



## Mathematics in Key Stage 3

Year 7			
Term	Topic	Content Learnt	High Performing Students will:
1	Place value, add and subtract	<ul style="list-style-type: none"> <li>Place value (inc. decimals)</li> <li>Add &amp; subtract (inc. decimals)</li> <li>Negative numbers</li> <li>Estimation</li> <li>Perimeter</li> <li>Scales</li> <li>Coordinates</li> </ul>	<ul style="list-style-type: none"> <li>Investigate <a href="https://nrich.maths.org/">https://nrich.maths.org/</a> to find challenges and problems involving decimals and negative numbers.</li> <li>Investigate the world of finance/science and how negative numbers are used. <a href="https://www.bbc.com/teach/skillswise/negative-numbers/znrkvk7">https://www.bbc.com/teach/skillswise/negative-numbers/znrkvk7</a></li> <li>Investigate other areas where decimals and negative numbers are used/found</li> <li>Negative number puzzles : <a href="https://www.khanacademy.org">https://www.khanacademy.org</a></li> <li>Investigate as many items as possible from home which measure things. An example would be to help an adult bake a cake and use the weighing scale to get the right amount.</li> </ul>
2	Geometry	<ul style="list-style-type: none"> <li>Draw, measure and name acute and obtuse angles</li> <li>Find unknown angles (straight line, at a point, vertically opposite)</li> <li>Properties of triangles and quadrilaterals</li> <li>Reasoning with shapes on coordinate grids</li> </ul>	<ul style="list-style-type: none"> <li><a href="https://www.mathsisfun.com/angles.html">https://www.mathsisfun.com/angles.html</a> is used for deeper insight to different types of angles. Here you will find real life scenario questions with different angles.</li> <li>Finding angles in different types of triangles, isosceles, scalene : <a href="https://www.khanacademy.org/math/basic-geo/basic-geometry-shapes#triangle-angles">https://www.khanacademy.org/math/basic-geo/basic-geometry-shapes#triangle-angles</a></li> <li>Finding properties of triangles and quadrilaterals. Here there is a great website with videos going through these shapes and properties: <a href="https://www.toppr.com/guides/maths/basic-geometrical-ideas/triangles-and-quadrilaterals/">https://www.toppr.com/guides/maths/basic-geometrical-ideas/triangles-and-quadrilaterals/</a></li> <li>Once again, <a href="https://nrich.maths.org">https://nrich.maths.org</a> will have challenges and worksheets on properties of shapes</li> </ul>
3	Multiply and divide	<ul style="list-style-type: none"> <li>Multiply and divide (inc. decimals)</li> <li>Factors, HCF, primes</li> <li>Area of rectangle and triangle Area of parallelogram</li> <li>Calculate the mean</li> </ul>	<ul style="list-style-type: none"> <li>Support your peers in their understanding of multiplication and division.</li> <li>Investigate <a href="https://nrich.maths.org/">https://nrich.maths.org/</a> to find challenges and problems involving multiplication and division</li> <li>Search for the topics being taught on <a href="https://vle.mathswatch.co.uk/vle/">https://vle.mathswatch.co.uk/vle/</a> and complete relevant</li> </ul>

			<p>exercises.</p> <ul style="list-style-type: none"> <li>- Ensure homework is completed to 100% and seek support where needed. This could be from a teacher or using the lessons on <a href="http://www.mymaths.co.uk">www.mymaths.co.uk</a></li> <li>- Explore Corbett Maths to complete more challenging questions on these topics. <a href="https://corbettmaths.com/">https://corbettmaths.com/</a></li> <li>- Research the real world applications.</li> </ul>
<b>4</b>	<b>Fractions</b>	<ul style="list-style-type: none"> <li>• Equivalent fractions</li> <li>• Multiples and LCM</li> <li>• Compare and order fractions and decimals</li> <li>• Add and subtract fractions</li> <li>• Change mixed to improper and vice versa</li> <li>• Add and subtract mixed numbers</li> <li>• Fraction of a quantity</li> </ul>	<ul style="list-style-type: none"> <li>- Explore the real life application of fractions.</li> <li>- Independently research fractions</li> <li>- Search and complete questions on fractions using <a href="https://vle.mathswatch.co.uk/vle/">https://vle.mathswatch.co.uk/vle/</a></li> <li>- Use websites such as Brain Genie to complete more challenging problem solving questions based around fractions. <a href="https://braingenie.ck12.org/">https://braingenie.ck12.org/</a></li> <li>- Support your peers in their understanding of fractions</li> <li>- Reflect upon previous topics taught and identify how fractions could be used in those topics.</li> </ul>
<b>5</b>	<b>Algebra</b>	<ul style="list-style-type: none"> <li>• Order of operations</li> <li>• Substitution (inc. scientific formulae)</li> <li>• Plotting graphs using table of values</li> <li>• Simplifying algebraic expressions</li> <li>• Solve word problems with expressions</li> <li>• Sequences (term to term, not nth term)</li> </ul>	<ul style="list-style-type: none"> <li>- Use <a href="https://nrich.maths.org/">https://nrich.maths.org/</a> to try problem-solving questions related to algebra</li> <li>- Explore sequences that can be found in nature</li> <li>- Listen to the Radio 4 maths podcast on the links between maths and science <a href="#">radio 4 podcast</a></li> <li>- Use the Mathswatch website to try all of the “harder” interactive questions associated with the topics listed</li> <li>- Try the “starter” problems for algebra on transum.org: <a href="#">algebra problems</a></li> </ul>
<b>6</b>	<b>Percentages and Pie charts</b>	<ul style="list-style-type: none"> <li>• Read and interpret pie charts</li> <li>• Convert between percentages and fractions and decimals</li> <li>• Percentage of a quantity</li> <li>• Find the whole given the part and the percentage</li> <li>• Solve word problems with proportion</li> </ul>	<ul style="list-style-type: none"> <li>- Find as many examples of pie charts being used in the media as possible – are they all accurate and representative?</li> <li>- Use the <a href="#">fractions</a> , <a href="#">decimals</a> ,and <a href="#">percentages</a> problem solving starters on transum.org</li> <li>- Use the Mathswatch website to try all of the “harder” interactive questions associated with the topics listed</li> <li>- Use <a href="https://nrich.maths.org/">https://nrich.maths.org/</a> to try problem-solving questions related to percentages</li> <li>- Explore where percentages are used in real life: look out for them in advertisements, news, information leaflets etc – keep track and show your teacher!</li> </ul>
<p>In addition to the above, students can also access the UKMT website to try any of the individual practice papers for additional problem solving challenge!</p>			

Year 8			
Term	Topic	Content Learnt	High Performing Students will:
1 & 2	<b>Factors and powers</b>	<ul style="list-style-type: none"> <li>• Find the prime factor decomposition of a number</li> <li>• Know the prime factorisation of numbers up to 30, giving answers as powers</li> <li>• Use prime factor decomposition to find the HCF or LCM of 2 numbers</li> <li>• Establish index laws for positive powers where the answer is a positive power</li> <li>• Apply the index laws for multiplication and division of positive integer powers</li> <li>• Show that any number to the power of zero is 1</li> <li>• Understand that each of the headings in the place value system, to the right of the tens column, can be written as a power of ten</li> <li>• Know the prefixes associated with 10<sup>9</sup>, 10<sup>6</sup>, 10<sup>3</sup> (giga, mega and kilo)</li> <li>• Understand the effect of multiplying or dividing by any integer power of 10</li> <li>• Understand the order in which to calculate expressions that contain powers and brackets in both the numerator and denominator of a fraction</li> <li>• Round numbers to a given number of significant figures</li> <li>• Use numbers of any size rounded to 1 significant figure to make standardized estimates for calculations with 1 step.</li> </ul>	<p>These resources have been chosen because they are ideal for developing knowledge and understanding of factors and multiples:</p> <p><a href="https://nrich.maths.org/6027">https://nrich.maths.org/6027</a></p> <p>Factorising factorials: <a href="https://nrich.maths.org/732">https://nrich.maths.org/732</a></p> <p>How we express powers of 10: <a href="https://www.mathsisfun.com/index-notation-powers.html">https://www.mathsisfun.com/index-notation-powers.html</a></p>
	<b>Working with powers</b>	<ul style="list-style-type: none"> <li>• Simplify simple expressions involving powers, but not brackets, by collecting like terms</li> <li>• Simplify simple expressions involving index notation, i.e. <math>x^2 + 2x^2</math>, <math>p \times p^2</math>, <math>r^5 \div r^2</math></li> <li>• Know and understand the meaning of an identity and use the identity sign</li> <li>• Simplify expressions involving brackets and powers e.g. <math>x(x^2 + x + 4)</math>, <math>3(a + 2b) - 2(a + b)</math></li> </ul>	<p>Use of BBC website to explore further or more challenging expansion of brackets: <a href="https://www.bbc.com/bitesize/guides/zcqmsrd/revision/3">https://www.bbc.com/bitesize/guides/zcqmsrd/revision/3</a></p>

		<ul style="list-style-type: none"> <li>• Establish index laws for positive powers of variables where the answer is a positive power</li> <li>• Apply the index laws for multiplication and division of small integer powers, e.g. <math>a^3 \times a^2</math>, <math>x^3 \div x^2</math></li> <li>• Know and use the general forms of the index laws for multiplication and division of positive integer powers. (e.g. <math>pa \times pb</math>, <math>pa \div pb</math>, <math>(pa)^b</math>)</li> <li>• Multiply a single term over a bracket e.g. <math>x(x + 4)</math>, <math>3x(2x - 3)</math></li> <li>• Use the distributive law to take out single term algebraic factors, e.g. <math>x^3 + x^2 + x = x(x^2 + x + 1)</math></li> <li>• Substitute positive and negative integers into linear expressions and expressions involving powers</li> <li>• Construct and solve equations that involve multiplying out brackets by a negative number and collecting like terms (e.g. <math>4(2a - 1) = 32 - 3(2a - 2)</math>)</li> </ul>	<p>Create your own algebraic expressions  <a href="https://nrich.maths.org/9327">https://nrich.maths.org/9327</a></p> <p>expanding brackets with negative numbers  <a href="https://studymaths.co.uk/topics/expandingAndSimplifyingExpressions.php">https://studymaths.co.uk/topics/expandingAndSimplifyingExpressions.php</a></p>
	<p><b>2D shapes and 3D solids</b></p>	<ul style="list-style-type: none"> <li>• Begin to use plans and elevations</li> <li>• Visualise and use a wide range of 2D representations of 3D objects</li> <li>• Analyse 3D shapes informally and through cross-sections, plans and elevations</li> <li>• Calculate the volume and surface area of right prisms</li> <li>• Calculate the lengths, areas and volumes in cylinders</li> <li>• Convert between larger volume measures to smaller ones (e.g. <math>m^3</math> to <math>cm^3</math>)</li> <li>• Calculate the lengths and areas given the volumes in right prisms</li> <li>• Use the formula for the circumference of a circle</li> <li>• Know the names of parts of a circle</li> <li>• Use the formulae to find area of a circle, given the radius or diameter</li> <li>• Use the formulae for the area of a circle, given area, to calculate the radius or diameter</li> </ul>	<p>Create your own shapes and draw plan views  <a href="https://www.mathspad.co.uk/i2/plansElevations.php">https://www.mathspad.co.uk/i2/plansElevations.php</a></p> <p>History of calculations of length area and volume  <a href="https://www.thoughtco.com/definition-of-area-2312366">https://www.thoughtco.com/definition-of-area-2312366</a></p> <p>Think about where the formula of a circle comes from:  <a href="https://www.mathopenref.com/circleareaderive.html">https://www.mathopenref.com/circleareaderive.html</a></p>

		<ul style="list-style-type: none"> <li>• Be able to correctly identify the hypotenuse</li> <li>• Know the formula for Pythagoras' theorem and how to substitute in values from a diagram</li> <li>• Use and apply Pythagoras' theorem to solve problems</li> <li>• Given the coordinates of points A and B, calculate the length of AB</li> </ul>	<p>How did Pythagorus create his theory...and was it all his??  <a href="http://talesoftimesforgotten.com/2018/03/24/did-pythagoras-discover-the-pythagorean-theorem/">http://talesoftimesforgotten.com/2018/03/24/did-pythagoras-discover-the-pythagorean-theorem/</a></p>
	<b>Real-life graphs</b>	<ul style="list-style-type: none"> <li>• Extend a proportion or relationship beyond known values (given proportion graphically or in words)</li> <li>• Recognise graphs that show direct proportion</li> <li>• Solve problems involving direct proportion with a graph</li> <li>• Discuss and interpret real-life graphs</li> <li>• Interpret information from a complex real life graph, read values and discuss trends</li> <li>• Plot the graphs of a function derived from a real life problem</li> <li>• Discuss and interpret linear and non linear graphs from a range of sources</li> <li>• Recognise graphs showing constant rates of change, average rates of change and variable rates of change</li> <li>• Plot a simple straight line graph (distance-time)</li> <li>• Draw and use graphs to solve distance-time problems</li> <li>• Identify misleading graphs and statistics – choosing the appropriate reasons from a small choice of options</li> <li>• Identify misleading graphs and statistics – choosing the appropriate reasons from a wide choice of options, or writing their own reasons.</li> </ul>	<p>Here you can find interesting links with science and can link the topics you will be taught in Science:  <a href="https://nrich.maths.org/8457">https://nrich.maths.org/8457</a></p> <p>Different scenarios with real life graphs:  <a href="http://www.graphingstories.com/">http://www.graphingstories.com/</a></p> <p>How does accurate data become misleading?  <a href="https://www.datapine.com/blog/misleading-statistics-and-data/">https://www.datapine.com/blog/misleading-statistics-and-data/</a></p>
<b>3 &amp; 4</b>	<b>Transformations</b>	<ul style="list-style-type: none"> <li>• Describe a reflection, giving the equation of the line of reflection</li> <li>• Show reflection on a coordinate grid in <math>y = x</math>, <math>y = -x</math></li> <li>• Describe and carry out translations using column vectors</li> </ul>	<p>Interactive tool for transformations:  <a href="https://www.mathspad.co.uk/i2/transform.php?a=rotation">https://www.mathspad.co.uk/i2/transform.php?a=rotation</a></p>

		<ul style="list-style-type: none"> <li>• Describe a rotation on a coordinate grid</li> <li>• Know that translations, rotations and reflections preserve length and angle</li> <li>• Know that translations, rotations and reflections map objects on to congruent images</li> <li>• Enlarge 2D shapes, given a centre of enlargement and a positive whole number scale factor</li> <li>• Describe 2D enlargements</li> <li>• Enlarge 2D shapes, given a centre of enlargement outside the shape and a negative whole-number scale factor</li> <li>• Enlarge 2D shapes, given a fractional scale factor</li> <li>• Recognise that enlargements preserve angle but not length</li> <li>• Enlarge 2D shapes and recognise the similarity of resulting shapes</li> <li>• Transform 2D shapes by simple combinations of rotations, reflections and translations, using ICT</li> <li>• Transform 2D shapes by more complex combinations of rotations, reflections and translations</li> <li>• Identify reflection symmetry in 3D shapes</li> <li>• Understand the implications of enlargement for perimeter</li> <li>• Identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments</li> <li>• Calculate areas and volumes of shapes after enlargement</li> </ul>	<p>Transformation treasure trail  <a href="https://www.teachitmaths.co.uk/resources/ks4/transformations-mixed/transformations-treasure-trail/20832">https://www.teachitmaths.co.uk/resources/ks4/transformations-mixed/transformations-treasure-trail/20832</a></p>
	<p><b>Fractions, decimals and percentages</b></p>	<ul style="list-style-type: none"> <li>• Know fractional equivalents to key recurring decimals e.g. 0.333333..., 0.66666666..., 0.111111...</li> <li>• Know the denominators of simple fractions that produce recurring decimals, and those that do not</li> </ul>	<p><a href="https://nrich.maths.org/1853">https://nrich.maths.org/1853</a>  Explore what makes a fraction a recurring decimal</p>

		<ul style="list-style-type: none"> <li>• Convert a recurring decimal to a fraction</li> <li>• Use an inverse operation</li> <li>• Use the unitary method for an inverse operation</li> <li>• Calculate percentage change, using the formula 'actual change/original amount <math>\times 100</math>' – where formula is given</li> <li>• Calculate percentage change, using the formula 'actual change/original amount <math>\times 100</math>' – where formula is recalled</li> <li>• Calculate compound interest and repeated percentage change</li> </ul>	<p>Challenging word problems :  <a href="https://braingenie.ck12.org/skills/107393">https://braingenie.ck12.org/skills/107393</a></p> <p>Investigate the use of compound interest in banking</p>
	<p><b>Constructions and loci</b></p>	<ul style="list-style-type: none"> <li>• Construct a triangle given two sides and included angle (SAS)</li> <li>• Construct a triangle given two angles and the included side (ASA)</li> <li>• Use straight edge and compass to construct a triangle, given three sides (SSS)</li> <li>• Use ruler and protractor to draw accurate nets of 3-D shapes, using squares, rectangles and triangles e.g. regular tetrahedron, square-based pyramid, triangular prism</li> <li>• Use straight edge and compass to construct the mid-point and perpendicular bisector of a line segment</li> <li>• Use straight edge and compass to construct the bisector of an angle</li> <li>• Use straight edge and compass to construct the perpendicular from a point on a line segment</li> <li>• Use straight edge and compass to construct a triangle, given right angle, hypotenuse and side (RHS)</li> <li>• Use straight edge and compass to construct the perpendicular from a point to a line segment</li> <li>• recognise and use the perpendicular distance from a point to a line as the shortest distance to the line</li> </ul>	<p>Have a go at this game:  <a href="http://www.euclidthegame.com/Tutorial/">http://www.euclidthegame.com/Tutorial/</a></p>

		<ul style="list-style-type: none"> <li>• Draw the locus equidistant between 2 points or from a point</li> <li>• Draw the locus equidistant between 2 lines</li> <li>• know that all the points equidistant from a single point in space form the surface of a sphere</li> <li>• Draw the locus equidistant from a line and around a rectangle</li> <li>• Produce shapes and paths by using descriptions of loci</li> <li>• Use construction to find the locus of a point that moves according to a rule</li> </ul>	<p>Visit this website to find out more:  <a href="https://sciencevmagic.net/geo/">https://sciencevmagic.net/geo/</a></p>
<p><b>5 &amp; 6</b></p>	<p><b>Probability</b></p>	<ul style="list-style-type: none"> <li>• Understand and use the probability scale from 0 to 1</li> <li>• Identify all possible mutually exclusive outcomes of a single event</li> <li>• Find and justify probabilities based on equally likely outcomes in simple contexts</li> <li>• Calculate the probability of a combination of events or single missing events of a set of mutually exclusive events using 'sum of outcomes = 1'</li> <li>• Calculate the probability of the final event of a set of mutually exclusive events</li> <li>• Know that if probability of event is p, probability of not occurring is 1 – p</li> <li>• Understand relative frequency as an estimate of probability and know when to add or multiply probabilities</li> <li>• Know how to calculate relative frequency</li> <li>• Use relative frequency to make estimates</li> <li>• Apply estimated probabilities to future data</li> <li>• Estimate probabilities based on these data (collected from a simple experiment)</li> <li>• Plot and use relative frequency diagrams, and recognise that with repeated trials experimental probability tends to a limit</li> <li>• Use experimentation to complete a data collection sheet, e.g. throwing a die or data-</li> </ul>	<p>Investigate the use of probability in betting</p> <p>Try these probability tasks:  <a href="https://nrich.maths.org/9388">https://nrich.maths.org/9388</a></p> <p><a href="https://www.khanacademy.org/math/statistics-probability/designing-studies/sampling-methods-stats/e/using-probability-to-make-fair-decisions">https://www.khanacademy.org/math/statistics-probability/designing-studies/sampling-methods-stats/e/using-probability-to-make-fair-decisions</a></p>



		<p>logging</p> <ul style="list-style-type: none"> <li>• Identify all mutually exclusive outcomes for two successive events with two or three outcomes in each event</li> <li>• Use the vocabulary of probability to assign probability to events.</li> <li>• Identify conditions for a fair game</li> <li>• Draw and use tree diagrams to represent outcomes of two independent events and calculate probabilities</li> <li>• Calculate the probability of independent and dependent events</li> </ul>	<p>Find out about the use of probability in everyday life:  <a href="https://www.bartleby.com/essay/Probability-in-Everyday-Life-and-in-The-F39DGD4C8B6A">https://www.bartleby.com/essay/Probability-in-Everyday-Life-and-in-The-F39DGD4C8B6A</a></p>
	<p><b>Scale drawings and measures</b></p>	<ul style="list-style-type: none"> <li>• Use scales in maps and plans</li> <li>• Use and interpret maps, using proper map scales (1:25 000)</li> <li>• Draw diagrams to scale</li> <li>• Use and interpret scale drawings, where scales use mixed units, and drawings aren't done on squared paper, but have measurements marked on them.</li> <li>• Solve simple geometrical problems showing reasoning</li> <li>• Distinguish between conventions, definitions and derived properties</li> <li>• Solve geometric problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals</li> <li>• Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons</li> <li>• Make simple drawings, demonstrating accurate measurement of length and angle</li> <li>• Use bearings to specify direction</li> <li>• Solve angle problems involving bearings</li> <li>• Begin to use congruency to solve simple problems in triangles and quadrilaterals</li> <li>• Know and use the criteria for congruence of triangles</li> <li>• Identify 2D shapes that are congruent or</li> </ul>	<p>Practise using and interpreting map scales in real life situations</p> <p>Try these tasks:  <a href="https://nrich.maths.org/11943">https://nrich.maths.org/11943</a></p> <p>Investigate the use of bearings in real life</p> <p>Try these challenging geometry tasks:  <a href="http://ccsstoobox.agilemind.com/pdf/MARS%20task%20Geometry.pdf">http://ccsstoobox.agilemind.com/pdf/MARS%20task%20Geometry.pdf</a></p>

		<p>similar by reference to sides and angles</p> <ul style="list-style-type: none"> <li>• Use the information given about the length of sides and size of angles to determine whether triangles are congruent, or similar</li> <li>• Know that triangles given SSS, SAS, ASA or RHS are unique, but that triangles given SSA or AAA are not.</li> <li>• Find points that divide a line in a given ratio, using the properties of similar triangles</li> <li>• Use similarity to solve problems in 2D shapes</li> </ul>	
<p style="text-align: center;"><b>Graphs</b></p>		<ul style="list-style-type: none"> <li>• Plot the graphs of linear functions in the form <math>y = mx + c</math> and recognise and compare their features</li> <li>• Recognise that linear functions can be rearranged to give <math>y</math> explicitly in terms of <math>x</math> e.g. rearrange <math>y + 3x - 2 = 0</math> in the form <math>y = 2 - 3x</math></li> <li>• Recognise that straight line graphs can be written in the form <math>y = mx + c</math></li> <li>• Be able to work out when a point is on a line</li> <li>• Begin to consider the features of graphs of simple linear functions, where <math>y</math> is given explicitly in terms of <math>x</math></li> <li>• Without drawing the graphs, compare and contrast features of graphs such as <math>y = 4x</math>, <math>y = 4x + 6</math>, <math>y = x + 6</math>, <math>y = -4x</math>, <math>y = x - 6</math></li> <li>• Know and use <math>y = mx + c</math> for any straight line</li> <li>• Know for a straight line <math>y = mx + c</math>, <math>m</math> is the gradient and <math>m = (\text{change in } y)/(\text{change in } x)</math></li> <li>• Recognise that any line parallel to a given line will have the same gradient.</li> <li>• Know that a line perpendicular to the line <math>y = mx + c</math>, will have a gradient of <math>-1/m</math></li> <li>• Recognise when lines are parallel or perpendicular from their equations</li> <li>• Recognise when lines are parallel and where a line crosses the <math>y</math>-axis from the equation of the line</li> <li>• Find the inverse of a linear function such as <math>x \rightarrow 2x + 5</math>, <math>x \rightarrow 2(x - 3)</math>, <math>x \rightarrow (x + 2)/4</math>, <math>x \rightarrow 5x - 4</math></li> </ul>	<p>Investigate the equation of a linear graph using the websites below:</p> <p><a href="https://www.interactive-maths.com/y--mx--c-activity-ggb.html">https://www.interactive-maths.com/y--mx--c-activity-ggb.html</a></p> <p><a href="https://www.mathspad.co.uk/teach/linkedDocuments/linearGraphs/linearGraphsProblems.pdf">https://www.mathspad.co.uk/teach/linkedDocuments/linearGraphs/linearGraphsProblems.pdf</a></p> <p><a href="https://www.interactive-maths.com/parallel-lines-ggb.html">https://www.interactive-maths.com/parallel-lines-ggb.html</a></p> <p><a href="https://www.interactive-maths.com/perpendicular-lines-ggb.html">https://www.interactive-maths.com/perpendicular-lines-ggb.html</a></p> <p><a href="https://www.mathsisfun.com/numberpatterns.html">https://www.mathsisfun.com/numberpatterns.html</a></p> <p>Explore how graphs are used in real life:</p> <p><a href="https://www.khanacademy.org/math/algebra/linear-word-problems/interpreting-linear-functions/e/interpreting-linear-graphs">https://www.khanacademy.org/math/algebra/linear-word-problems/interpreting-linear-functions/e/interpreting-linear-graphs</a></p> <p><a href="https://nrich.maths.org/9003">https://nrich.maths.org/9003</a></p>

		<ul style="list-style-type: none"><li>• Recognise the graph of the inverse of simple linear functions</li><li>• Recognise that when the linear and inverse of a linear function such as <math>y = 2x</math>, <math>y = 3x</math> are plotted, they are a reflection in the line <math>y = x</math></li><li>• Recognise geometric sequences and appreciate other sequences that arise</li><li>• Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear , exponential and reciprocal graphs</li><li>• Solve problems involving direct and inverse proportion, including graphical and algebraic representations</li></ul>	
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Year 9			
Term	Topic	Content Learnt	High Performing Students will:
Autumn	<b>1 Number</b>		
	1.1 Number problems and reasoning	<ul style="list-style-type: none"> <li>Use priority of operations with positive and negative numbers.</li> <li>Simplify calculations by cancelling.</li> <li>Use inverse operations.</li> <li>Work out the total number of ways of performing a series of tasks.</li> </ul>	<p>Explore: <a href="https://www.resourceaholic.com/p/problem-solving.html">https://www.resourceaholic.com/p/problem-solving.html</a> for challenges and real life situations using number.</p> <p>Explore: <a href="https://nrich.maths.org/8645">https://nrich.maths.org/8645</a> which goes through many examples of number problems covered in this topic .</p>
	1.2 Place value and estimating	<ul style="list-style-type: none"> <li>Estimate an answer.</li> <li>Use place value to answer questions.</li> </ul>	<p>What is a surd?: <a href="https://www.mathsisfun.com/surds.html">https://www.mathsisfun.com/surds.html</a> and here: <a href="https://www.math-only-math.com/pure-and-mixed-surds.html">https://www.math-only-math.com/pure-and-mixed-surds.html</a></p> <p>Working with indices: Go here for clarity and interesting questions with indices: <a href="https://mathsmadeeasy.co.uk/gcse-maths-revision/rules-indices-gcse-maths-revision-worksheets/">https://mathsmadeeasy.co.uk/gcse-maths-revision/rules-indices-gcse-maths-revision-worksheets/</a></p>
	1.3 HCF and LCM	<ul style="list-style-type: none"> <li>Write a number of the product of its prime factors.</li> <li>Find the HCF and LCM of two numbers.</li> </ul>	
	1.4 Calculating with powers (indices)	<ul style="list-style-type: none"> <li>Use powers and roots in calculations.</li> <li>Multiply and divide using index laws.</li> <li>Work out a power raised to a power.</li> </ul>	
	1.5 Zero, negative and fractional indices	<ul style="list-style-type: none"> <li>Use negative indices.</li> <li>Use fractional indices.</li> </ul>	
	1.6 Powers of 10 and standard form	<ul style="list-style-type: none"> <li>Write a number in standard form.</li> <li>Calculate with numbers in standard form.</li> </ul>	
	1.7 Surds	<ul style="list-style-type: none"> <li>Understand the difference between rational and irrational numbers.</li> <li>Simplify a surd.</li> <li>Rationalise a denominator.</li> </ul>	
	<b>2 Algebra</b>		
	2.1 Algebraic indices	<ul style="list-style-type: none"> <li>Use the rules of indices to simplify algebraic expressions.</li> </ul>	<p>Why do we use algebra? <a href="https://www.mathscareers.org.uk/article/10-reasons-for-studying-algebra/">https://www.mathscareers.org.uk/article/10-reasons-for-studying-algebra/</a> and here: <a href="https://www.ipracticemath.com/learn/algebra/algebra_in_daily_life">https://www.ipracticemath.com/learn/algebra/algebra_in_daily_life</a></p> <p>Perhaps go here if you need to recap year 8 algebra: <a href="https://www.drfrostmaths.com/resource.php?rid=223">https://www.drfrostmaths.com/resource.php?rid=223</a></p> <p>Websites to help and expand your knowledge of algebra: <a href="https://www.mathsisfun.com/algebra/index.html">https://www.mathsisfun.com/algebra/index.html</a> and here:</p>
	2.2 Expanding and factorising	<ul style="list-style-type: none"> <li>Use the index laws.</li> <li>Multiply and divide expressions.</li> <li>Use correct algebraic notation.</li> <li>Write and simplify expressions.</li> <li>Expand brackets.</li> <li>Factorise algebraic expressions.</li> </ul>	
	2.3 Equations	<ul style="list-style-type: none"> <li>Solve equations involving brackets and numerical fractions.</li> <li>Use equations to solve problems.</li> </ul>	
	2.4 Formulae	<ul style="list-style-type: none"> <li>Substitute numbers into formulae.</li> </ul>	

		<ul style="list-style-type: none"> <li>Rearrange formulae.</li> <li>Distinguish between expressions, equations, formulae and identities.</li> </ul>	<a href="https://www.missbsresources.com/algebra/algebra">https://www.missbsresources.com/algebra/algebra</a>
	<b>2.5 Linear sequences</b>	<ul style="list-style-type: none"> <li>Find a general formula for the nth term of an arithmetic sequence.</li> <li>Determine whether a particular number is a term of a given arithmetic sequence.</li> </ul>	Look at the Fibonacci Sequence from a Scientific point of view: <a href="https://www.livescience.com/37470-fibonacci-sequence.html">https://www.livescience.com/37470-fibonacci-sequence.html</a>
	<b>2.6 Non-linear sequences</b>	<ul style="list-style-type: none"> <li>Solve problems using geometric sequences.</li> <li>Work out terms in Fibonacci-like sequences.</li> <li>Find the nth term of a quadratic sequence.</li> </ul>	
	<b>2.7 More expanding and factorising</b>	<ul style="list-style-type: none"> <li>Expand the product of two brackets.</li> <li>Use the difference of two squares.</li> <li>Factorise quadratics of the form <math>x^2 + bx + c</math>.</li> </ul>	
	<b>3 Interpreting and representing data</b>		
<b>Spring</b>	<b>3.1 Statistical diagrams 1</b>	<ul style="list-style-type: none"> <li>Draw and interpret comparative and composite bar charts.</li> <li>Interpret and compare data shown in bar charts, line graphs and histograms</li> <li>Construct and use back-to-back stem and leaf diagrams.</li> <li>Construct and use frequency polygons and pie charts.</li> </ul>	Go here for some really interesting data on world issue (including the Corona Virus): <a href="https://www.worldometers.info/">https://www.worldometers.info/</a>  Why do we study statistics?: <a href="https://www.studypug.com/blog/the-importance-of-statistics-in-scientific-research-and-development/">https://www.studypug.com/blog/the-importance-of-statistics-in-scientific-research-and-development/</a> and here: <a href="https://statanalytica.com/blog/importance-of-statistics/">https://statanalytica.com/blog/importance-of-statistics/</a>
	<b>3.2 Time series</b>	<ul style="list-style-type: none"> <li>Plot and interpret time series graphs.</li> <li>Use trends to predict what might happen in the future.</li> </ul>	Statistics is manipulated in the world but is true statistics valid? <a href="https://statisticsbyjim.com/basics/importance-statistics/">https://statisticsbyjim.com/basics/importance-statistics/</a>
	<b>3.3 Scatter graphs</b>	<ul style="list-style-type: none"> <li>Plot and interpret scatter graphs.</li> <li>Determine whether or not there is a linear relationship between two variables.</li> </ul>	Use <a href="http://www.Drfrosmaths.com">www.Drfrosmaths.com</a> for help with videos and worksheets on statistics
	<b>3.4 Line of best fit</b>	<ul style="list-style-type: none"> <li>Draw a line of best fit on a scatter graph.</li> <li>Use the line of best fit to predict values.</li> </ul>	
	<b>3.5 Averages and range</b>	<ul style="list-style-type: none"> <li>Decide which average is best for a set of data.</li> <li>Estimate the mean and range from a grouped frequency table.</li> <li>Find the modal class and the group containing the median.</li> </ul>	
	<b>3.6 Statistical diagrams 2</b>	<ul style="list-style-type: none"> <li>Construct and use two-way tables.</li> <li>Choose appropriate diagrams to display data.</li> <li>Recognise misleading graphs.</li> </ul>	

4 Fractions, ratio and percentages		
4.1 Fractions	<ul style="list-style-type: none"> <li>• Compare fractions.</li> <li>• Add, subtract, multiply and divide fractions and mixed numbers.</li> <li>• Find a fraction of a quantity or measurement.</li> <li>• Use fractions to solve problems.</li> <li>• Find the reciprocal of an integer, decimal or fraction.</li> </ul>	<p>Find out how often we use fractions, ratio and proportion in real life: <a href="https://www.tes.com/teaching-resource/teachers-tv-ratios-and-proportions-in-real-life-6049215">https://www.tes.com/teaching-resource/teachers-tv-ratios-and-proportions-in-real-life-6049215</a></p> <p>Go to Khan academy for help with ratios: <a href="https://www.khanacademy.org/math/pre-algebra/pre-algebra-ratios-rates">https://www.khanacademy.org/math/pre-algebra/pre-algebra-ratios-rates</a></p> <p>Are you told Uni is expensive? Go here and calculate your repayments. It's so much easier than you have probably been told!! <a href="https://www.gov.uk/repaying-your-student-loan/what-you-pay">https://www.gov.uk/repaying-your-student-loan/what-you-pay</a></p> <p>And here: <a href="https://www.moneysavingexpert.com/students/student-loans-tuition-fees-changes/">https://www.moneysavingexpert.com/students/student-loans-tuition-fees-changes/</a></p>
4.2 Ratios	<ul style="list-style-type: none"> <li>• Write ratios in the form 1 : n or n : 1.</li> <li>• Compare ratios.</li> <li>• Find quantities using ratios.</li> <li>• Solve problems involving ratios.</li> </ul>	
4.3 Ratio and proportion	<ul style="list-style-type: none"> <li>• Convert between currencies and measures.</li> <li>• Recognise and use direct proportion.</li> <li>• Solve problems involving ratios and proportion.</li> </ul>	
4.4 Percentages	<ul style="list-style-type: none"> <li>• Work out percentage increases and decreases.</li> <li>• Solve real-life problems involving percentages.</li> </ul>	
4.5 Fractions, decimals and percentages	<ul style="list-style-type: none"> <li>• Calculate using fractions, decimals and percentages.</li> <li>• Convert a recurring decimal to a fraction.</li> </ul>	
5 Angles and trigonometry		
5.1 Angle properties of triangles and quadrilaterals	<ul style="list-style-type: none"> <li>• Derive and use the sum of angles in a triangle and in a quadrilateral.</li> <li>• Derive and use the fact that the exterior angle of a triangle is equal to the sum of the two opposite interior angles.</li> </ul>	<p>Everything you want to know about angles in shapes: <a href="https://www.mathsisfun.com/geometry/interior-angles-polygons.html">https://www.mathsisfun.com/geometry/interior-angles-polygons.html</a></p> <p>Who is Pythagoras? <a href="https://www.famousscientists.org/pythagoras/">https://www.famousscientists.org/pythagoras/</a></p> <p>Have a look at the proof of Pythagoras theorem: <a href="https://www.mathsisfun.com/geometry/pythagorean-theorem-proof.html">https://www.mathsisfun.com/geometry/pythagorean-theorem-proof.html</a></p> <p>Try get a deeper understanding of 90° trigonometry here: <a href="https://www.mathsisfun.com/geometry/pythagorean-theorem-proof.html">https://www.mathsisfun.com/geometry/pythagorean-theorem-proof.html</a></p> <p>And here you can watch a video of good examples where we use trig in real life situations: <a href="https://www.youtube.com/watch?v=cjMqxYpuu_w">https://www.youtube.com/watch?v=cjMqxYpuu_w</a></p>
5.2 Interior angles of a polygon	<ul style="list-style-type: none"> <li>• Understand and use the angle properties of parallel lines.</li> <li>• Find missing angles using corresponding and alternate angles.</li> <li>• Calculate the sum of the interior angles of a polygon.</li> <li>• Use the interior angles of polygons to solve problems.</li> </ul>	
5.3 Exterior angles of a polygon	<ul style="list-style-type: none"> <li>• Know the sum of the exterior angles of a polygon.</li> <li>• Use the angles of polygons to solve problems.</li> </ul>	
5.4 Pythagoras' theorem 1	<ul style="list-style-type: none"> <li>• Calculate the length of the hypotenuse in a right-angled triangle.</li> <li>• Solve problems using Pythagoras' theorem.</li> </ul>	

	<b>5.5 Pythagoras' theorem 2</b>	<ul style="list-style-type: none"> <li>• Calculate the length of a shorter side in a right-angled triangle.</li> <li>• Solve problems using Pythagoras' theorem.</li> </ul>	
	<b>5.6 Trigonometry 1</b>	<ul style="list-style-type: none"> <li>• Use trigonometric ratios to find lengths in a right-angled triangle.</li> <li>• Use trigonometric ratios to solve problems.</li> </ul>	
	<b>5.7 Trigonometry 2</b>	<ul style="list-style-type: none"> <li>• Use trigonometric ratios to calculate an angle in a right-angled triangle.</li> <li>• Find angles of elevation and angles of depression.</li> <li>• Use trigonometric ratios to solve problems.</li> <li>• Know the exact values of the sine, cosine and tangent of some angles.</li> </ul>	
	<b>6 Graphs</b>		
<b>Summer</b>	<b>6.1 Linear graphs</b>	<ul style="list-style-type: none"> <li>• Find the gradient and y-intercept from a linear equation.</li> <li>• Rearrange an equation into the form <math>y = mx + c</math>.</li> <li>• Compare two graphs from their equations.</li> <li>• Plot graphs with equations <math>ax + by = c</math>.</li> </ul>	Equation of a straight line: <a href="https://www.bbc.co.uk/bitesize/guides/z9387p3/revision/2">https://www.bbc.co.uk/bitesize/guides/z9387p3/revision/2</a>
	<b>6.2 More linear graphs</b>	<ul style="list-style-type: none"> <li>• Sketch graphs using the gradient and intercepts.</li> <li>• Find the equation of a line, given its gradient and one point on the line.</li> <li>• Find the gradient of a line through two points.</li> </ul>	Go here for different activities using straight line graphs: <a href="https://www.interactive-maths.com/straight-line-graphs.html">https://www.interactive-maths.com/straight-line-graphs.html</a> and here for drawing and comparing gradients: <a href="http://www.desmos.com">www.desmos.com</a> and different types of graphs
	<b>6.3 Graphing rates of change</b>	<ul style="list-style-type: none"> <li>• Draw and interpret distance–time graphs.</li> <li>• Calculate average speed from a distance–time graph.</li> <li>• Understand velocity–time graphs.</li> <li>• Find acceleration and distance from velocity–time graphs.</li> </ul>	Why study quadratics at school as written by Oxford University: <a href="https://educationblog.oup.com/secondary/maths/why-quadratics">https://educationblog.oup.com/secondary/maths/why-quadratics</a>
	<b>6.4 Real-life graphs</b>	<ul style="list-style-type: none"> <li>• Draw and interpret real-life linear graphs.</li> <li>• Recognise direct proportion.</li> <li>• Draw and use a line of best fit.</li> </ul>	
	<b>6.5 Line segments</b>	<ul style="list-style-type: none"> <li>• Find the coordinates of the midpoint of a line segment.</li> <li>• Find the gradient and length of a line segment.</li> <li>• Find the equations of lines parallel or perpendicular to a given line.</li> </ul>	
	<b>6.6 Quadratic graphs</b>	<ul style="list-style-type: none"> <li>• Draw quadratic graphs.</li> <li>• Solve quadratic equations using graphs.</li> </ul>	

	<ul style="list-style-type: none"> <li>Identify the line of symmetry of a quadratic graph.</li> <li>Interpret quadratic graphs relating to real-life situations.</li> </ul>	
<b>6.7 Cubic and reciprocal graphs</b>	<ul style="list-style-type: none"> <li>Draw graphs of cubic functions.</li> <li>Solve cubic equations using graphs.</li> <li>Draw graphs of reciprocal functions.</li> <li>Recognise a graph from its shape.</li> </ul>	
<b>6.8 More graphs</b>	<ul style="list-style-type: none"> <li>Interpret linear and non-linear real-life graphs.</li> <li>Draw the graph of a circle.</li> </ul>	
<b>7 Area and volume</b>		
<b>7.1 Perimeter and area</b>	<ul style="list-style-type: none"> <li>Find the perimeter and area of compound shapes.</li> <li>Recall and use the formula for the area of a trapezium.</li> </ul>	<p>In-depth article of using perimeter and area of shapes in the real world:  <a href="https://kb.osu.edu/bitstream/handle/1811/78121/OJSM_63_Spring2011_11.pdf">https://kb.osu.edu/bitstream/handle/1811/78121/OJSM_63_Spring2011_11.pdf</a></p> <p>Find the volumes and areas of any shape here:  <a href="https://www.skillsyouneed.com/num/volume.html">https://www.skillsyouneed.com/num/volume.html</a></p> <p>Real world problems with area and volume:  <a href="https://study.com/academy/lesson/volume-real-world-geometry-problems.html">https://study.com/academy/lesson/volume-real-world-geometry-problems.html</a></p> <p>Want a challenge on perimeter, area and volume?  <a href="https://nrich.maths.org/9374">https://nrich.maths.org/9374</a></p>
<b>7.2 Units and accuracy</b>	<ul style="list-style-type: none"> <li>Convert between metric units of area.</li> <li>Calculate the maximum and minimum possible values of a measurement.</li> </ul>	
<b>7.3 Prisms</b>	<ul style="list-style-type: none"> <li>Convert between metric units of volume.</li> <li>Calculate volumes and surface areas of prisms.</li> </ul>	
<b>7.4 Circles</b>	<ul style="list-style-type: none"> <li>Calculate the area and circumference of a circle.</li> <li>Calculate area and circumference in terms of <math>\pi</math>.</li> </ul>	
<b>7.5 Sectors of circles</b>	<ul style="list-style-type: none"> <li>Calculate the perimeter and area of semicircles and quarter circles.</li> <li>Calculate arc lengths, angles and areas of sectors of circles.</li> </ul>	
<b>7.6 Cylinders and spheres</b>	<ul style="list-style-type: none"> <li>Calculate volume and surface area of a cylinder and a sphere.</li> <li>Solve problems involving volumes and surface areas.</li> </ul>	
<b>7.7 Pyramids and cones</b>	<ul style="list-style-type: none"> <li>Calculate volume and surface area of pyramids and cones.</li> <li>Solve problems involving pyramids and cones.</li> </ul>	