Year 9 Straight Line Graphs

Keywords

Gradient:
The steepness of a line

Intercept:
This is where two lines cross

The y-intercept:
This is where the line meets the y-axis

Parallel:
Two lines that never meet with the same gradient

Co-ordinate:
A set of values that show an exact position on a graph

Substitute:
When a letter is replaced by a number

Reciprocal:
A pair of numbers that multiply together to give 1

Perpendicular:
Two lines that meet at a right angle. The gradients multiplied equals to -1

Coefficient:
A number or quantity placed with a variable.

Dr Frost Key Skills
267-Plotting a straight line from a table of values
268 -Relationship between a line and its equation
269 -x and y intercepts of the line
270A-L -Gradients of the line
273 -Drawing a line from its equation
274 -Equation of parallel lines
445a-c – Equations of perpendicular lines

Year 8
- Generate sequences given a rule in words
- Generate sequences given a simple algebraic rule
Generate sequences given a complex algebraic rule
Find the rule for the nth term of a linear sequence

Year 9
- Using table of values
- Lines parallel to the axis, y=x and y=-x
- Understand and use y=mx+c
- Find the equation of a line from a graph
- Compare gradients
- Compare intercepts

Learning Journey

Key Knowledge

$$y = mx + c$$

The coefficient of x (the number in front of x) tells us the **gradient** of the line

$y = mx + c$

Y and x are **coordinates**

The value of c is the point at which the line crosses the y-axis.
Y intercept

Plotting Straight Line graphs

To plot a straight line graph,
you may be given a table or you may need to draw one.

Plot the graph of $y = 4x - 2$ for the values of x from -3 to 3

1) Draw a table of values if you have not been given one

x	-3	-2	-1	0	1	2	3
y							

2) Substitute in your x values to y = 4x – 2, this will give the corresponding y values

x	-3	-2	-1	0	1	2	3
y	-14	-10	-6	-2	2	6	10

3) Plot the points on the graph.

E.g. (-3, -14), (-2, -10), (-1, -6), (0, -2), …. etc

Year 9 Forming and Solving Equations

Keywords

Inequality:
An inequality compares who values showing if one is greater than, less than or equal to another

Variable:
A quantity that may change within the context of the problem

Rearrange:
Change the order, making a variable the subject

Inverse operation:
The operation that reverses the action

Substitute:
Replace a variable with a numerical value

Solve: find a numerical value that satisfies an equation

Expression:
A sentence in algebra that does **NOT** have an equals sign.

Expand
The process of multiplying each term in the bracket by the expression outside the bracket.

Dr Frost Key Skills
199- Solving linear equations where the variable appears on one side of the equation only
254- Solving linear equations including brackets
257- Solving linear equations where the variable appears on both sides of the equation
259- Forming and Solving linear equations from a given context (excluding angles)

Learning Journey

Year 8
- Multiply out a single bracket
- Solve equations, including with brackets
- Form and solve equations with brackets
- Understand and Solve simple inequalities
- Solve equations and inequalities with unknowns on both side

Year 9
- One and two step equations and inequalities
- Equations and inequalities with brackets
- Solve equations and inequalities with unknowns on both sides
- Equations and inequalities in mathematical context

Key Knowledge

Solve Two Step Equations & Inequalities

$6y + 2 = 20$
$-2 \quad -2$
$6y = 18$
$\div 6 \quad \div 6$
$y = 3$

Subtract first because the 2 is separate from y

Divide because it is the inverse of multiplying

$\frac{w - 5}{3} < 6$
$\times 3 \quad \times 3$
$w - 5 < 18$
$+5 \quad +5$
$w < 23$

Multiply first because the entire expression is divided by 3

Add because it is the inverse of subtracting

Solve with unknowns on both sides

$5x - 20 > 3x + 4$
$-3x \qquad -3x$
$2x - 20 > 4$
$+20 \quad +20$
$2x > 24$
$\div 2 \quad \div 2$
$x > 12$

Subtract 3x from both sides because it is the smaller term of x

Solve like a normal two step equation

Year 9 Testing Conjectures

Year 7
- LCM and HCF
- Prime Factor Decomposition
- Use a Venn diagram to calculate the HCF and LCM
- Make and test conjectures
- Use counter examples to disprove a conjecture

Year 8
- Multiply out a single bracket
- Expand a pair of binomials

Year 9
Factors, multiples and primes
Expand a pair of binomials
Conjectures about number
Always, sometimes, never true
Explore the 100 grid

Learning Journey

Keywords

Multiples: found by multiplying any number by positive integers

Factor: Integers that multiply together to get another number.

Prime: An integer with only 2 factors.
HCF: highest common factor (biggest factor two or more numbers share)

LCM: Lowest common multiple (the first time the times table of two or more numbers match)

Verify: The process of making sure a solution is correct

Proof: Logical mathematical arguments used to show the truth of a statement

Binomial: A polynomial with two terms

Quadratic: A polynomial with four terms (often simplified to three terms)

Dr Frost Key Skills

96 HCF and LCM by listing
161 Prime Factorisation of a number
162 HCF and LCM by prime factorisation
252 Expanding a single Bracket
299 Expanding Two Brackets
300 Expanding Three Brackets
453 Testing Conjectures and counter examples

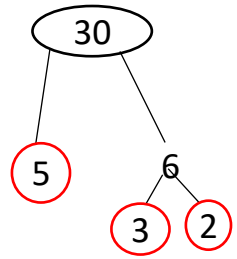
Key Knowledge

Factors, Multiples and Prime

Once you have written as prime factors, **CIRCLE IT!**

30 written as a product of prime factors

$30 \equiv 5 \times 3 \times 2$



HCF and LCM

Find the HCF between 72 and 36

72: 1, 2, 3, 4, 6, 12, 18, 24, 36, 72

36: 1, 2, 3, 4, 6, 9, 12, 36

Common Factors are factors two or more numbers share

Find the LCM between 8 and 5

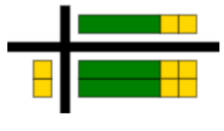
8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

Although both numbers have 80 too, this is **not** the **lowest common multiple!**

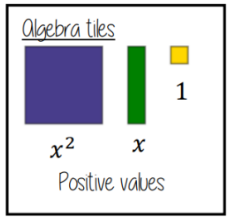
5: 5,10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80

Expanding Binomials

$2(x + 2) \equiv 2x + 4$



Algebra tiles can represent a binomial expansion
Has two terms



$(x + 3)(x + 3) \equiv x^2 + 6x + 9$

This is a quadratic
It has four terms which simplified to three terms

Year 9 3D Shapes

Keywords

2D: Two dimensions to the shape e.g. length and width

3D: Three dimensions to the shape e.g. length, width and height.

Vertex: A point where two or more-line segments meet.

Edge: A line on the boundary joining two vertex
Face: A flat surface on a solid object

Cross-section: A view inside a solid shape made by cutting through it

Plan: A drawing of something when drawn from above (sometimes birds eye view)

Surface Area : The surface area of a three-dimensional object is the total area of all its faces

Volume: The space occupied within the boundaries of an object in three-dimensional space

Nets: A pattern that can be cut and folded to make a model of a solid shape

Dr Frost Key skills

25 Introduction to 2D shapes
138 Area of Rectangle
139 Area of Parallelogram
140 Area of triangle
143 Nets of 3D shapes
209 Circumference of a circle
210 Area of a Circle
231 Volume of Prisms
232 Surface Area of cuboids and prisms
233 Volume of Cylinders
234 Surface Area of Cylinder

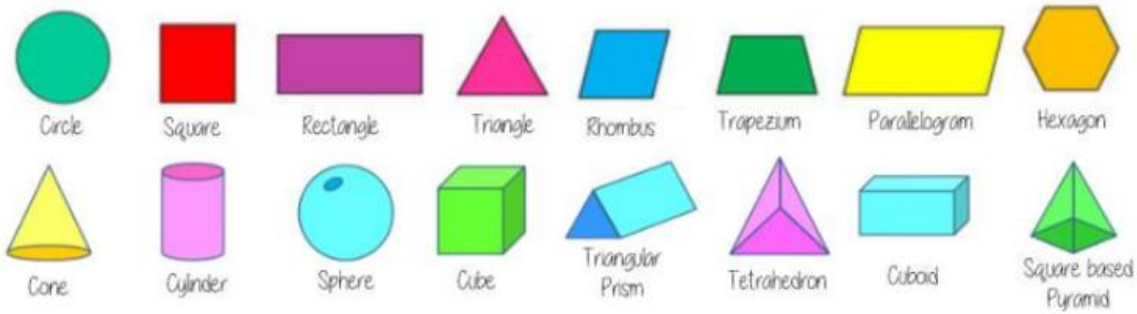
Year 7
Area of rectangles and parallelograms
Area of triangle
Solve problems using the area of trapezia

Year 8
Calculate the area of triangles, rectangles and parallelograms
Calculate the perimeter and area of compound shapes
Calculate the area of a circle

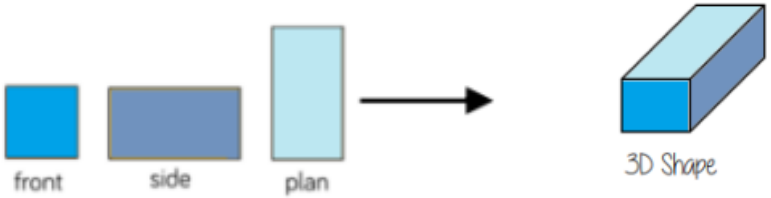
Year 9
Know names of 2D and 3D shapes
Recognise prisms (including language of edges and vertices)
Plans and elevations
Find area of 2D shapes (R)
Surface area of cubes and cuboids, triangular prisms and cylinders
Volume of cubes and cuboids, prisms and cylinders

Key Knowledge

Name of 2D and 3D shapes

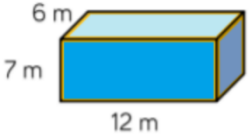


Plans and Elevation

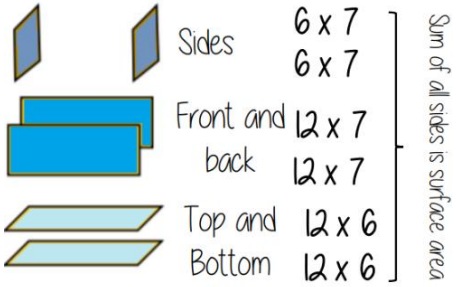


The direction you are considering the shape from determines the front and side views.

Total Surface Area



Calculate the area of every single face



$= 396\text{cm}^2$

Year 9 Numbers

Keywords

Integer: A whole number that is positive or negative

Rational: A number that can be made by dividing two integers

Irrational: A number that cannot be made by dividing two integers

Inverse operation: The operation that reverses the action

Quotient: The result of a division

Product: The result of a multiplication.

Multiples: Found by multiplying any number by positive integers

Factor: Integers that multiply together to get another number

Dr Frost Key skills

101 Converting between mixed fractions and improper fractions
117 Adding and subtracting fractions with any denominators
119 Multiply a fraction by an integer
155 Adding or subtracting a mixture of positive and negative numbers
156 Multiplying or dividing a mixture of positive and negative numbers
166 Dividing proper fractions
167 Multiply fractions involving a mixed number
168 Dividing fractions involving a mixed number
169 Fractional increase and decrease
170 Fractional original problems
171 Problem Solving involving a fraction of an amount
301 Conversion of large numbers to standard form
302 Conversion of small numbers to standard form
303 Adding or subtracting in standard form
304 Multiplying or Dividing in Standard form

Year 8
Multiply a fraction by an integer
Multiply and divide fractions with different denominators
Multiply and divide improper and mixed fractions
Work with numbers greater than 1 in standard form
Investigate negative powers of 10
Work with numbers between 0 and 1 in standard form
Add and subtract numbers in standard form
Multiply and divide numbers in standard form

Year 7
Add Directed Numbers
Subtract Directed Numbers
Multiplication and Division of Directed Numbers
Use order of operations with Directed Numbers
Add and Subtract Fractions with the same denominator
Add and Subtract Fractions with any denominators
Add and subtract improper fractions and mixed numbers

Key Knowledge

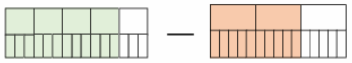
Four Operations with Fractions

Adding and Subtracting

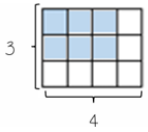
Find the lowest common multiple for both denominators

Calculate

$\frac{4}{5} - \frac{2}{3}$ $\quad \frac{4}{5} \times \frac{3}{3} \quad \frac{2}{3} \times \frac{5}{5} \quad \frac{12}{15} - \frac{10}{15} = \frac{2}{15}$



Multiplying Fractions



Calculate

$\frac{3}{4} \times \frac{2}{3} = \frac{3\times2}{4\times3} = \frac{6}{12} = \frac{1}{2}$

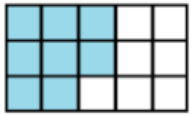
Dividing fractions

Calculate

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

Make sure you **multiply** the first fraction with the **reciprocal**

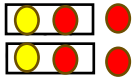
Represented



Addition

Directed numbers

$2 + -4 = -2$



Generalisation

$+ - = -$

Subtraction

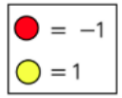
Generalisation

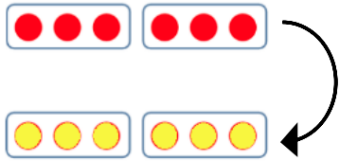
$- - = +$

$5 - -2 = 7$

We need to draw 2 sets of Zero pairs before so we can take away 2 red counters

Multiplication





-2 x -3 = 6

The act of making counters into their negative is turning them over

Divisions are the inverse operations

Year 9
Using Percentages

Keywords

Compound interest:
Calculating interest on both the amount plus previous interest

Simple interest:
The amount of interest is fixed over period.

Depreciation: A decrease in the value of something over time.

Growth:
Where a value increases in proportion to its current value such as doubling.

Decay:
The process of reducing an amount by a consistent percentage rate over time.

Decimal Multiplier:
This is equivalent of the percentage.

Equivalent:
Of equal value.

Dr Frost's Key Skills

130 Calculate a simple percentage of an amount using chunking

214 Determine what percentage one number is of another

215 Percentage Change

219 Percentage of amount, using a decimal multiplier (Simple Interest)

222 Reverse Percentage problems

223 Reverse Percentage Problems using Decimal multipliers

359 Calculating values after compound percentage changes

Learning Journey

Year 9
Calculate percentage increase and decrease
Express a change as a percentage
Solve reverse percentage problems
Solve problems with repeated percentage change (H)
Calculate simple interest
Calculate compound interest
Solve problems with Value Added Tax

Year 10
Repeated percentage change
Solve problems involving growth and decay
Calculate simple and compound interest

Key Knowledge

Percentage of an amount (Non-Calculator)

To calculate any percentage, it is useful to start with 10%

30% of 120: 10% = 120 ÷ 10 = 12 — To find 10% we divide by 10.

30% = 3 x 12 = 36 — To find 30% we multiply 10% by 3.

Percentage of an amount (Calculator)

To calculate any percentage, we will use a decimal multiplier.

83% of 120: 83% = 0.83

Change the percentage to a decimal multiplier and then multiply

83% of 120= 0.83 x 120= 99.6

Percentage Increase and Decrease (Non-Calculator)

Increase:
To calculate a percentage increase we calculate the percentage and add the value on to the original amount

Increase 70 by 65%

10% = 70 ÷ 10 = 7

5%= 7 ÷ 2 = 3.5

60% = 6 x 7 = 42

65%= 60% + 5% = 42 + 3.5 = 45.5

70 +45.5 =115.5

Percentage Increase and Decrease (Calculator)

Increase:
To calculate a percentage increase, calculate 65% using the decimal multiplier and add it on

Increase 70 by 65%

65% of 70 65% = 0.65

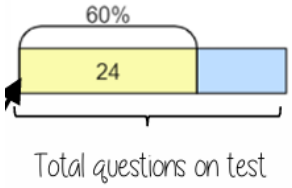
65% of 70= 0.65 x 70 = 45.5

70 + 45.5 = 115.5

Finding the original amount

In a test Lucy scored 60% of her questions correctly.
Her score was 24.
How many questions were on the test?

Always draw a bar model to illustrate the question



$60\% = 24$

$\div 60$ / $\times 100$

$1\% = 0.4$

$100\% = 40$

$\div 60$ / $\times 100$

Year 9 Maths and Money

Keywords

Credit: Money being placed into a bank account

Debit: Money that leaves a bank account
Balance: the amount of money in a bank account

Expense: A cost/ outgoing.

Deposit: An initial payment (often a way of securing an item you will later pay for)

Multiplier: A number you are multiplying by. (Multiplier more than 1 = increasing, less than 1 = decreasing)

Per Annum: Each year

Currency: The type of money a country uses.

Unitary: One – The cost of one

Dr Frost Key Skills

360 Financial Maths

219 Calculate Simple interest

359 Calculating Values after compound percentage changes

177 Exchange rates

Year 9
Money Bills and Bank statement
Simple interest
Compound Interest
Wages and Taxes
Exchange Rates

Learning Journey

Key Knowledge

Simple Interest

For each year of investment the interest remains the same

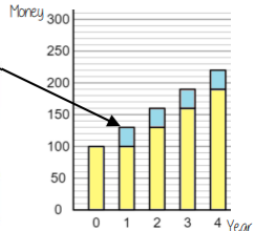
$$\frac{\text{Principal amount} \times \text{Interest Rate} \times \text{Years}}{100}$$

Principal amount is the amount invested in the account

e.g Invest £100 at 3% simple interest for 4 years

$\frac{100 \times 30 \times 4}{100} = £120$

This account earned £120 interest. At the end of year 4 they have £220



Compound Interest

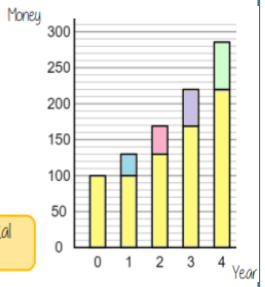
Interest is added to the current value of investment at the end of each year so the next year's interest is greater.

$$\text{Principal amount} \times \text{Multiplier}^{\text{Years}}$$

e.g Invest £100 at 3% compound interest for 4 years

$100 \times 1.3^4 = £285.61$

This account has £285.61 in total at the end of the 4 years.



Unit Pricing

4 Oranges	5 cupcakes
£1	£1.20

$4 = £1.00 \div 2$
$2 = £0.50 \div 2$
$1 = £0.25$

$5 = £1.20 \div 5$
$1 = £0.20$

Cost per Unit

To calculate unit per cost you divide by the cost

Cupcakes are the best value as one item has the cheapest value

There is a directly proportional relationship between the cost and number of units

Year 9 Deduction

Keywords

Parallel: Two straight lines that never meet with the same gradient.

Perpendicular: Two straight lines that meet at 90º

Transversal: A line that crosses at least two other lines.

Sum: The result of adding two or more numbers.

Conjecture: A statement that might be true but is not proven.

Equation: A statement that says two things are equal

Polygon: A 2D shape made from straight edges.

Counterexample: an example that disproves a statement

Dr Frost Key Skills

110 Sum of the angles on a straight line and around a point

147 Vertically opposite angles

149 Sum of angles in a triangle

150 Angles in Isocolese triangle

151 Sum of Angles in a quadrilateral

262 Alternate, corresponding or co-interior angles

263 Determine Algebraic expressions and equations using angle facts

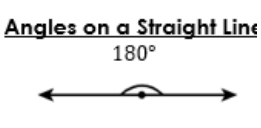
Year 9

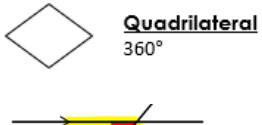
Basic Angle Facts
Angle Facts with Algebra
Angles in Parallel Lines
Angles in Parallel lines with Algebra

Learning Journey

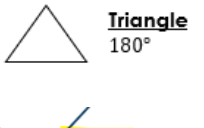
Key Knowledge

Key angle facts





Alternate Angles are **Equal**

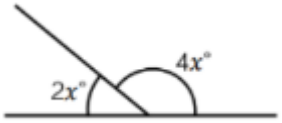


Corresponding Angles are **Equal**

Co-interior angles **sum** up to **180**

Solving angle problems

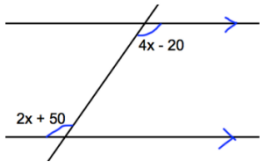
Link facts to algebra	Form an Equation	State the reason	Solve



$2x + 4x = 180°$

Angles on a straight line sum up to 180

$$2x + 4x = 180°$$
$$6x = 180°$$
$$x = 30°$$



$\boldsymbol{4x - 20 = 2x + 50}$

Alternate angles are equal

$$4x - 20 = 2x + 50$$
$+20$ $+20$
$$4x = 2x + 70$$
$-2x$ $-2x$
$$2x = 70$$
$\div 2$ $\div 2$
$$x = 35$$

Year 9 Rotation and Translation

Keywords

Reflection- This is a type of transformation that flips a shape in a mirror line.

Rotation-Rotation are transformation that turn a shape around a fixed point.

Translation- This is a type of transformation that moves a shape left or right or up and down

Clockwise- A term used to describe the motion that proceeds within the same direction as that of a clock's hands.

Anti-Clockwise- A term used to describe a turn to the left, in the opposite direction of a clock

Enlargement- This is a type of transformation that makes a shape bigger or smaller using the centre of enlargement

Dr Frost Key Skills

279 Describing a Reflection
280 Rotational Symmetry
282 Describing a Rotation
294 Describing an Enlargement for a positive integer scale factor
295 Enlarging a shape using a positive scale factor
296 Enlarging a shape using a fractional scale factor
374 Translations of shapes by a vector
375 Describing translations using vector notation

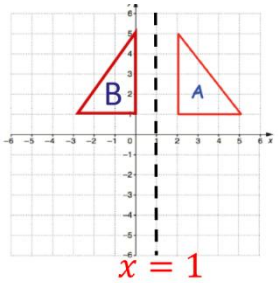
Year 9
Identify the order of rotational symmetry of a shape
Reflecting in a straight line
Translating a Shape
Describing Translation
Describing Rotations
Describing Reflections
Series of Transformation

Learning Journey

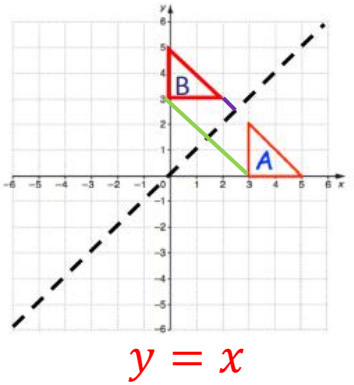
Key Knowledge

Reflection

Reflect Shape A in the line X = 1.
Label it B

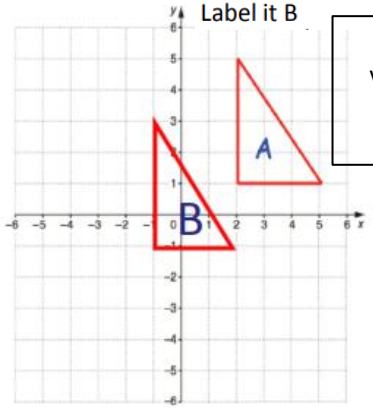


For each vertices in Shape A, count how many squares it is away from the mirror line and reflect it.
You should do this for all vertices!



Translation

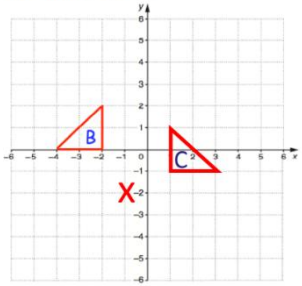
Translate shape A by $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$.
Label it B



This tells us that each vertices from Shape A has moved 3 to the left and move 2 down

Rotation

Rotate shape B from the point (-1, -2)



Steps

1) Use a tracing paper and outline Shape B
2) Draw a Arrow facing North on top of the tracing paper
3) Rotate the tracing paper about the centre of enlargement.

Make sure you hold down the tracing paper

Year 9 Pythagoras Theorem

Keywords

Square number: The output of a number multiplied by itself

Square root: A value that can be multiplied by itself to give a square number

Hypotenuse: The largest side on a right-angled triangle. Always opposite the right angle.

Opposite: The side opposite the angle of interest

Adjacent: The side next to the angle of interest

Year 9
Square and Square roots
Identify the hypotenuse of a right-angled triangle
Determine whether a triangle is right-angled
Calculate the hypotenuse of a right-angled triangle
Calculate missing sides in right-angled triangles
Use Pythagoras' theorem on coordinate axes
Use Pythagoras' theorem in 3D shapes (H)

Dr Frost Key Skills
88 Power Notation and Calculate simple powers e.g. square and cube numbers

157 Find a square root of square numbers
288 Pythagoras Theorem in 2D

289 Distance between two points given their coordinates

410 Pythagoras Theorem in 3D

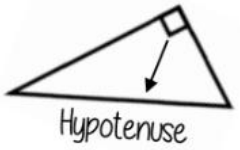
Key Knowledge

Squares and Square roots

1 x 1 **1** | 2 x 2 **4** | 3 x 3 **9** | 4 x 4 **16**

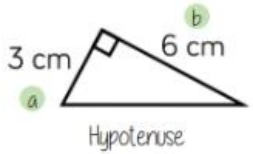
This can also be written as 4^2

Identify the hypotenuse



The hypotenuse is always the longest side on a triangle because it is opposite the biggest angle.

Calculate the hypotenuse



Either of the short sides can be labelled a or b

$a^2 + b^2 = \text{hypotenuse}^2$

1. Substitute in the values for a and b

$3^2+6^2 = \text{hypotenuse}^2$

$9 + 36 = \text{hypotenuse}^2$

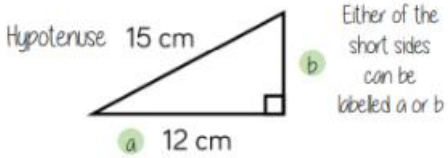
$45 = \text{hypotenuse}^2$

2. To find the hypotenuse square root the sum of the squares of the shorter sides

$\sqrt{45} = \text{hypotenuse}$

$6.71cm = \text{hypotenuse}$

Calculate the Shorter Side



Either of the short sides can be labelled a or b

$a^2 + b^2 = \text{hypotenuse}^2$

$12^2+b^2 = 15^2$

1. Substitute in the values you are given

$144 + b^2 = 225$

$-144 \quad -144$

Rearrange the equation by subtracting the shorter square from the hypotenuse squared

Square root to find the length of the side

$b^2 = 111$

$b = \sqrt{111} = 10.54\ cm$

Year 9 Enlargement and Similarity

Keywords

Enlarge:
to make a shape bigger (or smaller) by a given multiplier (scale factor)

Scale Factor:
The multiplier of enlargement.
(This could be fractional or negative)

Centre of enlargement:
The point the shape is enlarged from

Congruent:
The same size and shape

Corresponding:
Items that appear in the same place in two similar situations

Parallel:
Straight lines that never meet (equal gradients)

Similar:
Two polygons have the same shape, but possibly have different sizes

Column Vector:
This is a way of writing a vector which gives information about the vector.
The horizontal component tells us how many spaces to the left or right and the vertical component tells us how many spaces up or down.

Dr Frost Key Skills
471 Proving Triangles Congruence Using SSS, SAS, ASA and RHS
294 &377 Describing an Enlargement
295 Enlargement by a positive Integer Scale Factor
376 Enlargement by a negative Scale Factor
324 Relationship between Scale Factors of Length, Area and Volume

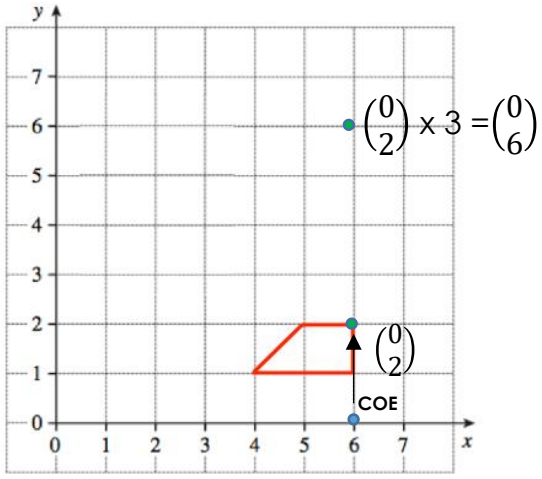
Learning Journey

Year 9
- Enlargement a shape by Positive Integer Scale Factor
- Enlarge a shape by a Positive Integer Scale factor from a point
- Enlarge a shape by Positive Fractional Scale Factor
- Enlarge a shape by a negative scale factor (H)
- Work out missing sides and angles in a pair of given similar shapes
- Solve problems with similar triangles (H)

Year 10 and 11
- Explore Areas of Similar Shapes
- Explore Volumes of Similar Shapes
- Understand and use Conditions for Congruent triangles
- Understand the difference between congruence and similarity

Key Knowledge

Counting Squares



Enlarge the trapezium by scale factor 3, centre (6, 0).

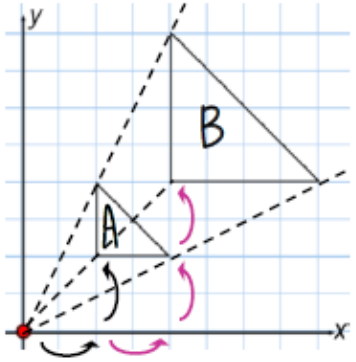
Using Ray Lines

Enlargement from a point

Enlarge shape A by SF 2 from (0,0)

The shape is enlarged by 2

The distance from the point enlarges by 2



1) Find the Centre of Enlargement (COE)
2) From the COE, count the squares required to go to each vertices of the shape and write this as a column vector
3) Multiply the column vector by the scale factor
4) From the COE, use the new column vector and plot your points. (Do this for all vertices)

Year 9 Solving Ratio and Proportion

Keywords

Best Buys- An item or product which gives the best value for money out of all its competitors.

Direct proportion: A relationship between two quantities such that as one increases, the other increase (or as one decrease, the other decreases)

Inverse Proportion: A relation between two quantities such that one increases in proportion as the other decreases

Conversion: The process of changing or causing something to change from one form to another

Currencies: A system of money in general use in a particular country.

Dr Frost Key Skills

176 Multiplicative scaling and numerical proportion relationships
177 Exchange rates
224 Simplifying Ratios
225 Finding a quantity within a ratio where either the total amount, a particular amount or difference is given
227 Combining ratios

Year 9
- Direct proportion
- Direct proportion graphs
- Currency Conversion
- Inverse Proportion
- Best buys
- Ratio (Including Sharing, Finding the difference, Simplifying in the ratio 1 : n, combining ratio)

Learning Journey

Key Knowledge

Direct Proportion

If 5 gallons is the same as 40 pints, calculate how many pints convert to 15 gallons.

5 gallons = 40 pints (x 3)

15 gallons = ? (x 3)

15 gallons = 120 pints

Inverse Proportion

It takes 2 painters 7 days to paint a house. How many days does it take 1 painter to paint the same house?

2 people = 7 days (Divide by 2)

1 person = ? (Multiply by 2)

1 person = 14 days

The difference between inverse and direct is one side is multiplied by 2 and the other is divided by 2

Best Buys

OFFICE DEALS	PAPER WORLD
Packs of 20 folders	Pack of 15 folders
£10.80	£8.40

Which is the better deal?

20 x 1 = 20
20 x 2 = 40
20 x 3 = 60
20 x 4 = 80
20 x 5 = 100
20 x 6 = 120

15 x 1 = 15
15 x 2 = 30
15 x 3 = 45
15 x 4 = 60
15 x 5 = 75
15 x 6 = 90

Method 1 (Calculator)

Unitary Method – Find the value of one item first.

£10.80 ÷ 20 = £0.54 £8.40 ÷ 15 = £0.56

Office deals is cheaper.

Method 2 (Non-Calculator)

LCM- Find the LCM between the folders

As we need 60 folders
Office Deals
10.80 x 3 = £32.40

As we need 60 folders
Paper World
8.40 x 4 = £33.60

Office deals is cheaper

Year 9 Rates

Keywords

Speed: A measure of how fast something is moving or the rate at which distance is covered in a given time

Distance: A measurement of how far something is

Density: Refers to the measure of how tightly packed a substance or object is.

Mass: The mass of an object tells you how heavy something is. This is usually measured in **grams (g)** and kilograms **(kg)**

Volume: This is the amount of space occupied by a solid, liquid or a shape This is usually measured in cm^3 or m^3

Time: How long something takes and this could be measured using seconds, minutes, hours or days.

Dr Frost Key Skills

325 Speed Calculations from a journey

326 Speed Calculations from multiple journeys or a journey in stages

327 Constructing and reading distance time graphs

328 Density

459 Understanding and drawing speed time graphs

Year 9

- Metric Conversions
- Speed, Distance and Time
- Combining Speed Distance and Time
- Distance Time graphs
- Velocity Time graphs
- Density, mass and volume
- Dual Density
- Capacity and Flow
- Converting compound units

Learning Journey

Key Knowledge

Calculating Distance

Iain walked from his parents' farm into town at a steady speed of $5km/h$.

The journey took $3\ hours$. How far did Iain walk?

Speed

Time

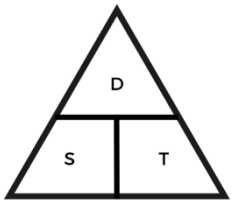
The word far is associated with distance

$$Distance = Time \times Speed$$
$$3 \times 5 = 15km$$

speed = distance ÷ time

distance = speed × time

time = distance ÷ speed



Calculating Speed

Alan travels $100km\ in\ 5hrs$.

Find his average speed in km/h.

$$Speed = Distance \div Time$$
$$100 \div 5 = 20km/h$$

Calculating Time

Joanna drives for $400km$ at an average speed of $80km/h$.

How long was her journey?

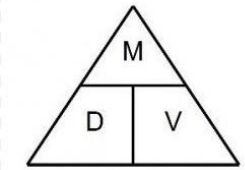
$$Time = Distance \div Speed$$
$$400 \div 80 = 5\ hours$$

Calculating Density, Mass and Volume

Calculating Mass

The density of air is 1.3 kg/m^3. Calculate the mass of a balloon which holds 0.0035 m^3 of air.

$$Mass = Density \times volume$$
$$1.3 \times 0.0035 = 0.00455kg$$



$$Mass = Density \times volume$$
$$Density = Mass \div volume$$
$$Volume = Mass \div Density$$

Year 9 Probability

Keywords

Probability:
This tells us how likely something is to happen. This can be shown as decimals, percentages or fractions.

Event: One or more outcomes from an experiment

Intersection: Elements that are common to both sets

Union: The combination of elements in two sets

Product: The answer when two or more values are multiplied together

Mutually Exclusive: Two events are mutually exclusive if they cannot happen simultaneously

Independent Event: One event does not affect the probability of the other.
Example – Flipping heads on a coin has no effect on rolling a 3 on a dice

Dependent events: One outcome affects another Example – choosing one red card reduces the chance of choosing another red card

Dr Frost Key Skills

247 Probabilities using worded terms
248 Theoretical probabilities using counts
249 Sample Space Diagram
250 Probability of mutually exclusive events
251 Experimental probabilities
353 Probabilities of independent events
354 Probability of dependent events
355 and 356 Probabilities from Venn diagram (Using Venn notation)

Year 8

Find probabilities from a sample space
Find probabilities from two-way tables
Find probabilities from Venn diagrams

Year 9

Single event probability
Relative frequency - including convergence
Expected outcomes
Independent events
Use tree diagrams
Use tree diagrams to solve without replacement problems

Learning Journey

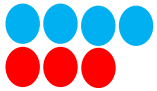
Year 10

Find probabilities using equally likely outcomes
Use the property that probabilities sum to 1
Using experimental data to estimate probabilities
Find probabilities from tables, Venn diagrams and frequency trees
Construct and interpret sample spaces for more than one event
Calculate probability with independent events
Use tree diagrams for independent events
Use tree diagrams for dependent events
Construct and interpret conditional probabilities (tree diagrams)

Key Knowledge

Sum to 1

Probabilities is always a value between 0 and 1



The probability of selecting a **blue counter** is $\frac{4}{7}$

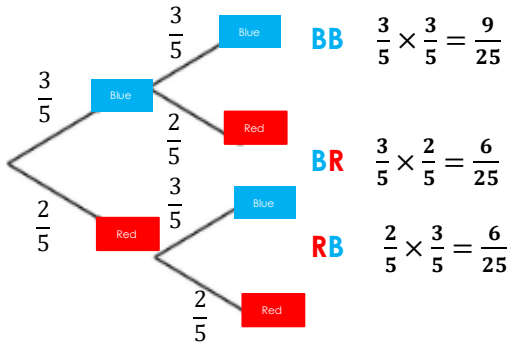
The probability of selecting a **red counter** is $\frac{3}{7}$

Because they are replaced the second pick has the same probability.

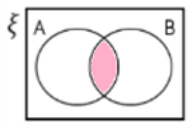
Tree Diagram for independent events

Isabel has a bag with 3 blue counters and 2 red counters.
She picks a counter and replaces it before the second pick.

Draw a tree diagram to represent this event.

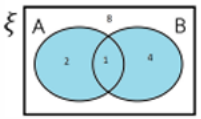


Venn diagram



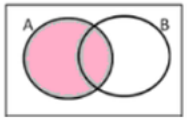
in set A AND set B

$P(A \cap B)$



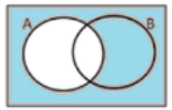
in set A OR set B

$P(A \cup B)$



in set A

$P(A)$



NOT in set A

$P(A')$

Year 9
Algebriac Representation

Keywords

Quadratic: An equation where the highest exponent of the variable is a square

Simultaneous Equations: An equation involving two or more unknowns that have the same values in each equation

Substitution: The process of replacing a variable (a letter representing an unknown number) with a specific value or another expression within an equation or expression

Inequalities: An inequality compares two values, showing if one is less than, greater than, or simply not equal to another value

Intersect: This can be described as a point where two lines cross

Parallel: Straight lines that never intersect

Perpendicular: Straight lines that intersect and meet at right angles

Turning Points: A point on a curve where the gradient (or slope) changes direction

Dr Frost Key Skills

275 Solving Linear Equations using Graphical Methods
276 Solving Linear Equations using Elimination or Substitution
366 Plotting Quadratic graphs from a table of values
368 Quadratic Graphs and their features
419 Solve Non-Linear Equations by Substitution

Learning Journey

Year 9
Drawing Quadratic Graphs
Interpreting Quadratic Graphs
Solving Simultaneous Equations
Solving Simultaneous Equations Graphically
Inequalities on a number line
Solving Inequalities Graphically

Key Knowledge

Two Linear Equations (Elimination)

$$3x + 2y = 18$$
$$3x - y = 9 \quad \text{X 2}$$

Both unknowns have different coefficients, thus one or both equations **must** be multiplied to create a common coefficient.

SSS- Same Sign Subtract
DSA- Different Sign Add

$$3x + 2y = 18$$
$$+\ 6x - 2y = 18$$

$$9x = 36$$
$$x = 4$$

Substitute x = 4 into **an** original equation

$$3x + 2y = 18$$
$$3(4) + 2y = 18$$
$$12 + 2y = 18$$
$$2y = 6$$
$$y = 3$$

1) $y = 2x$
2) $x + y = 6$

1) Label the equations 1 and 2
2) Substitute what you know to the other equation and solve
3) Substitute your answer to work out the other unknown

$$x + 2x = 6$$
$$3x = 6$$
$$x = 2$$