GCSE chapter	Learning objective	Notes
1 Basic number	Solve problems set in a real-life context.	
	Multiply a decimal number by another decimal number.	
	Divide by a decimal number.	
	Round to a given number of significant figures.	
	Estimate before calculating.	
	Round a calculation to give a reasonable answer.	
	Find multiples and factors.	
	Identify prime numbers	
	Identify square and triangular numbers.	
	Find square roots.	
	Identify cubes and cube roots.	
	Identify prime factors.	
	Identify the least common multiple of two numbers.	
	Identify the highest common factor of two multiples.	
	Multiply and divide positive and negative numbers.	
2 Fractions, ratio and proportion	Find one quantity as a fraction of another	
	Add and subtract fractions with different denominators.	
	Multiply proper fractions and mixed numbers.	
	Divide by fractions.	
	Use a calculator to accurately solve problems involving fractions.	
	Increase and decrease quantities by a percentage.	
	Work out percentage change.	
	Express one quantity as a percentage of another.	
3 Statistical diagrams and averages	Draw and interpret bar charts and pie charts.	
	Draw and interpret line graphs.	
	Use averages to solve more complex problems.	
	Identify the advantages and disadvantages of each type of average and learn which one to use in different situations.	
	Work out and use the range of a set of data.	
	Calculate the mode, the median and the mean from a frequency table.	
	Identify the modal group.	
	Estimate the mean from a grouped frequency table.	
	Draw, interpret and use scatter diagrams.	
	Draw and use a line of best fit.	
4 Number and sequences	Recognise patterns in number sequences	
	Generate sequences, given the n th term.	
	Find the n th term of a linear sequence.	
	Recognise and continue some special number sequences such as square numbers.	
	Find the n th term of a sequence from a diagram or practical problem.	
	Generate the terms of a quadratic sequence from the n th term.	
	Work out the n th term of a quadratic sequence	
5 Ratio and proportion	Simplify a ratio.	
	Express a ratio as a fraction.	
	Divide amounts in given ratios.	
	Complete calculations from a given ratio.	
	Recognise and solve problems using direct proportion.	
	Find either the cost per unit weight or the weigh per unit cost and use to identify the cheapest product.	
5 Ratio and proportion	Recognise and solve problems involving the compound measures of rates of pay, speed, density and pressure	
	Calculate compound interest.	
	Solve problems involving repeated percentage change.	
	Calculate the original amount after a known percentage change.	
6 Angles	To know the sum of the angles on a straight line, around a point, in a triangle and in a quadrilateral.	
	To solve missing angle problems in triangles.	
	To work out the sum of the interior angles in a polygon.	
	To be able to calculate the size of the interior and exterior angles of any regular polygon.	
	To solve problems involving alternate, corresponding, allied and opposite angles	
	To be able to calculate the size of angles in special quadrilaterals using their geometric	

	properties.	
	To be able to make a scale drawing to a given scale.	
	To be able to convert measurements to calculate actual distances.	
	To be able to read, interpret and draw bearings diagrams.	
	To use the geometrical properties of a diagram to calculate a bearing.	
7 Transformations, constructions and loci	Demonstrate that two triangles are congruent	
	Find the order of rotational symmetry for a 2D shape	
	Recognise shapes with rotational symmetry.	
	Translate, reflect, rotate and enlarge a 2D shape.	
	Combine transformations	
	Construct the bisectors of lines and angles	
	Construct angles of 60° and 90°.	
	Draw a locus for a given rule	
	Solve practical problems using loci	
	Construct and interpret plans and elevations of 3D shapes.	
8 Algebraic manipulation	Recognise expressions, equations, formulae and identities.	
	Substitute into, manipulate and simplify algebraic expressions.	
	Factorise an algebraic expression.	
	Expand two binomials to obtain a quadratic expression.	
	Expand the square of a binomial.	
	Expand more than two binomials.	
	Factorise a quadratic expression of the form $x^2 + ax + b$ into two linear brackets.	
	Factorise a quadratic expression of the form $ax^2 + bx + c$ into two linear brackets.	
	Change the subject of a formula.	
9 Length, area and volume	Calculate the circumference and area of a circle.	
	Calculate the area of a parallelogram.	
	Calculate the area of a trapezium.	
	Calculate the length of an arc.	
	Calculate the area and angle of a sector.	
	Calculate the volume of a prism.	
	Calculate the volume and surface area of a cylinder.	
	Calculate the volume of a pyramid.	
	Calculate the volume and surface area of a cone.	
	Calculate the volume and surface area of a sphere.	
10 Linear graphs	Draw linear graphs by finding points.	
	Find the gradient of a straight line.	
	Draw a line with a certain gradient.	
	Draw graphs using the gradient-intercept method.	
	Draw graphs using the cover-up method.	
	Find the equation of a line, using its gradient and intercept.	
	Find the equation of a line given two points on the line.	
	Convert from one unit to another unit by using a conversion graph.	
	Use straight-line graphs to find formulae.	
	Solve simultaneous linear equations using graphs.	
	Draw linear graphs parallel or perpendicular to other lines and passing through a specific point.	
11 Right-angled triangles	Calculate the length of the hypotenuse in a right angled triangle.	
	Calculate the length of a shorter side in a right angled triangle.	
	Solve practical problems involving Pythagoras' theorem.	
	Use Pythagoras' Theorem and isosceles triangles	
	Use Pythagoras' theorem to solve problems involving three dimensions.	
	Use the three trigonometric ratios.	
	Use the trigonometric ratios to calculate an angle.	
	Find lengths of sides and angles in right-angled triangles using the sine and cosine functions.	
	Find lengths of sides and angles in right-angled triangles using the tangent function.	
	Decide which trigonometric ratio to use in a right-angled triangle.	
	Solve practical problems using trigonometry.	
	Solve problems using an angle of elevation or an angle of depression.	
	Solve bearing problems using trigonometry.	
	Find the missing angle in an isosceles triangle.	
	Calculate the area of an isosceles triangle.	
	Show two triangles are similar.	

12 Similarity	Work out the scale factor between similar triangles.	
	Solve problems involving the area and volume of similar shapes.	
13 Exploring and applying probability	Calculate experimental probabilities and relative frequencies.	
	Estimate probabilities from experiments.	
	Use different methods to estimate probabilities.	
	Recognise mutually exclusive, complementary and exhaustive events.	
	Predict the likely number of successful events, given the number of trials and the probability of any one outcome.	
	Read two-way tables and use them to work out probabilities.	
	Use Venn diagrams to solve probability questions.	
14 Powers and standard form	Use powers (also known as indices).	
	Multiply and divide by powers of 10.	
	Use rules for multiplying and dividing powers.	
	Change a number into standard form.	
	Calculate using numbers in standard form.	
15 Equations and inequalities	Solve equations in which the variable (the letter) appears as part of the numerator of a fraction.	
	Solve equations where you have to expand brackets first.	
	Solve equations where the variable appears on both sides of the equals sign.	
	Set up equations from given information and then solve them.	
	Solve simultaneous linear equations in two variables using the elimination method.	
	Solve simultaneous linear equations by balancing coefficients.	
	Solve problems using simultaneous linear equations.	
	Solve a simple linear inequality and represent it on a number line.	
	Show a graphical inequality.	
	Find regions that satisfy more than one graphical inequality.	
16 Counting, accuracy and surds	Recognise rational numbers, reciprocals, terminating decimals and recurring decimals.	
	Convert terminating decimals to fractions.	
	Convert fractions to recurring decimals.	
	Find reciprocals of numbers or fractions.	
	How to estimate powers and roots of any given positive number.	
	Apply the rules of powers to negative and fractional powers.	
	Find and use the relationship between negative powers and roots.	
	Simplify surds.	
	Calculate and manipulate surds, including rationalising a denominator.	
	Find the error interval or limits of accuracy of numbers that have been rounded to different degrees of accuracy.	
	Combine limits of two or more variables together to solve problems.	
	Work out the number of choices, arrangements or outcomes when choosing from lists or sets.	
17 Quadratic equations	Draw and read values from quadratic graphs.	
	Solve a quadratic equation by factorisation.	
	Rearrange a quadratic equation so that it can be factorised.	
	Solve a quadratic equation by using the quadratic formula.	
	Recognise why some quadratic equations cannot be solved.	
	Solve a quadratic equation by completing the square.	
	Identify the significant points of a quadratic function graphically.	
	Identify the roots of a quadratic function by solving a quadratic equation.	
	Identify the turning point of a quadratic function by using symmetry or completing the square.	
	Solve a pair of simultaneous equations where one is linear and one is non-linear, using graphs.	
	Solve equations by the method of intersecting graphs.	
	Solve simultaneous equations where one equation is linear and the other is non-linear.	
	Solve quadratic inequalities.	
18 Sampling and more complex diagrams	Understand sampling.	
	Collect unbiased reliable data for a sample.	
	Draw and interpret frequency polygons.	
	Draw and interpret cumulative frequency graphs.	
	Draw and interpret box plots.	
	Draw and interpret histograms where the bars are of equal width.	
	Draw and interpret histograms where the bars are of unequal width.	

	Calculate the median, quartiles and interquartile range from a histogram.	
19 Combined events	Work out the probability of different outcomes of combined events.	
	Work out the probability of two outcomes or events occurring at the same time.	
	Use tree diagrams to work out the probability of combined events.	
	Use the connectors 'and' and 'or' to work out the probabilities for combined events.	
	Work out the probability of combined events when the probabilities change after each event.	
20 Properties of circles	Work out the size of angles in circles.	
	Find the size of angles in cyclic quadrilaterals.	
	Use tangents and chords to find the size of angles in circles.	
	Use the alternate segment theorem to find the size of angles in circles.	
21 Variation	Solve problems where two variables have a directly proportional relationship.	
	Work out the constant of proportionality.	
	Solve problems where two variables have an inversely proportional relationship.	
	Work out the constant of proportionality.	
22 Triangles	Use trigonometric ratios and Pythagoras' theorem to solve more complex two-dimensional problems.	
	Use trigonometric ratios and Pythagoras' theorem to solve more complex three-dimensional problems.	
	Find the sine, cosine and tangent of any angle from 0° to 360°.	
	Use the sine rule and the cosine rule to find sides and angles in any triangle.	
	Work out the area of a triangle if you know two sides and the included angle.	
23 Graphs	Interpret distance–time graphs	
	Draw a graph of the depth of liquid as a container is filled.	
	Read information from a velocity–time graph.	
	Work out the distance travelled from a velocity–time graph.	
	Work out the acceleration from a velocity–time graph.	
	Use areas of rectangles, triangles and trapeziums to estimate the area under a curve.	
	Interpret the meaning of the area under a curve.	
	Draw a tangent at a point on a curve and use it to work out the gradient at a point on a curve	
	Interpret the gradient at a point on a curve.	
	Find the equation of a tangent to a circle.	
23 Graphs (continued)	Recognise and plot cubic, exponential and reciprocal graphs	
	Transform a graph.	
24 Algebraic fractions and functions	Simplify algebraic fractions	
	Solve equations containing algebraic fractions.	
	Change the subject of a formula where the subject occurs more than once.	
	Find the output of a function.	
	Find the inverse function.	
	Find the composite of two functions.	
	Find an approximate solution for an equation using the process of iteration.	
25 Vector geometry	Add and subtract vectors.	
	Use vectors to solve geometric problems.	

Algebraic proof!