to 360° .

An adjacent interior and exterior angle add to 180° .



Exterior angles in any polygon add to 360° .

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

Step 1

Basic angle rules and notation

Step 2

Angles in parallel lines

Step 3

Alternate and corresponding angles

Step 4

Alternate, corresponding and co-interior angles

Step 5

Solve problems with angles in parallel lines

Step 6

Properties of special quadrilaterals and their diagonals

Step 7

Find unknown lengths and angles in special quadrilaterals

Step 8

Exterior angles of a polygon

Step 9

Interior angles of a polygon

Step 10

Interior angles of a regular polygon

Step 11

Prove simple geometric facts **E**

Key vocabulary

angle

measure of turn, measured in degrees

vertically opposite angles

pairs of equal angles that are opposite each other at a vertex created by two straight intersecting lines

transversal

line that cuts across two or more lines, forming angles where it intersects each one

parallel lines

lines that maintain a constant distance from each other

alternate angles

pair of angles that are formed by parallel lines cut by a transversal, positioned on opposite sides of the transversal

corresponding angles

pair of angles that are in the same relative position when parallel lines are cut by a transversal

co-interior angles

pair of angles that are formed by parallel lines cut by a transversal. They lie on the same side of the transversal and inside the parallel lines and sum to 180°

polygon

closed 2-D shape made of straight lines

exterior angle

angle formed when one side of a polygon is extended, creating an angle outside the polygon

interior angle

angle inside a polygon where two sides meet

regular polygon

polygon where all the sides are equal in length and all the interior angles are equal

quadrilateral

polygon with four straight sides and four interior angles that sum to 360°

parallel lines

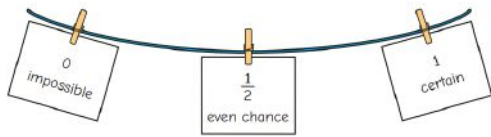
lines that maintain a constant distance from each other

perpendicular

where lines, planes or surfaces meet at a right angle



Summer Block 2 Tables and probability



The **probability scale** gives us a way to **describe** the likelihood of an event happening. As mathematicians, we might want a more precise way of describing probability. We can use **fractions, decimals, or percentages** to precisely identify probabilities.

Colour	red	blue	green
Probability	0.3	0.2	

Probabilities sum to 1, so:

$$P(\text{green}) = 1 - (0.3 + 0.2) = 0.5$$

Experimental probability =

$$\frac{\text{number of successes}}{\text{number of trials}}$$

	Year 8	Year 9	Total
School lunch		26	44
Packed lunch	31		56
Total		51	

Two-way tables display two categorisations of one set of data. How can we find the missing numbers?

A		B						
		Dice						
		1	2	3	4	5	6	
Coin	Heads	(1, H)	(2, H)	(3, H)	(4, H)	(5, H)	(6, H)	
	Tails	(1, T)	(2, T)	(3, T)	(4, T)	(5, T)	(6, T)	

A and B are examples of sample space diagrams for rolling a dice and flipping a coin.

Step 1

Probability vocabulary

Step 2

The probability scale

Step 3

Probability of a single event

Step 4

Use the property that probabilities sum to 1

Step 5

Probability experiments

Step 6

Sample spaces for 1 or more events

Step 7

Probabilities from sample space diagrams

Step 8

Two-way tables

Step 9

Probabilities from two-way tables

Step 10

Frequency trees

Step 11

Probabilities from frequency trees

Key vocabulary

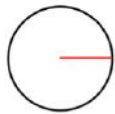
event	outcome or group of outcomes that has a probability of happening
outcome	possible result of an experiment or trial
probability scale	scale indicating how likely events are to happen, from 0 (impossible) to 1 (certain)
random	describes an event or outcome that happens by chance, with no way to predict exactly which result will occur
bias	describes an outcome that is more likely than others because something has influenced it unfairly
experiment	repeatable process or action, for example rolling a dice or flipping a coin, used to observe possible outcomes
trial	single run of a probability experiment
experimental probability	likelihood of an event based on results from trials
theoretical probability	expected likelihood of an event happening



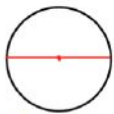
Summer Block 3

Circles

Parts of a Circle



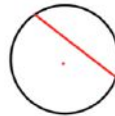
Radius



Diameter



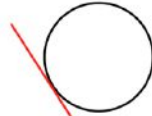
Circumference



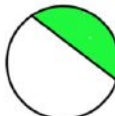
Chord



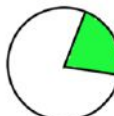
Arc



Tangent

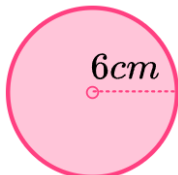
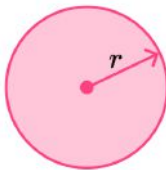


Segment

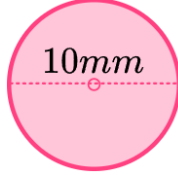


Sector

$$\text{Area} = \pi r^2$$



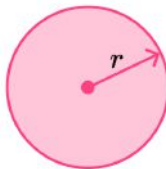
$$\begin{aligned}\text{Area} &= \pi r^2 \\ \text{Area} &= \pi \times 6^2 \\ \text{Area} &= 36\pi \text{ cm}^2 \\ \text{Area} &= 113.1 \text{ cm}^2\end{aligned}$$



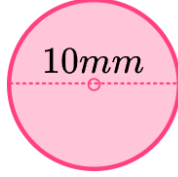
$$\begin{aligned}\text{Area} &= \pi r^2 \\ \text{Area} &= \pi \times 5^2 \\ \text{Area} &= 25\pi \text{ mm}^2 \\ \text{Area} &= 78.5 \text{ mm}^2\end{aligned}$$

$$\text{Circumference} = 2 \times \pi \times r$$

$$\text{Circumference} = \pi \times d$$



$$\begin{aligned}C &= 2\pi r \\ C &= 2 \times \pi \times 6 \\ C &= 12\pi \text{ cm} \\ C &= 37.7 \text{ cm}\end{aligned}$$



$$\begin{aligned}C &= \pi d \\ C &= \pi \times 10 \\ C &= 10\pi \text{ mm} \\ C &= 31.4 \text{ mm}\end{aligned}$$

Step 1

Circle vocabulary

Step 2

Pi as a ratio

Step 3

Circumference of a circle

Step 4

Perimeter of parts of a circle

Step 5

Area of a circle

Step 6

Area of parts of a circle

Step 7

Area and circumference of a circle

Step 8

Perimeter of a compound shape with circles

Step 9

Perimeter and area of compound shapes with circles

Key vocabulary

radius

distance from the centre of a circle to any point on the circumference

diameter

straight line passing through the centre of a circle from one point on the circumference to another

circumference

perimeter of a circle

arc

portion of the circumference of a circle

tangent

straight line that touches a circle at exactly one point without crossing it

pi (π)

mathematical constant representing the ratio of a circle's circumference to its diameter

sector

part of a circle formed from two radii subtended by an arc

arc

portion of the circumference of a circle

perimeter

total distance along the boundary of a 2-D shape

area

amount of space taken up by a shape or surface, measured in square units



Summer Block 4

Graphs and charts

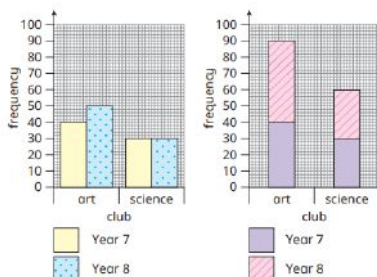
Graphs and charts can be used to quickly understand a set of data. Different types of graph are useful for different reasons.

Pictograms are a simple way to represent frequencies for different categories. They need a key to show what each symbol represents.

Day	Number of T-shirts sold
Monday	●
Tuesday	● ● ●
Wednesday	● ●
Thursday	
Friday	● ●

Key:
● = 4

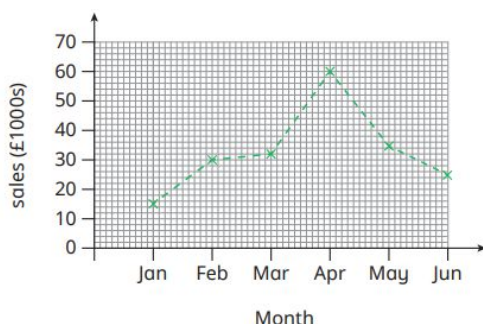
Bar charts are a more precise way to show frequencies for categories. Dual bar charts show comparative data side by side. Composite bar charts show stack up comparative data.



Pie charts are useful for comparing the frequencies of different groups quickly.



Time series graphs track a variable over time. Time is always plotted on the x-axis. We use them to analyse trends over time.



Step 1 Pictograms and bar charts

Step 2 Vertical line charts

Step 3 Draw pie charts

Step 4 Interpret pie charts

Step 5 Line graphs

Step 6 Choose the most appropriate graph or chart

Step 7 Compare distributions using graphs

Step 8 Misleading graphs and charts

Key vocabulary

pictogram	way to show information using symbols that represent a certain amount
bar chart	chart that uses rectangular bars to represent frequencies from a data set
frequency	number of times that a value appears in a data set
key	information that shows what a symbol represents
composite bar chart	chart that represents multiple data sets within a single bar, using segments to represent different categories
pie chart	circular representation of data split into sectors that represent different values
proportion	fraction of something in relation to the total
sector	part of a circle formed from two radii subtended by an arc
axes	two perpendicular lines (horizontal x-axis and vertical y-axis) that define the coordinate plane and are used to plot points and graphs
line graph	representation of data that uses a line to show change
scale	set of numbers, counting in multiples, used to mark intervals on an axis
time series graph	data points plotted over time to show trends, patterns or changes
distance-time graph	representation of data that shows how the distance travelled by an object changes over time
compare	look at quantities to find out whether their value is greater than, equal to or less than
distribution	describes how data values are spread or arranged across a range of possible outcomes
range	difference between the greatest and smallest pieces of data in a set



Summer Block 5 Sequences

Linear sequences:

Increase or decrease by a common difference.

$$4, 7, 10, 13, 16, \dots$$

$+3 \quad +3 \quad +3 \quad +3 \quad +3$

$$5, 4, 3, 2, 1$$

$-1 \quad -1 \quad -1 \quad -1$

Non-Linear sequences:

Don't increase by a common difference. There are different types of non-linear sequences.

Geometric sequences:

Multiply (or divide) by a common ratio.

$$1, 2, 4, 8, 16, \dots$$

$\times 2 \quad \times 2 \quad \times 2 \quad \times 2 \quad \times 2$

$$20, 10, 5, 2.5, 1.25$$

$\div 2 \quad \div 2 \quad \div 2 \quad \div 2$

Fibonacci sequences:

Add the previous two terms to find the next.

$$1, 3, 6, 10, 15, \dots$$

$+2 \quad +3 \quad +4 \quad +5$

Square/cube numbers:

We can put numbers with shared properties into a sequence e.g. square/cube numbers.

Step 1

Generate and describe a sequence given a rule in words

Step 2

Generate a sequence given a simple algebraic rule

Step 3

n th term of a linear sequence

Step 4

Generate a sequence given a complex algebraic rule **E**

Key vocabulary

term

number/object that relates to a specific position in a sequence

term-to-term rule

rule that describes how to get from one term of a sequence to the next

common difference

constant value that is added to or subtracted from each term to get the next term of a sequence

linear sequence

sequence with a common difference between consecutive terms

non-linear sequence

sequence with no common difference between consecutive terms

arithmetic sequence

linear sequence

position-to-term

rule that describes how to get each number in a sequence from its position

common difference

constant value that is added to or subtracted from each term to get the next term of a sequence

coefficient

number in front of a variable indicating the multiple of the variable

substitute

replace letters with numerical values

Triangular numbers:

Numbers that can form a triangle of dots. Can you spot the number pattern?

$$1, 3, 6, 10, 15, \dots$$

$+2 \quad +3 \quad +4 \quad +5$



1



3



6



10