

## Edexcel GCSE (9-1) Mathematics

UNIT / LESSON	HOURS	PRIOR KNOWLEDGE
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**Key:** *Italic specification references are assumed prior knowledge and are covered*

<b>1 Number</b>	15	Have a firm grasp of place value and be able to order integers and decimals and use the four operations. Know integer complements to 10 and to 100, multiplication facts to $10 \times 10$ , strategies for multiplication and division. Have encountered squares, square roots, cubes and cube roots and have knowledge of their properties.
1.1 Number problems and reasoning		Multiply numbers in a similar format to questions later in the section. List possible outcomes from two events.
1.2 Place value and estimating		Estimate the value of a square root. Round numbers to a specified degree of accuracy. Apply the four operations.
1.3 HCF and LCM		Multiply prime factors together. List the factors of a number.
1.4 Calculating with powers (indices)		Work out simple powers. Apply the four operations.
1.5 Zero, negative and fractional indices		Convert between fractions and decimals. Use the laws of indices for positive indices.
1.6 Powers of 10 and standard form		Multiply by powers of 10 when the number is written as an ordinary number and not an index. Review different ways to divide by 10. Use negative indices.
1.7 Surds		Review the meaning of the dot in the recurring notation. Identify the missing multiple which practices the skills of searching for a perfect square factor.

<b>2 Algebra</b>	<b>14</b>	<p>Use negative numbers with the four operations and recall and use hierarchy of operations and Use a calculator for decimals and negative numbers. Use index laws numerically.</p> <p>Use and interpret algebraic notation.</p> <p>Set up and solve simple equations.</p> <p>Recall the definitions of geometric and arithmetic sequences.</p>
2.1 Algebraic indices		<p>Recognise that squaring and taking the square roots, and cubing and taking the cube root, are</p> <p>Calculate with powers.</p>
2.2 Expanding and factorising		<p>Simplify algebraic terms, including using index notation.</p> <p>Multiply a single term over a bracket.</p> <p>Find highest common factors.</p>
2.3 Equations		<p>Solve a simple equation expressed in words.</p> <p>Solve simple algebraic equations</p> <p>Find lowest common multiples.</p>
2.4 Formulae		<p>Substitute values into a one-step formula.</p> <p>Write numbers in standard form.</p>
2.5 Linear sequences		<p>Find the next term of a given arithmetic sequence.</p> <p>Substitute values in a simple linear expression.</p> <p>Write terms in a sequence given the nth term.</p> <p>Use a function machine to find outputs.</p>
2.6 Non-linear sequences		<p>Find the next term of given sequences.</p> <p>Identify arithmetic and geometric sequences.</p> <p>Find the term-to-term rule for a sequence.</p>
2.7 More expanding and factorising		<p>Recalling a square root.</p> <p>Finding the factor pairs of small integers.</p>
<b>3 Interpreting and representing data</b>	<b>9</b>	<p>Read scales on graphs, draw circles, measure angles and plot coordinates in the first quadrant. Have experience of tally charts.</p> <p>Use inequality notation.</p> <p>Find midpoint of two numbers.</p> <p>Find the range, mean, median and mode of a data set.</p>
3.1 Statistical diagrams 1		<p>Work out mode, median and range from a list of numbers.</p>
3.2 Time series		<p>Identify trends by noticing whether sequences of numbers increase, decrease or oscillate.</p>
3.3 Scatter graphs		<p>Recognise when a line has a positive, negative or zero gradient.</p> <p>Plot points on a coordinate grid, and identify points that do not lie on a straight line.</p>
3.4 Line of best fit		<p>Understand and be able to define the meaning of correlation.</p> <p>Read values from graphs.</p>
3.5 Averages and range		<p>Find the range of a list of numbers.</p> <p>Find the midpoint of two numbers.</p>
3.6 Statistical diagrams 2		<p>Use subtraction to find missing values.</p>

		Draw a bar chart.
		Draw a pie chart.

4 Fractions, ratio and percentages	18	<p>Know the four operations of number.</p> <p>Find common factors.</p> <p>Have a basic understanding of fractions as being 'parts of a whole'.</p> <p>Define percentage as 'number of parts per hundred'.</p> <p>Be aware that percentages are used in everyday life.</p> <p>Use ratio notation, and to write a ratio in its simplest form.</p>
4.1 Fractions		Identify unit fractions, improper fractions and mixed numbers.
		Multiply a whole number by a fraction.
		Know the priority of operations.
4.2 Ratios		Multiply a fraction by its reciprocal for a product of 1.
		Simplify ratios.
		Write ratios in the form $n : 1$ .
4.3 Ratio and proportion		Write one number as a proportion of the total.
		Identify equivalent ratios.
4.4 Percentages		Find a percentage of a given amount.
		Work out percentage multipliers.
4.5 Fractions, decimals and percentages		Convert between fractions, decimals and percentages.
		Solve simple equations.

5 Angles and trigonometry	12	<p>Rearrange simple formulae and equations, as preparation for rearranging trig formulae. Recall basic angle facts.</p> <p>Understand that fractions are more accurate in calculations than rounded percentage or decimal. Recall the properties of special types of triangles and quadrilaterals.</p>
5.1 Angle properties of triangles and		<p>Recognise special types of triangle and quadrilateral.</p> <p>Recall basic angle facts.</p>
5.2 Interior angles of a polygon		<p>Name polygons and understand the meaning of 'regular polygon'.</p> <p>Substitute numbers into an expression.</p> <p>Find missing angles in triangles, quadrilaterals and at a point.</p>
5.3 Exterior angles of a polygon		<p>Find missing angles on a straight line.</p> <p>Calculate the sum of interior angles of a polygon.</p>
5.4 Pythagoras' theorem 1		<p>Recall square numbers and square roots.</p> <p>Find the area of a square.</p>
5.4 Pythagoras' theorem 1		<p>Find square roots.</p> <p>Recognise perfect squares.</p> <p>Use Pythagoras' theorem to find the length of the hypotenuse.</p>
5.6 Trigonometry 1		<p>Convert fractions to decimals.</p> <p>Identify the hypotenuse.</p> <p>Use the angle sum of a triangle to work out missing angles.</p>
5.7 Trigonometry 2		<p>Identify the opposite and adjacent sides of a given angle in right-angled triangles.</p> <p>Use the trigonometric ratios to find lengths in right-angled triangles.</p>

<b>6 Graphs</b>	20	<p>Identify coordinates of given points in the first quadrant or all four quadrants. Write the equation for a straight line graph.</p> <p>Use and draw conversion graphs.</p> <p>Use function machines and inverse operations.</p> <p>Use compound units, such a speed.</p>
6.1 Linear graphs		Identify positive and negative gradients and intercepts from graphs.
		Rearrange equations.
6.2 More linear graphs		Identify lines with the same gradient or y-intercept from their equations.
		Write the equation of a line from a graph.
6.3 Graphing rates of change		Find speed from given distance and time.
		Find the area of triangles and rectangles.
6.4 Real-life graphs		Write the equation of a line from a sketch graph.
		Plot a graph using values given in a table.
6.5 Line segments		Identify parallel and perpendicular lines
		Know properties of gradients of parallel lines.
		Identify the gradient and intercept from an equation in the form $y = mx + c$ .
6.6 Quadratic graphs		Identify quadratic expressions.
		Write the equation of a line from a graph.
6.7 Cubic and reciprocal graphs		Know the shape of linear and quadratic graphs.
6.8 More graphs		Match the shape of a container to the graph of depth of water against time.
		Read values from graphs.

<b>7 Area and volume</b>	17	<p>Know the names and properties of 3D shapes.</p> <p>Know the concept of perimeter and area by measuring lengths of sides. Substitute numbers into an equation and give answers to an appropriate degree of accuracy. Know the various metric units.</p> <p>Identify planes of symmetry of 3D solids.</p> <p>Sketch a net of a 3D shape.</p> <p>Work out the volume of a 3D solid made of cuboids.</p> <p>Recall Pythagoras' theorem.</p>
7.1 Perimeter and area		Recognising units of length (perimeter) and area.
		Work out the area and perimeter of rectangles, triangles and parallelograms.
7.2 Units and accuracy		Recall the formulae for the area of quadrilaterals and triangles. Identify the possible integer
		Round numbers to a specified degree of accuracy.
		Work out percentages of quantities.
7.3 Prisms		Calculate the volume and surface area of a cuboid.
		Calculate the volume of a shape made from cuboids.
7.4 Circles		Understand 'radius' and 'diameter'.
		Solve and rearrange simple equations.
7.5 Sectors of circles		Work out fractions of a circle given the angle of a sector.
		Simplify equations.
7.6 Cylinders and spheres		Find the area and circumference of a circle in terms of $\pi$ .
		Sketch a net of a cylinder.
		Solve simple equations.
7.7 Pyramids and cones		Find the volume of a cube.
		Find the side length of a cube given its volume.
		Calculate the area of a triangle.
		Use Pythagoras' theorem to work out the length of the hypotenuse.

<b>8 Transformations and constructions</b>	13	<p>Recognise 2D shapes.</p> <p>Plot coordinates in four quadrants and linear equations parallel to the coordinate axes. Convert metric measures.</p> <p>Recognise congruent and similar shapes.</p> <p>Transform shapes using translation, reflection, rotation and enlargement.</p>
8.1 3D solids		Draw 3D shapes on an isometric grid.
		Recognise dimensions of a cuboid.
8.2 Reflection and rotation		Draw simple straight lines on a coordinate grid.
		Know whether the image is congruent to the original following a reflection or a rotation.
8.3 Enlargement		Enlarge shapes on a coordinate grid in one quadrant.
8.4 Transformations and combinations of		Describe translations.
8.5 Bearings and scale drawings		Convert metric measures and apply to scales.
		Accurate drawing of right-angled triangle.
8.6 Constructions 1		Accurate drawings of triangles given SSS and ASA.
		Know the meaning of the terms perpendicular, bisect, arc.
8.7 Constructions 2		Draw angles with a protractor.
		Construct triangles and deduce information from them.
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<b>9 Equations and inequalities</b>	13	Understand the $\geq$ and $\leq$ symbols. Substitute into, solve and rearrange linear equations. Factorise simple quadratic expressions. Recognise the equation of a circle.
9.1 Solving quadratic equations 1		Know that a square has two possible roots Find the factors of a given number. Factorise expressions. Solve simple equations containing a squared term.
9.2 Solving quadratic equations 2		Understand the term quadratic Find positive and negative square roots. Solve quadratic equations by factorising. Expand two pairs of brackets. Simplify surds.
9.3 Completing the square		Expand and simplify a square bracket. Simplify surds. Solve simple equations, giving the answer in surd form.
9.4 Solving simple simultaneous equations		Substitute into simple algebraic expressions. Rearrange equations.
9.5 More simultaneous equations		Recall the equation of a straight line. Solve simple simultaneous equations.
9.6 Solving linear and quadratic simultaneous equations		Identify different types of equations. Solve quadratic equations.
9.7 Solving linear inequalities		Understand inequality signs Construct correct inequalities from given information

10 Probability	8	<p>Understand that a probability is a number between 0 and 1, and distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur. Mark events and/or probabilities on a probability scale of 0 to 1. Know how to add and multiply fractions and decimals. Express one number as a fraction of another.</p> <p>List all outcomes for a single event systematically. Make predictions from experimental data. Complete a two-way table.</p>
10.1 Combined events		List all outcomes for a single event systematically.
		List all outcomes for two events systematically.
10.2 Mutually exclusive events		Add decimals. Subtract decimals and fractions from 1.
		Understand the relationship between ratios and fractions.
10.3 Experimental probability		Simplify fractions.
		Multiply whole numbers by decimals.
10.4 Independent events and tree diagrams		Add and multiply fractions and decimals.
10.5 Conditional probability		Know that the probability of something not happening is 1 minus the probability of the event happening.
		Draw and use probability tree diagrams.
10.6 Venn diagrams and set notation		Interpret inequalities.
		Use Venn diagrams.

<b>11 Multiplicative reasoning</b>	<b>8</b>	<p>Find a percentage of an amount and relate percentages to decimals. Rearrange equations and use these to solve problems. Know speed = distance/time, density = mass/volume. Convert between metric units. Solve simple direct and indirect proportion problems, including currency conversion.</p>
11.1 Growth and decay		Understand the use of indices.
		Work out the decimal multiplier for a percentage increase/decrease.
11.2 Compound measures		Calculate simple rates.
		Substitute numbers into equations, and solve for the unknown.
		Use speed = distance/time to solve problems.
11.3 More compound measures		Convert between metric units.
		Recall the formulae for the area of a circle and volume of a prism.
11.4 Ratio and proportion		Rearrange formulae.
		Recognise graphs of $y = x$ and $y = 1/x$ .
		Find the gradient of a line given its equation.
		Decide whether quantities are in direct proportion.
<b>12 Similarity and congruence</b>	<b>6</b>	<p>Recognise and enlarge shapes and calculate scale factors. Know how to calculate area and volume in various metric measures. Measure lines and angles, and use compasses, ruler and protractor to construct standard constructions. Recognise congruent shapes. Know basic angle facts.</p>
12.1 Congruence		Know the angle sum of interior angles of a triangle.
		Recognise congruent shapes.
		Recall basic angle facts.
		Find missing lengths using Pythagoras' theorem.
12.2 Geometric proof and congruence		Know the conditions of congruence and use correct mathematical notation for equal angles and sides.
		Recall the properties of special triangles and quadrilaterals.
12.3 Similarity		Use geometric properties to find similarities and differences between given polygons.
		Calculate scale factors.
12.4 More similarity		Find area scale factor, given length scale factor.
12.5 Similarity in 3D solids		Work out the volume and surface area of a cube.
		Convert between metric units.
		Work out cubes and cube roots.

<b>13 More trigonometry</b>	15	Use axes and coordinates to specify points in all four quadrants. Recall and apply Pythagoras' Theorem and trigonometric ratios. Substitute into formulae.
13.1 Accuracy		Find upper and lower bounds of a given measurement.
13.2 Graph of the sine function		Know the exact values of $\sin \theta$ for $\theta = 30^\circ, 45^\circ, 60^\circ$ and $90^\circ$ Use Pythagoras' theorem. Find angles using the sin function.
13.3 Graph of the cosine function		Know the exact values of $\cos \theta$ for $\theta = 30^\circ, 45^\circ, 60^\circ$ and $90^\circ$ Use Pythagoras' theorem. Find angles using the cos function.
13.4 The tangent function		Know the exact values of $\tan \theta$ for $\theta = 30^\circ, 45^\circ, 60^\circ$ Use Pythagoras' theorem. Find angles using the tan function.
13.5 Calculating areas and the sine rule		Calculate the area of a triangle using $(1/2)ab \times \sin C$ Know the formula for calculating the area of a circle. Use trigonometry
13.6 The cosine rule and 2D trigonometric problems		Use bearings Calculate the area of a triangle. Solve calculations.
13.7 Solving problems in 3D		Use the sine and cosine rule.
13.8 Transforming trigonometric graphs 1		Reflect and rotate a coordinate point. Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and $90^\circ$ ; know the exact value of $\tan \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and $60^\circ$ Sketch $y = \sin x, y = \cos x$ and $y = \tan x$ for $x$ from $0^\circ$ to $360^\circ$
13.9 Transforming trigonometric graphs 2		Translate coordinate points by column vectors. Understand negative translations.

<b>14 Further statistics</b>	10	Understand the different types of data: discrete/continuous. Have experience of inequality notation. Multiply a fraction by a number. Understand the data handling cycle.
14.1 Sampling		Use fractions and percentages to work out data from a table.
14.2 Cumulative frequency		Find the median of a data set.
14.3 Box plots		Find the median and range from a stem-and-leaf diagram.
14.4 Drawing histograms		Division calculations Draw a frequency diagram. Write the modal class Estimate the mean mass.
14.5 Interpreting histograms		Write the modal class Estimate the mean mass.
14.6 Comparing and describing populations		Work out the mean, median and mode of data sets. Work out the mean and range from a table.
<b>15 Equations and graphs</b>	7	Solve quadratics and linear equations. Solve simultaneous equations algebraically.
15.1 Solving simultaneous equations graphically		Know and draw graphs of circles.
15.2 Representing inequalities graphically		Know which integers satisfy an inequality Solve inequalities with one variable and show solution using set notation.
15.3 Graphs of quadratic functions		Solve quadratic equations by factorising. Sketch simple quadratic graphs Find coordinates of maximum point.
15.4 Solving quadratic equations graphically		Understand maximum and minimum points. Find roots of an equation by completing the square and using the quadratic formula.
15.5 Graphs of cubic functions		Know where a graph will cross the x-axis Expand and simplify double brackets Find roots of a quadratic equation by completing the square

<b>16 Circle theorems</b>	10	<p>Have practical experience of drawing circles with compasses.</p> <p>Recall the words, centre, radius, diameter, circumference, arc, sector and segment</p> <p>Recall the relationship of the gradient between two perpendicular lines.</p> <p>Find the equation of the straight line, given a gradient and a coordinate.</p>
16.1 Radii and chords		<p>Recall the properties of an isosceles triangle and the language of a circle.</p> <p>Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS).</p>
16.2 Tangents		<p>Recall that the line drawn from the centre of a circle to the midpoint of a chord is at right angles to the chord.</p> <p>Know that the sum of the angles in a triangle must be <math>180^\circ</math></p> <p>Recall the correct maths language for parts of a circle</p>
16.3 Angles in circles 1		<p>Recall simple maths facts.</p> <p>Recall the correct maths language for parts of a circle.</p>
16.4 Angles in circles 2		<p>Recall sum of angles of a triangle and a quadrilateral.</p> <p>Recall correct maths language for parts of a circle.</p>
16.5 Applying circle theorems		<p>Understand that <math>x^2 + y^2 = r^2</math> is the equation of a circle with centre at the origin.</p> <p>Find the gradient of a line from its equation and know the gradient of a line perpendicular to it.</p> <p>Find the equation of the straight line, given a gradient and a coordinate.</p> <p>Recall circle theorems</p>
<b>17 More algebra</b>	7	<p>Simplify surds.</p> <p>Use negative numbers with all four operations.</p> <p>Add and multiply numeric fractions.</p> <p>Recall and use the hierarchy of operations.</p> <p>Manipulate algebraic expressions.</p> <p>Recall and use the quadratic formula.</p>
17.1 Rearranging formulae		<p>Substitute into linear equations.</p> <p>Change the subject of a formula.</p> <p>Factorise linear expressions.</p>
17.2 Algebraic fractions		<p>Simplify numeric fractions and fractions containing simple algebraic terms.</p> <p>Add and multiply numeric fractions.</p>
17.3 Simplifying algebraic fractions		<p>Factorise expressions by identifying the common factor between two terms.</p> <p>Simplify fractions containing simple algebraic terms.</p> <p>Factorise quadratic expressions of the form <math>x^2 + bx + c</math></p>
17.4 More algebraic fractions		<p>Simplify algebraic fractions by cancelling common factors.</p> <p>Add, subtract, divide and multiply fractions containing simple algebraic terms.</p>
17.5 Surds		<p>Decide whether each number is rational or irrational.</p>
17.6 Solving algebraic fraction equations		<p>Find the lowest common multiple of two algebraic fractions.</p> <p>Solve quadratic equations by factorising.</p> <p>Manipulate expressions containing simple algebraic fractions.</p>
17.7 Functions		<p>Calculate the output from a function machine for three different inputs.</p> <p>Solve simple equations</p> <p>Write expressions using function machines</p>
17.8 Proof		<p>Identify an odd number and an even number written algebraically.</p> <p>Recall the definitions of equations and identities.</p>

<b>18 Vectors and geometric proof</b>	9	Use vectors to describe translations. Recall and use Pythagoras' Theorem. Recall the properties of triangles and quadrilaterals. Express the relationship between two quantities as a ratio. Simplify surds.
18.1 Vectors and vector notation		Use vectors to describe translations.
		Recall and use Pythagoras' Theorem.
		Simplify surds.
18.2 Vector arithmetic		Understand the components of a vector and use <b>vectors to describe translations</b> . Recall properties of triangles and quadrilaterals.
18.3 More vector arithmetic		Use properties of a parallelogram to identify <b>equal and parallel lines</b> . Add two column vectors.
18.4 Parallel vectors and collinear points		Identify parallel column vectors. Add and subtract column vectors.
18.5 Solving geometric problems		Understand the relationship between ratio and <b>fractional parts</b> Identify parallel vectors
<b>19 Proportion and graphs</b>	14	Draw linear and quadratic graphs. Recognise linear and quadratic graphs. Calculate the gradient of a linear function between two points. Recall transformations of trigonometric functions. Write statements of direct proportion and forming an equation to find values. Recognise a graph showing direct proportion.  Recall and use the formula $\text{speed} = \text{distance} \div \text{time}$ .
19.1 Direct proportion		Recognise direct proportion Write equations for quantities in <b>direct proportion</b> .
19.2 More direct proportion		Use direct proportion. Find the constant of proportionality.
19.3 Inverse proportion		Using inverse proportion to solve simple problems. Write equations for quantities in <b>direct proportion</b> .
19.4 Exponential functions		Evaluate indices
19.5 Non-linear graphs		Work out the area of a trapezium Recall and use the formula $\text{speed} = \text{distance} \div \text{time}$ . Find the gradient of a line between two given <b>points</b> .
19.6 Translating graphs of functions		Translating coordinates Function notation
19.7 Reflecting and stretching graphs of functions		Transformation of functions