Topic	Rationale	Knowledge Acquisition	Key Vocabulary	Skills and Enrichment
1. Number	**Number taught initially to lay the ground work for more complex ideas**	Understanding place value.	**Significant, factor, multiple, prime, product, index, root, indices, square, cube, standard form**	**5! In maths means '5 factorial' and is equal to 5 x 4 x 3 x 2 x 1** **Builders use estimates to give their clients an idea of how much the work will cost.** **Astronomers use LCM of patterns in the orbits of the Sun and the Moon to predict solar ecplises.** **A googol is a 1 followed by 100 zeros.** **Surds are used to express irrational numbers in exact form.**
		Estimating the value of a square root.		
		Estimating a calculation by appropriately rounding different values.		
		Writing a number as a product of its prime factors, and then expressing it in index form.		
		Finding the HCF and LCM of a pair of numbers.		
		Solving more complicated prime factor questions, where the numbers are initially written in index form.		
		Recalling basic facts about indices.		
		Calculating using indices and roots.		
		Using the laws of indices.		
		Using the laws of indices for negative and fractional powers.		
		Simplifying surds by identifying perfect square factors.		
		Rationalising the denominator.		
		Writing a number in standard form.		
		Converting a number from standard form to ordinary form.		
		Calculating with numbers written in standard form.		
		Know and understand the meaning of an identity and use the identity sign		

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2. Algebra	**Similar to unit 1 the algebra covered here lays the foundation for more complex problem solving across mathematical strands as well as more challenging algebra**	Use the rules of indices with algebra.	**Indices, brackets, HCF, factorise, expand, expression, identity, formula, equation, substitute, subject, Fibonacci, linear, arithmetic, quadratic**	**You can use an equation to work out the distances travelled of a car journey. You can use a formula to work the acceleration of a formula 1 racing car. Patterns linking data are often used to identify trends in the data. The amount of money you have in a savings account increases in a geometric sequence. Expanding two brackets is a skill needed for graphing and analysing functions.**
		Expand single brackets and collect like terms.		
		Factorise expressions, taking the HCF of two terms outside a single bracket.		
		Expand double brackets.		
		Simplify algebraic expressions involving fractional and negative indices.		
		Expand double brackets.		
		Factorise quadratic expressions, including the difference of two squares.		
		Distinguish between expressions, identities, formulae and equations.		
		Solve an equation with an unknown on both sides (without brackets).		
		Solve an equation with an unknown on both sides (with brackets).		
		Substitute values into a formula.		
		Verify that an equation has a solution between two values.		
		Write a formula to represent a real-life context.		
		Rearrange formulae to change the subject.		
		Solve an equation involving fractions.		
		Find terms in a Fibonacci-type sequence.		
		Find the formula for the nth term of an arithmetic sequence and use it to solve problems.		
		Find the formula for the nth term of a quadratic sequence.		

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3. Data Handling	**The initial data unit recaps on KS3 Handling data. Problems are presented with more challenge.**	Draw and interpret a two-way table.	**Pie chart, stem and leaf, distribution, frequency polygon, outliers, discrete, continuous, mean, mode, median, range, trend, correlation**	**Scientists can use trends in weather patterns to investigate climate change. Scatter graphs help us to determine whether there is a connection between two sets of data.**
		Compare and interpret pie charts.		
		Interpret back-to-back stem and leaf diagrams and compare the range of		
		two distributions.		
		Draw a frequency polygon for grouped continuous data.		
		Identify outliers and find the range for two sets of data.		
		Estimate mean and range, and identify the modal group and group containing median		
		Interpret a time series graph and describe the trend.		
		Scatter graphs: consider correlation, the line of best fit and the reliability of		

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4. Fractions, ratio and percentages	**A basic number unit which lays the foundation for compound interest calculations and direct proportion problems later in the course**	Add and subtract mixed numbers. Multiply and divide mixed numbers. Write a ratio in its simplest form, removing units. Write a ratio as a unit ratio. Change amounts between currencies using an exchange rate. Write a ratio and a formula from recipe information, and scale up the ratio. Share an amount in a given ratio. Find the final amount after a percentage increase or decrease. Calculate a percentage decrease. Calculate the original price, give the price after a percentage increase. Calculate the percentage increase and the total final amount of a two-year investment.	**Fraction, improper, denominator, numerator, ratio, percentage**	**You can use reciprocals to work out the gradients of perpendicular graphs as well as to simplify calculations. Hairdressers use ratios to mix different dyes together to get the correct hair colour. Converting fractions, decimals and percentages can make calculations simpler.**

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5. Angles and trigonometry	**Pythagoras' Theorem and Trigonometry need to be covered prior to solving problems in non-right angled triangles. Angle work needs to be covered in depth before circle theorems.**	Find the size of the interior and exterior angles of regular polygons.	**Interior, exterior, quadrilateral, pentagon, hexagon,**	**The angle at which you hit a tennis ball affects its trajectory. Polygons are used in the construction of buildings and bridges due to their strength and beauty. Polygons have been used for thousands of years to create decorative patterns called mosaics.**
		Find the number of sides of a regular polygon, given the size of an interior angle.		
		Use the sum of the interior angles of a polygon to find the size of one interior angle in an irregular polygon.		
		Use angle facts to find a missing angle.		
		Use angle facts to find a missing angle.		
		Show that the sum of the interior angles of a quadrilateral is 360°.		
		Use angle facts to find a missing angle.		
		Use Pythagoras' theorem to find the lengths of sides in right-angled triangles.		
		Use the converse of Pythagoras' theorem to determine whether a triangle is right-angled.		
		Use Pythagoras' theorem to find the length of a side in a right-angled triangle, giving the answer in surd form.		
		Use trigonometry to find the lengths of sides in right-angled triangles.		
		Use trigonometry to find the size of an angle in a right-angled triangle.		
		Use trigonometry to solve a problem that may be represented as a right-angled triangle. Understand the term 'angle of elevation'.		
		Know the exact values of the sine, cosine and tangent of some angles.		

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6. Graphs	**This must follow algebraic substitution in unit 2.**	Write the gradient and y-intercept from the equation of a line.	**Gradient, Intercept, linear, segment, midpoint, quadratic, cubic, reciprocal, parallel, perpendicular**	**You can use linear graphs to show how two values are related, like converting from pounds to dollars. You can plot a straight line graph using the gradient and y-intercept – you don't have to plot a table of values. A rate of change tells us how fast something changes in a given time period. Your speed measures how fast your position changes over time.**
		Write the equation of a straight line from a graph.		
		Draw a linear graph from its equation without using a table of values.		
		Find the gradient of a line segment through two given points.		
		Interpret a distance-time graph in context.		
		Interpret the gradient and intercept of a real-life graph in context.		
		Find the midpoint and length of a line segment.		
		Write the equation of a line parallel to a given line, and through a given point; write the equation of a line perpendicular to a given line.		
		Match quadratic, cubic, reciprocal and circle equations to sketches of their graphs.		
		Use a graph to estimate the solutions to a cubic equation.		
		Interpret the properties of a quadratic curve (maximum, intercepts) in context.		
		Match graphs showing the depth of water against time to containers of different shapes.		

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7. Area and Volume	**In order to access more demanding problem solving questions students need to have covered how to change the subject before this unit.**	Find the area and perimeter of an isosceles trapezium, using the correct measurements.	**Area, perimeter, trapezium, parallel, circumference, sector, segment, volume, error interval, inequality, bounds, prism, sphere, cone, cylinder**	**The name trapezium comes from the Greek word, trapeza, meaning table. The accuracy of a measurement depends on the instrument you measure it with. Speedometers record the number of revolutions of the wheel and the time taken. They then use the circumference of the wheel to work out the distance travelled in that time, and then the speed.**
		Find the length of one of the parallel sides of a trapezium, given the area.		
		Calculate the circumference of a circle, then calculate the area of a circle, giving the answer in terms of π.		
		Find the perimeter of a semicircle.		
		Find the area and arc length of the sector of a circle.		
		Convert between units of area and between units of volume.		
		Write a percentage error interval as an inequality.		
		Write inequalities to show the upper and lower bounds of measurements rounded to different levels of accuracy.		
		Find the volume of a triangular prism, using the correct measurements.		
		Find the surface area of a cylinder.		
		Find the volume of a sphere, giving the answer in terms of π.		
		Find the volume of a cone, using the correct measurements.		

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8. Transformations and Constructions	**Bearings work needs to follow from angles in unit 5. Map ratios needs to follow from ratio in unit 4.**	Enlarge a shape by a fractional scale factor. Describe reflections, rotations and translations. Describe enlargements using a scale factor and centre of enlargement. Draw a combination of transformations and describe the result using a single transformation. Draw the plan and elevations of a 3D shape. Use map ratios to calculate lengths. Given the bearing of A from B, find the bearing of B from A. Draw an accurate scale drawing using bearings. Construct a perpendicular bisector. Construct an angle bisector. Construct an SSS triangle to a given scale, using a ruler and compasses. Shade the region that satisfies a rule.	**Transformation, reflection, rotation, translation, enlargement, scale factor, bearings, plan, view, elevations, perpendicular, bisector**	**Architectural buildings show plans and elevations of buildings.** **Car mechanics and engineers need to know how far apart has rotated when checking engine parts.** **Special effects artists use enlarged shapes when designing images for a background scene.** **Bearings are used in plane and boat navigation as the north line is fixed.**

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9. Equations and Inequalities	**Unit 2 algebra is the pre-requisite for this unit**	Solve simple quadratic equations.	**Quadratic, coefficient, solve, factorise, simultaneous, inequality**	**Quadratic equations can have 0, 1 or 2 possible solutions.** **The word 'quadratic' means 'quad' meaning square or four sided.** **Completing the square can help you find the minimum or maximum point of a quadratic curve.** **A quadratic expression is a way of describing the area of a rectangular shape.**
		Factorise a quadratic equation when the coefficient of x2 > 1.		
		Construct, rearrange and solve a quadratic equation.		
		Solve a quadratic equation using the quadratic formula; give the answer		
		Factorise a quadratic expression by completing the square.		
		Solve a quadratic equation by completing the square; give the answer in		
		Solve simultaneous equations.		
		Find the equation of a straight line through two given points using sim		
		Solve simultaneous equations where one equation is a quadratic.		
		Find all integer solutions to an inequality.		
		Represent an inequality on a number line and in a solution set.		

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10. Probability	**Students must know fraction and decimal arithmetic from unit 4 before covering this work.**	Use the fact that P(not A) = 1 – P(A). Calculate the probability of independent combined events.	**Probability, independent, sample space, mutually exclusive, conditional**	**The word 'probability' comes from the Latin word 'probabilitas' which can have different meanings. In Europe it is a measure of the 'authority' of a witness in legal cases.** **The oldest known dice ever excavated is 5000 years old.** **Dice used to be called 'bones' because they were made from a bone in the ankle of hoofed animals.**
		Use the fact that P(not A) = 1 – P(A). Find P(A or B).		
		Draw a sample space diagram for two combined independent events and use it to find probabilities.		
		Use a two-way table to find probabilities.		
		Find P(A) given P(B) and P(A or B) for mutually exclusive events.		
		Use the fact that that the probabilities of an exhaustive set of mutually exclusive events sum to 1. Calculate expected frequency. Decide whether a spinner is fair.		
		Complete a tree diagram and use it calculate the probability of independent combined events.		
		Draw a Venn diagram and use it to calculate probabilities, including conditional probabilities.		
		Understand set notation and list the elements of sets from a Venn diagram.		