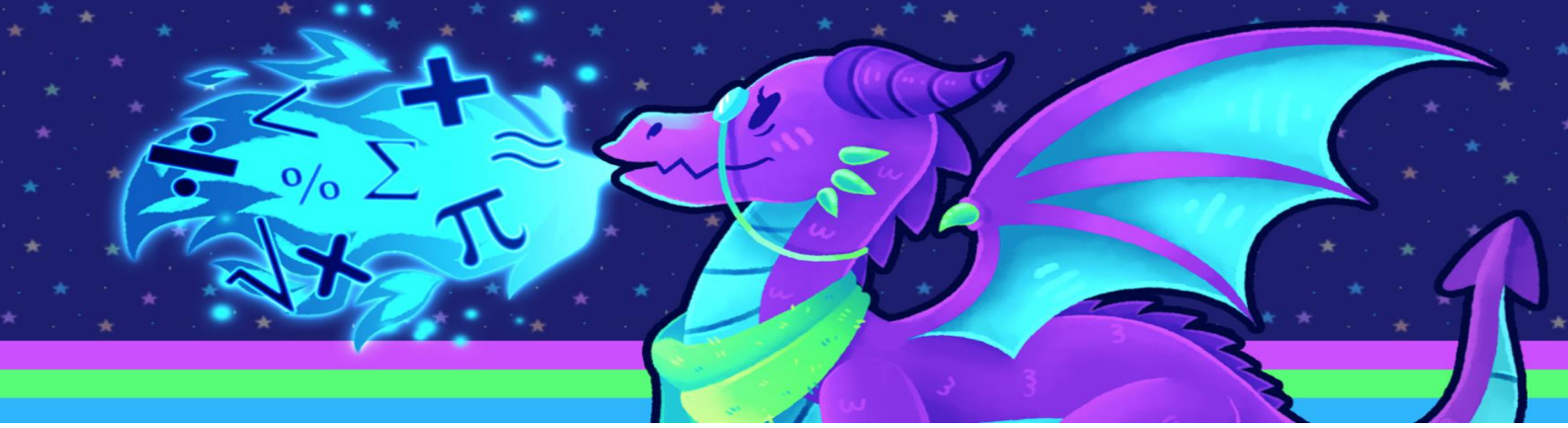


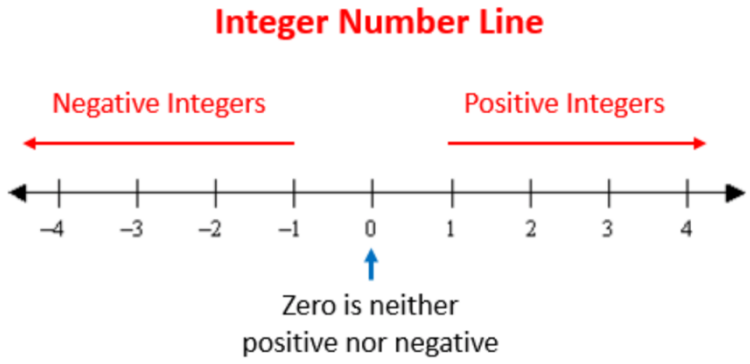
Baldragon Academy

National 4 Maths

Checklist

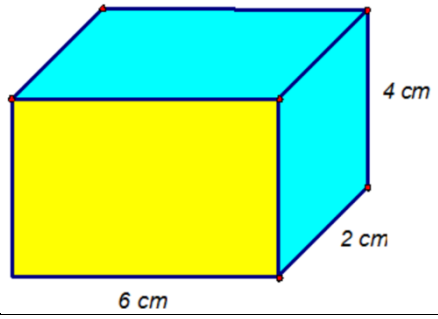
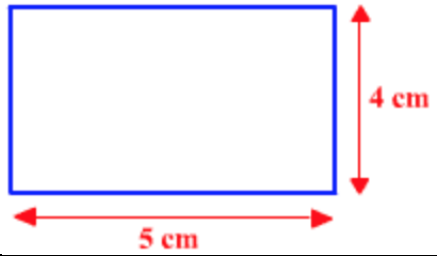
Contents: **Page**

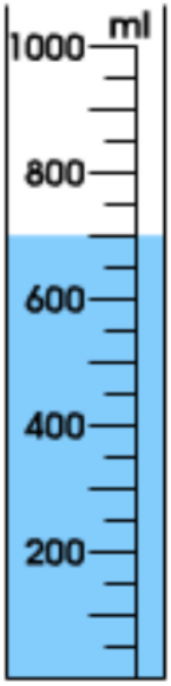
Numeracy

Topic	Skills	Notes			
Number					
Add and Subtract Integers	Integers are any whole numbers, both positive and negative. The easiest way to do this is with a number line.  Example: The temperature was 3°C. The temperature then fell by 4°C. What was the new temperature? 3°C - 4°C = - 1°				
Round Answers to One Significant Figure or 2 Decimal Places	Example: 72 m = 70 m to 1 sig fig Example: 36.238 m = 36.24 m to 2 d.p.				
Find Simple Percentage and Fraction of Shapes and Quantities	To find a fraction of a quantity, we divide by the bottom and multiply by the top. Example: Calculate $\frac{2}{3}$ of 15 = 15 ÷ 3 × 2 = 10 A percentage is just a fraction over 100. Example:				

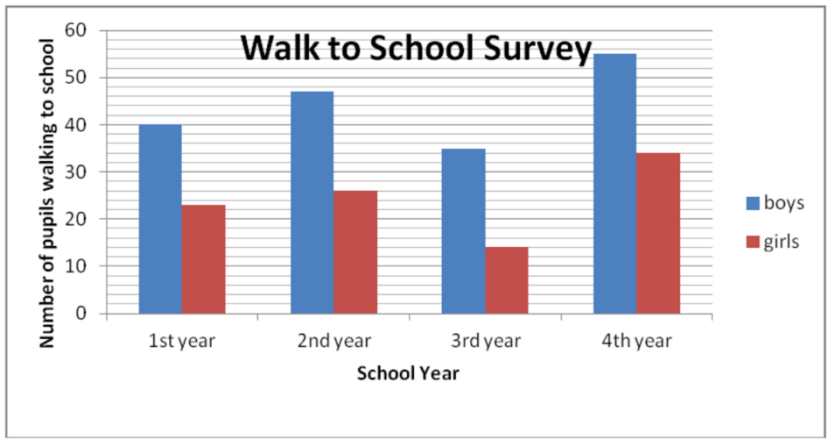
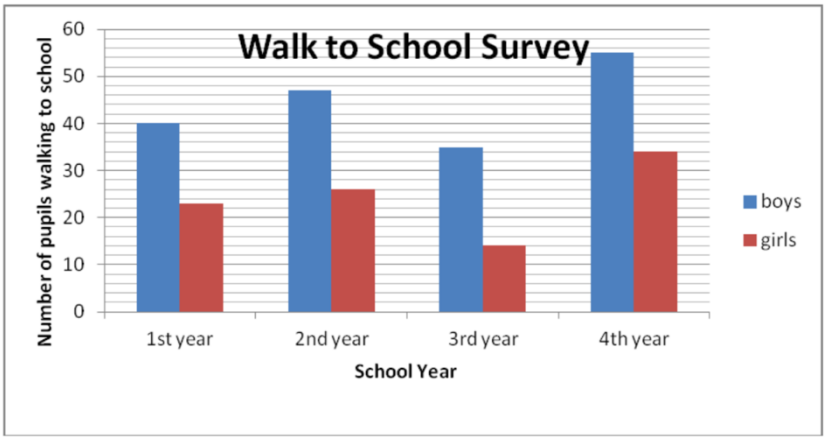
	15% = $\frac{15}{100}$ This means that to find a percentage of a quantity we just divide by 100 and multiply by the percentage. Example: Calculate 20% of £400 = £400 ÷ 100 × 20 = £80				
Calculate Percentage Increase and Decrease	Calculate percentage then add to or subtract from the original quantity. Example: A TV costs £800 + 20% VAT. Calculate the total cost of the TV. 20% of £800 = £800 ÷ 100 × 20 = £160 Total Cost = £800 + £160 = £960				
Equivalence of Fractions, Decimals, and Percentages	Example: Write 25% as a fraction, decimal, and percentage Percentage = 25% , Fraction = $\frac{25}{100} = \frac{1}{4}$, Decimal = 0.25				
Calculate Ratio and Direct Proportion	To calculate a ratio of a quantity we add, divide, and multiply. Example: Share £36 between Trevor and Lee in the ratio 4:2 Add: 4 + 2 = 6 shares Divide: £36 ÷ 6 = £6 per share Multiply: 4 × £6 = £24 2 × £6 = £12 Trevor will receive £24 and Lee will receive £12 Direct proportion is when an increase or decrease in one quantity, causes an increase or decrease in another.				

	Example: If 20 cans of juice weigh 400 g, how much does 1 can of juice weigh? 400 g ÷ 20 cans = 20 g				
Calculate a Rate	Hire Purchase is a way of buying items through instalments (payments made over a certain time), usually once a deposit is put down (an upfront payment) Example: A sofa can be bought through hire purchase with a deposit of £20 and then 12 monthly instalments of £20. How much will the sofa cost in total? Total = deposit + instalments = £20 + (12 × £20) = £20 + £240 = £260				
Calculate Distance Given Speed and Time	Use the formula: $D = S \times T$				
Measure					
Calculate Time Intervals in 12 and 24 Hour Time	Example: How long is it from 0820 to 0935? 1 hour and 15 minutes				
Volume of Cube and Cuboid	Formula: $V = l \times b \times h$ Where: V = volume l = length b = breadth h = height Example: Calculate the volume of the cuboid				

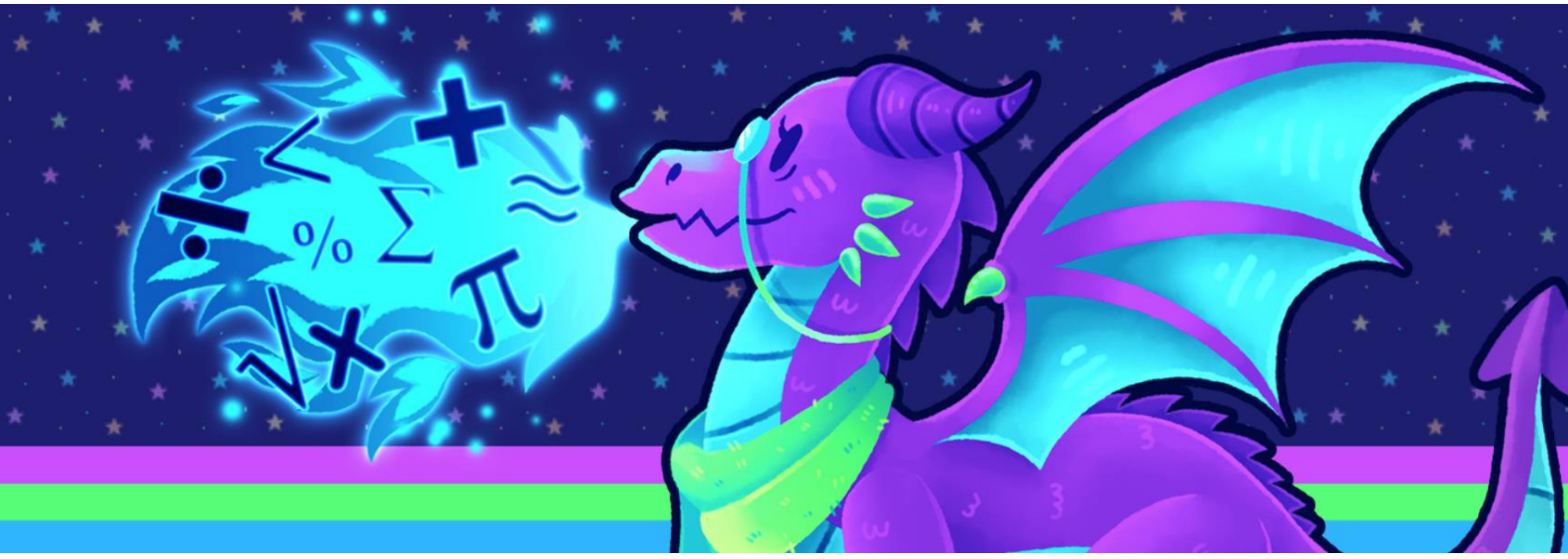
	 $V = l \times b \times h$ $V = 6 \times 2 \times 4$ $V = 48\ cm^3$ Note: cubed units for volume				
Area of Square and Rectangle	Formula: $A = l \times b$ Where: A = area l = length b = breadth Example: Calculate the area of the rectangle  $A = l \times b$ $A = 5 \times 4$ $A = 20\ cm^2$ Note: squared units for area				
Perimeter of Shapes (Straight Sides)	The perimeter of a shape is the total distance around the outside. It is found be adding together all of the lengths.				

Read a Scale With Un-Numbered Divisions	 Example: Since there are 4 divisions between every 200 ml, then each division represents 200ml ÷ 4 = 50 ml. This means that there is 700 ml in the test tube.				
Convert Between Different Units of Measurement	Common Conversions: 1 g = 1 cm^2 = 1 ml 1000 ml = 1 litre 10 mm = 1cm 100 cm = 1m 1000 m = 1 km 60 mins = 1 hour 45 mins = 0.75 hours 30 mins = 0.5 hours 15 mins = 0.25 hours				
Make Comparisons of Length, Weight, Area and Temperature	Example: Jeff needs to wallpaper a rectangular room that is 6 m by 3 m. He buys 15 m of wallpaper. Will this be enough? No, because the perimeter of the room is 6 m + 6 m + 3 m + 3 m = 18 m which is bigger than the 15 m he bought.				
Give Reasons for Decisions Based on Calculations	See above.				

Statistics

Extract, Interpret and Make Decisions Based on Data from Tables, Charts, Graphs, and Diagrams	Example:  How many 1st year boys walk to school? 40 1st year boy walk to school				
Make Decisions Based on Patterns and Trends in Data	Example: Compare walking to school by both boys and girls across the year groups.  Across all year groups, more boys walk to school than girls. 4th years walk to school more than any other year group for both boys and girls.				
Make Decisions Based on Probability	The probability of something happening is how likely it is to occur. For this we use a probability between 0 and 1. 0 means that this thing will NEVER happen, 1 means that it is certain to happen, and 0.5 means there is an even chance of that even either occurring or not occurring. We use the formula:				

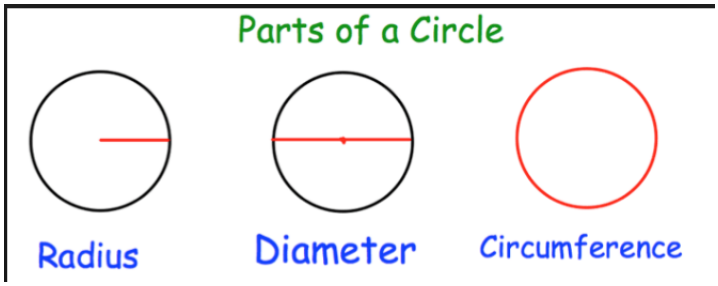
	$P(event) = \frac{number\ of\ ways\ it\ could\ happen}{total\ number\ of\ outcomes}$ Example: In Class A 6 out of 25 pupils are left handed. In Class B 8 out of 28 pupils are left handed. In which class are you more likely to choose a left handed child at random? Class A: $P(left-handed) = \frac{6}{25} = 0.24$ Class B: $P(left-handed) = \frac{8}{28} = 0.29$ You are more likely to choose a left-handed child at random from Class B as 0.29 > 0.24.				

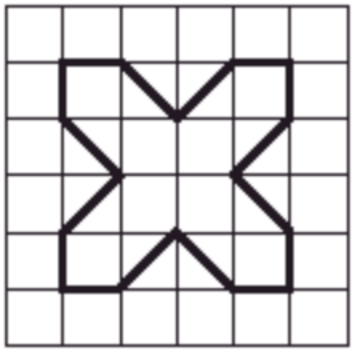
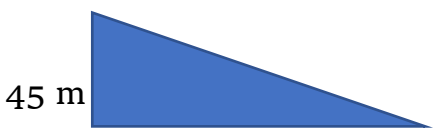


Expressions and Formulae

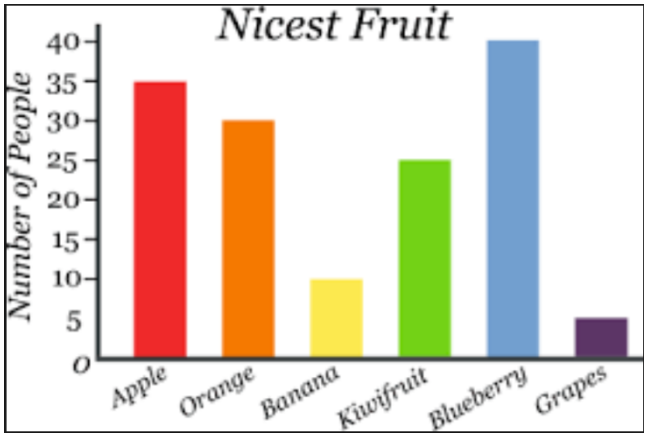
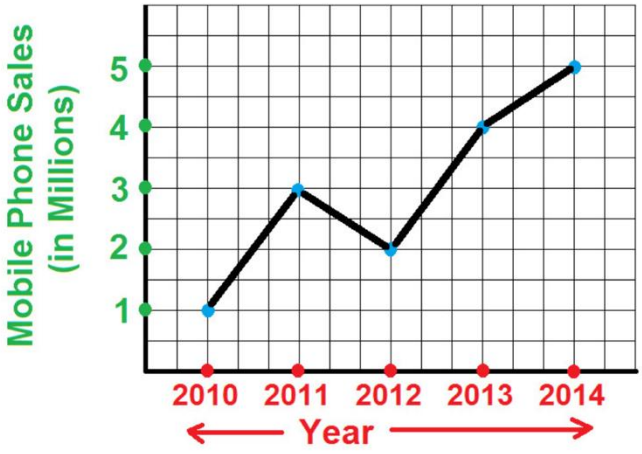
Topic	Skills	Notes			
Algebra					
Factorising	Pull out the highest common factor between both variables Example:				

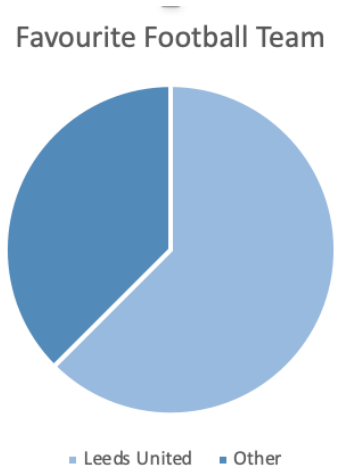
	Factorise $2x + 10$ Since the highest number that both 2 and 10 can be divided by is 2, then this is the HCF. $2x + 10$ $= 2(x + 5)$				
Multiplying Brackets and Simplifying	Multiply everything inside the bracket by what is outside the bracket. Example: Expand the bracket $4(2x + 3)$ $4(2x + 3)$ $= 8x + 12$ To simplify algebraic terms we combine letters that are the same: $5m + 2z - 2m + z - 7 = 3m + 3z - 7$				
Substituting and Evaluating	We substitute the letter for the number given Example: Peter works part-time in a mobile phone shop. His weekly pay is calculated using the formula: $P = 5.5H + 10M$ Where P is his pay in pounds, H is the hours that he works, and M is the number of mobile phones that he sells. One week he works for 20 hours and sells 12 mobile phones. Calculate his pay for that week. We substitute in $H = 20$ and $M = 12$ $P = (5.5 \times 20) + (10 \times 12)$ $P = 110 + 120$ $P = £230$				
Creating and Using Linear	Use the formula: $bottom = jump \times top \pm n$				

Equations from Patterns	Where: Bottom = bottom row of table Top = top row of table Jump = number added each time + or – n = a number we'll have to add or take away in order to get the answer needed To find an unknown, we substitute in the values we are told into the equation we have created and solve for the unknown				
Geometry					
Circumference and Area of a Circle	 To calculate the circumference of a circle we use the formula: $C = \pi D$ Where: C = circumference π = 3.14 D = diameter To calculate the area of a circle we use the formula: $A = \pi r^2$ Where: A = area π = 3.14 r = radius and $r^2 = r \times r$ Note: A circles radius is HALF its diameter				
Area of 2D Shapes	Square/ Rectangle: $A = l \times b$	Trapezium:			

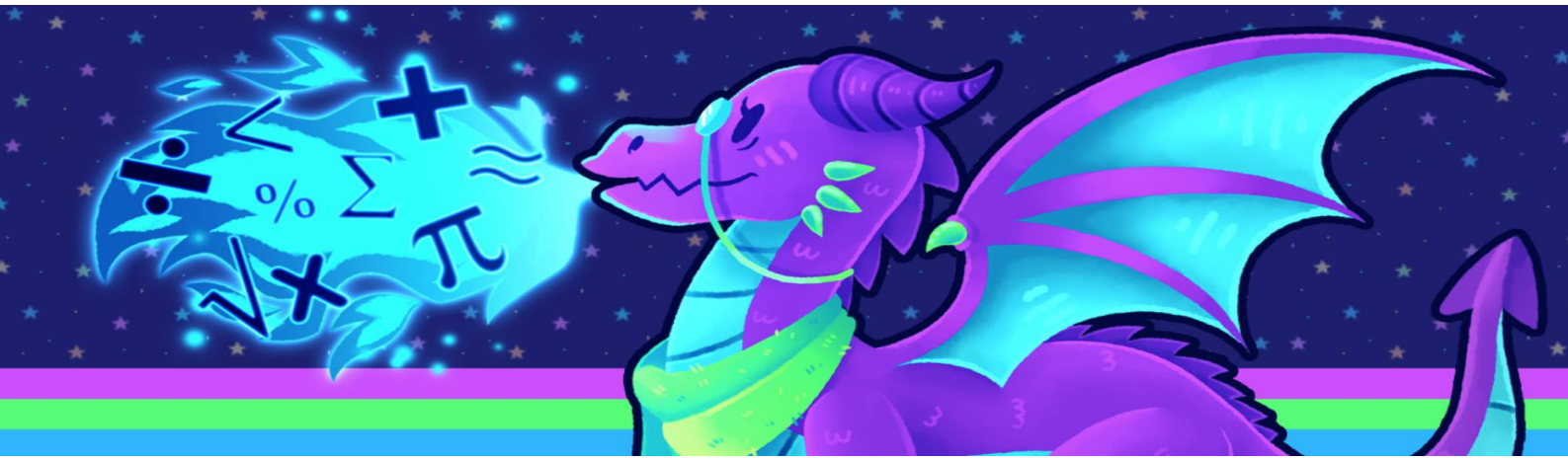
		$A = \frac{a+b}{2} \times h$				
Volume of Prisms	General formula: $V = Ah$ Where: V = volume A = area of the base H = height of prism					
Reflective and Rotational Symmetry	The order of rotational symmetry is how many times a shape will fit exactly back into itself in a 360° turn. Example:  This shape has rotational symmetry of order 4 (it fits exactly back into itself 4 times in a full turn) It also has 4 lines of symmetry					
Gradient	The gradient is a measure of the slope of a line. It is found using: $gradient = \frac{vertical}{horizontal}$ Example: The difficulty of a ski slope is graded blue (easy) or black (hard) depending on the steepness of the slope. A section is classed as difficult if it has a gradient of greater than 0.4. A section of ski slope is shown below  (a) Calculate the gradient of the slope.					

	(b) Should this section be graded as black (hard)? Give a reason for your answer. (a) $$gradient = \frac{vertical}{horizontal}$$ $$gradient = \frac{45}{120}$$ $$gradient = 0.375$$ (b) No it should not be graded hard as 0.375 < 0.4.				
Statistics					
Mean, Mode, Median, and Range	For any given data set: Range = highest – lowest Median = the middle number in an ordered data set Mode = most common number Mean = sum of all the numbers / number of numbers Example: For the following data set, calculate the mean, median, mode, and range. 2, 3, 7, 4, 4 Note: First we must put the data set in order from lowest to highest. 2, 3, 4, 4, 7 Range = 7 – 2 = 5 Median = 4 Mode = 4 Mean = (2 + 3 + 4 + 4 + 7)/5 = 20/5 = 4				

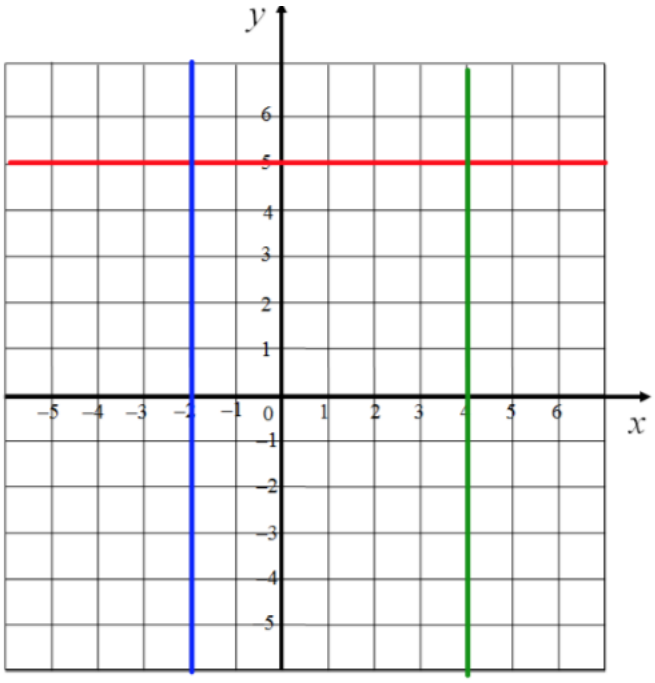
Frequency Tables	Example: <table><tr><th>Mark</th><th>Tally</th><th>Frequency</th></tr><tr><td>4</td><td>II</td><td>2</td></tr><tr><td>5</td><td>II</td><td>2</td></tr><tr><td>6</td><td>IIII</td><td>4</td></tr><tr><td>7</td><td>~~IIII~~</td><td>5</td></tr><tr><td>8</td><td>IIII</td><td>4</td></tr><tr><td>9</td><td>II</td><td>2</td></tr><tr><td>10</td><td>I</td><td>1</td></tr></table>				
Constructing Bar Graphs, Line Graphs, and Pie Charts	Bar Graphs – HAVE TO HAVE EQUAL SPACES BETWEEN EACH BAR Example:  Line Graphs Example:  Pie Charts: To calculate the angle to be drawn in a pie chart, we divide 360° (the number of degrees in a circle) by the total number of people				

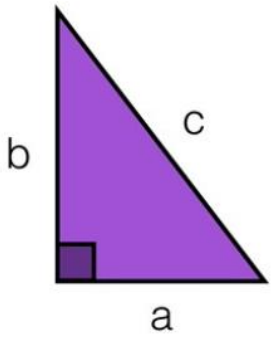
	surveyed, then multiply this answer by how many people answered each thing. Example: 40 people were surveyed on what their favourite football team is. 25 people answered Leeds United. Display this in a pie chart. $360° \div 40 \times 25 = 225°$  				
Probability	The probability of something happening is how likely it is to occur. For this we use a probability between 0 and 1. 0 means that this thing will NEVER happen, 1 means that it is certain to happen, and 0.5 means there is an even chance of that even either occurring or not occurring. We use the formula: $$P(event) = \frac{number\ of\ ways\ it\ could\ happen}{total\ number\ of\ outcomes}$$ Example: When rolling a six-sided dice, what is the probability that we will roll an even number? Since there are 3 even numbers on a six-sided dice then – $$P(even) = \frac{3}{6} = \frac{1}{2} = 0.5$$				

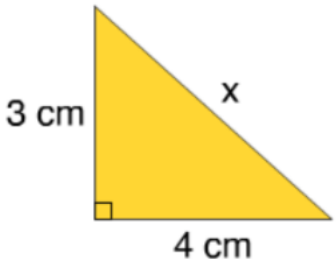
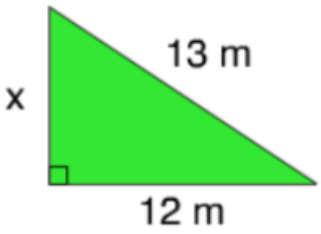
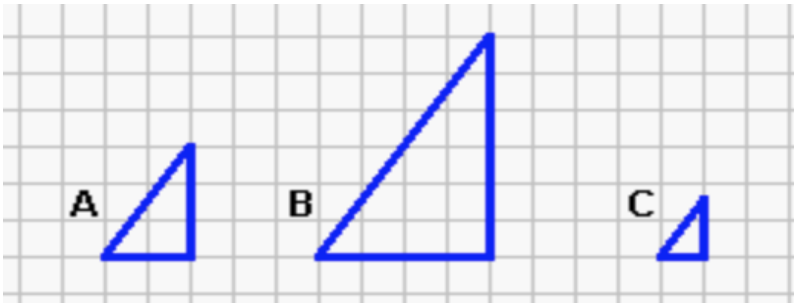
	This means that you are just as likely to roll an even number as you are an odd number.				

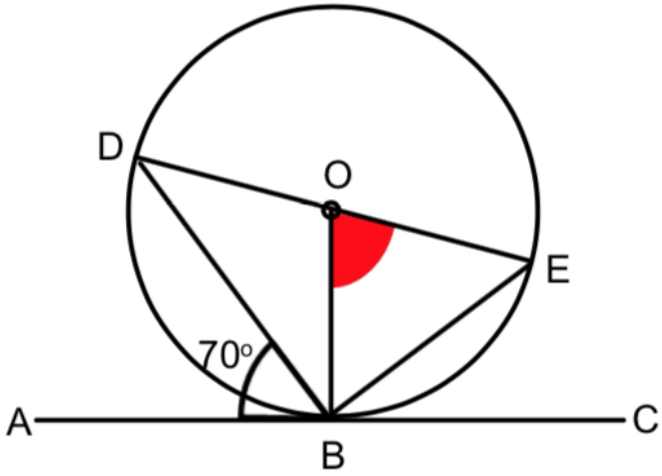


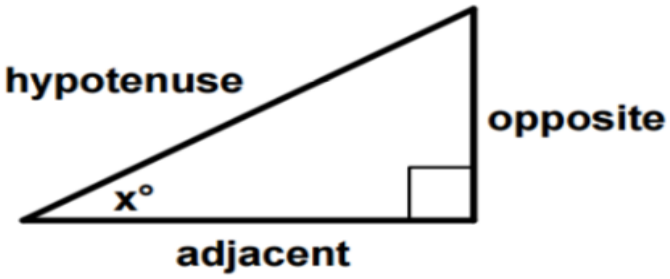
Relationships

Topic	Skills	Notes			
Linear Equations					
Drawing and Recognising a Graph of a Linear Equation	• Draw a straight line graph when given values of x • Know and understand the straight line equation $y = mx + c$ • When we have an equation y = a or x = b then we have a horizontal or vertical line that cuts the named axis at that point 				

	y = 5 , x = - 2 , x = 4				
Solving Linear Equations	Example: Solve for x: 5x + 3 = 23 5x + 3 = 23 5x = 20 x = 4 Example: Solve for q: 7q + 4 = - 10 7q + 4 = -10 7q = -14 q = - 2				
Changing the Subject of the Formula	Example: Change the subject of the formula E = 3w – k to w. E = 3w – k — change sides 3w – k = E — + k to both sides 3w = E + k — ÷ 3 to both sides $w = \frac{E + k}{3}$				
Geometric Skills					
Using Pythagoras' Theorem	For right-angled triangles: $c^2 = a^2 + b^2$ Where: c is the hypotenuse (the length opposite the right angle) a and b are the shorter sides  Example:				

	Solve for x:  $c^2 = a^2 + b^2$ $x^2 = 3^2 + 4^2$ $x^2 = 25$ $x = \sqrt{25}$ $x = 5\ cm$ Note: If you're being asked to calculate the length of a shorter side, a, then the equation changes to a minus: $a^2 = c^2 - b^2$ Example: Solve for x: $a^2 = c^2 - b^2$ $x^2 = 13^2 - 12^2$ $x^2 = 25$ $x = \sqrt{25}$ $x = 5\ cm$  				
Use a Fractional Scale to Enlarge or Reduce a Shape	Multiply original lengths by scale factor to find the lengths of the reduced or enlarged shapes, (a scale factor of 2 will make a shape double in size, a scale factor of 0.5 will half the size of the shape) Example:  B is an enlargement of A by a scale factor of 2 C is a reduction of A by a scale factor of 0.5				

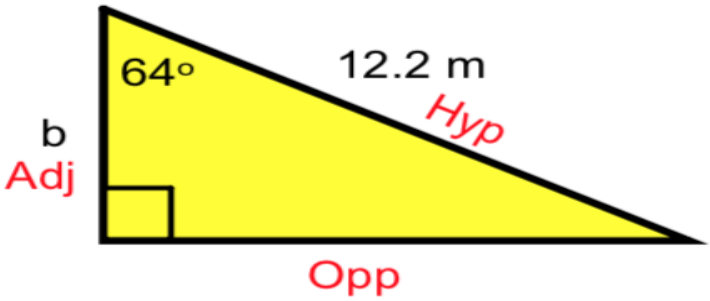
Use parallel lines, symmetry and circle properties to calculate angles	Combination of angle properties associated with: • Intersecting and parallel lines • Triangles and Quadrilaterals Circles: • Angle in a semi-circle • Relationship between tangent and radius Example: Calculate the size of angle BOE  Angle ABO is a right angle so angle DBO is equal to 90° – 70° = 30° Triangle DOB is an isosceles so angles DBO and ODB are the same = 30° and since there are 180 in a triangle angle DOB = 180° – 30° – 30° = 120° Angle DOE is a straight line = 180° so angle BOE = 180° – 120° = 60°				
Trigonometry					
Calculating a Side in a Right-Angled Triangle	Given a side and an angle:				



$\sin x° = \frac{opp}{hyp}$ $\cos x° = \frac{adj}{hyp}$ $\tan x° = \frac{opp}{adj}$

Your hypotenuse is the length across from the right angle, the adjacent length is the one next to the angle you are given, and the opposite length is the one opposite the angle you are given

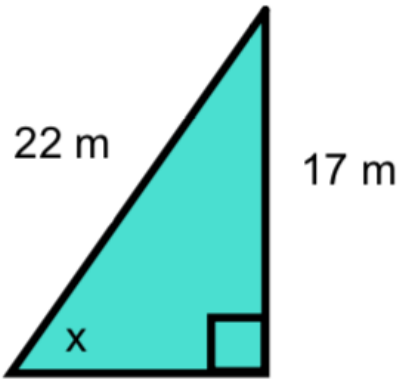
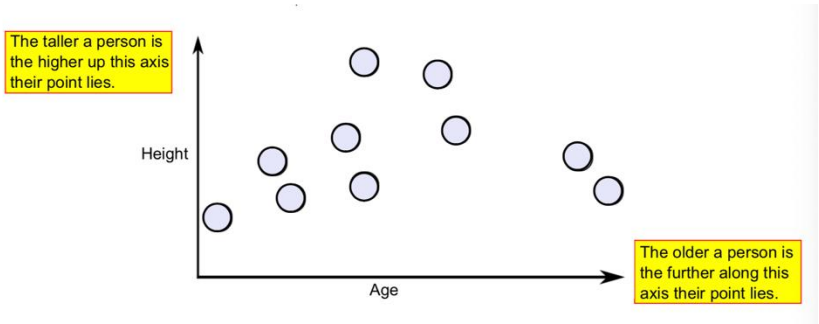
Example:



We want to find the length adjacent to the angle given and we know the hypotenuse, this means we are using our cos ratio

$$\cos x° = \frac{adj}{hyp}$$
$$\cos 64° = \frac{b}{12.2}$$
$$b = 12.2 \times \cos 64°$$
$$b = 5.3\ m\ to\ 2\ d.p.$$

Calculating an Angle in	Given 2 sides				

a Right-Angled Triangle	Example:  We are given the lengths of the hypotenuse and the length opposite the angle we have to find so we use the sin ratio. $\sin x° = \frac{opp}{hyp}$ $\sin x° = \frac{17}{22}$ $x° = \sin^{-1}(\frac{17}{22})$ $x° = 50.6°$				
Statistics					
Constructing a Scatter Graph	Plotting a scatter graph is a lot like plotting coordinates. Each point will tell us 2 pieces of information. Each point on the below scatter graph represents one person.  				
Drawing and Applying a Best-Fitting	The line should have roughly the same number of data points on either side. Use the line of best fit to estimate one variable given the other.				

Straight Line