Year 11 Curriculum Implementation: Mathematics

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	The expectation is that: • All students will develop confidence and competence with the content identified by standard type • All students will be assessed on the content identified by the standard and the underlined type; more highly attaining students will develop confidence and competence with all of this content. • Only the more highly attaining students will be assessed on the content identified by bold type. The highest attaining students will develop confidence and competence with the bold content.					
Knowledge & Skills	**Probability** • Understand that empirical unbiased samples tend towards theoretical probability distributions with increasing sample size • Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams • Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions • Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams **Congruence and Similarity** • Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS) • Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs • Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures **Equations, Quadratics, Rearranging Formulae and Identities** • Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation • Simplify and manipulate algebraic expressions (including those involving surds) by: ○ expanding products of two **or more** binomials ○ factorising quadratic expressions of the form $ax^2 + bx + c$ including the difference of two squares ○ **factorising quadratic expressions of the form** $ax^2 + bx + c$ • Know the difference between an equation and an identity • Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs **Perimeter and Area** • Find the surface area of pyramids composite shapes **Simultaneous Equations** • Solve two simultaneous equations in two variables (linear / linear or linear/quadratic) algebraically • Find approximate solutions using a graph • Translate simple situations or procedures into algebraic expressions or formulae • Derive two simultaneous equations • Solve the equations and interpret the solution	**Circumference and Area** • Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment • Calculate surface area of spheres, cones and composite solids • Calculate arc lengths, angles and areas of sectors of circles **Real Life Graphs** • Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration. • Interpret the gradient of a straight-line graph as a rate of change **Sequences** • Recognise and use: ○ Fibonacci type sequences ○ quadratic sequences ○ and simple geometric progressions (`r^n` where `n` is an integer and `r`is a rational number > 0) ○ **other sequences** • Deduce expressions to calculate the nth term of linear and quadratic sequences **Standard Form** • Understand and use place value (e.g. when working with very large or very small numbers) Calculate with and interpret standard form $A \times 10^n$ where $1 \leqslant A < 10$ and `n` is an integer **Sketching Graphs** • Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions and the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, **exponential functions $y = kx$ for positive values of k, and the trigonometric functions (with arguments in degrees)** $y = \sin x, y = \cos x$ **and** $y = \tan x$ f **or angles of any size** **2D Representations of 3D Shapes** • Construct and interpret plans and elevations of 3D shapes	**Volume** • Make links to similarity • Calculate the volume of spheres, pyramids, cones and composite solids, including frustums • Calculate exactly with multiples of `pi` **Scatter Graphs** • Recognise correlation and know that it does not indicate causation • Draw estimated lines of best fit • Make predictions • Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so **Numerical Methods** • Find approximate solutions to equations numerically using iteration **Equation of a Circle** • Recognise and use the equation of a circle with centre at the origin • Find the equation of a tangent to a circle at a given point. **Further Equations and Graphs** • Solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation • Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula • Find approximate solutions using a graph • Identify and interpret roots, intercepts and turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square • Translate simple situations or procedures into algebraic expressions or formulae • derive an equation, solve the equation and interpret the solution **Direct and Inverse Proportion** • Understand that x is inversely proportional to y is equivalent to x is proportional to 1/y • Construct and interpret equations that describe direct and inverse proportion • Recognise and interpret graphs that illustrate direct and inverse proportion	**Inequalities** • Solve linear inequalities in one or two variables and quadratic inequalities in one variable • Represent the solution set on a number line, using set notation and on a graph **Vectors** • Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors • Use vectors to construct geometric arguments and proofs **Transforming Functions** • Sketch translations and reflections of a given function **Gradients and Rates of Change** • Interpret the gradient at a point on a curve as the instantaneous rate of change • Apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts • Interpret the gradient of a straight-line graph as a rate of change **Pre-Calculus and Area Under a Curve** • Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs) • Interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts **Algebraic Fractions** • **Simplify and manipulate algebraic expressions involving algebraic fractions**		
Links to prior learning	**Probability** **KS3** • Construct and interpret Venn Diagrams including probability. • Draw and label tree diagrams to represent combined events • Use tree diagrams to combine independent events with "AND" rule **Congruence and Similarity** **KS3** • Use congruence in triangles	**Circumference and Area** **KS3** • Circumference of circles • Area of Circles • Area of sectors **Real Life Graphs** **KS3** • Using Co-ordinates	**Volume** **KS3** • Calculate the volume of a prisms including cylinders • Calculate the volume of pyramids and cones • Calculate the volume of composite 3D shapes • Solve problems involving volume of prisms	**Inequalities** **KS3** • Solve inequalities • Substitute numbers into complex formulae • Change the subject of Scientific formulae • Solve problems involving inequalities and formulae **Vectors**		

	• Understand and use integer scale factors • Understand and use fractional scale factors • Use area and volume scale factors **Equations, Quadratics, Rearranging Formulae and Identities** **KS3** • Solve equations with multiple steps • Solve inequalities • Substitute numbers into complex formulae • Change the subject of Scientific formulae • Solve problems involving inequalities and formulae **Perimeter and Area** **KS3** • Find perimeter of composite shapes involving rectangles and triangles • Use rectangles, parallelograms and triangles in composite shapes to find area • Know and use the formula for the area of a trapezium **Simultaneous Equations** **KS3** • Solve equations with multiple steps • Solve inequalities • Substitute numbers into complex formulae	• Co-ordinates and Shape • Horizontal and Vertical Lines • Plotting Straight Line Graphs **Sequences** **KS3** • Recognise and generate geometric sequences • Recognise and generate quadratic sequences • Find the nth term of simple quadratic sequences **Standard Form** **KS3** • Recognise when a number is in standard form • Convert large and small numbers between ordinary and standard form • Use standard form in calculations **Sketching Graphs** **Y10** • Work with co-ordinates in all four quadrants • Solve geometrical problems on co-ordinate axes • Plot graphs of equations that correspond to straight line graphs in the co-ordinate plane • Use the form $y = mx + c$ to identify parallel lines and perpendicular lines • Find the equation of the line through two given points, or through one point with a given gradient • Identify and interpret gradients and intercepts of linear functions graphically and algebraically **2D Representations of 3D Shapes** **KS3** • Surface area of Cuboids • Surface area of Prisms • Scale	**Scatter Graphs** **KS3** • Plot points on a scatter graph and draw lines of best fit • Identify correlation and comment • Use a scatter graph to estimate values **Numerical Measures** **KS3** • Substitution into Expressions • Substitution into Formulae **Equation of a Circle** **KS3** • Circumference of circles • Area of Circles **Y10** • Work with co-ordinates in all four quadrants • Solve geometrical problems on co-ordinate axes • Plot graphs of equations that correspond to straight line graphs in the co-ordinate plane • Use the form $y = mx + c$ to identify parallel lines and perpendicular lines • Find the equation of the line through two given points, or through one point with a given gradient • Identify and interpret gradients and intercepts of linear functions graphically and algebraically **Further Equations and Graphs** **Y10** • Plot graphs of equations that correspond to straight line graphs in the co-ordinate plane • Use the form $y = mx + c$ to identify parallel lines and perpendicular lines • Find the equation of the line through two given points, or through one point with a given gradient • Identify and interpret gradients and intercepts of linear functions graphically and algebraically **Direct and Inverse Proportion** **KS3** • Ratio and multiplicative relationships (Introduction to ratio) • Simplifying ratio • Sharing into a ratio (using bar model) • Working with connected ratios • Direct Proportion (context-based questions, best value, recipes) • Use and draw direct proportion graphs • Understand inverse proportion • Solve problems using inverse proportion • Use and draw inverse proportion graphs	**KS3** • Ratio and multiplicative relationships (Introduction to ratio) • Simplifying ratio • Sharing into a ratio (using bar model) • Working with connected ratios **Y10** • Describe translations as 2D vectors **Transforming Functions** **Y10** • Identify, describe and construct congruent and similar shapes, including on co-ordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors) • Describe translations as 2D vectors • Describe the changes and invariance achieved by combinations of rotations, reflections and translations **Gradients and Rates of Change** **Y10** • Work with co-ordinates in all four quadrants • Solve geometrical problems on co-ordinate axes • Plot graphs of equations that correspond to straight line graphs in the co-ordinate plane • Use the form $y = mx + c$ to identify parallel lines and perpendicular lines • Find the equation of the line through two given points, or through one point with a given gradient • Identify and interpret gradients and intercepts of linear functions graphically and algebraically **Pre-Calculus and Area Under a Curve** **KS3** Know and use the formula for the area of a trapezium **Algebraic Fractions** **KS3** • Convert between mixed numbers and improper fractions • Add and subtract fractions • Multiply fractions • Divide fractions • Factorising into a single bracket (including variables as factors) • Factorising Quadratics		
Assessment	**Unit Reviews** These will be completed on a regular basis after a unit of work has been completed. **Bi-Weekly Assessment** This involves attempting a set of past exam paper questions on topics that they have already been taught at some point so far.	**Unit Reviews** These will be completed on a regular basis after a unit of work has been completed. **Bi-Weekly Assessment** This involves attempting a set of past exam paper questions on topics that they have already been taught at some point so far. **Mock Exams**	**Unit Reviews** These will be completed on a regular basis after a unit of work has been completed. **Bi-Weekly Assessment** This involves attempting a set of past exam paper questions on topics that they have already been taught at some point so far.	**Unit Reviews** These will be completed on a regular basis after a unit of work has been completed. **Bi-Weekly Assessment** This involves attempting a set of past exam paper questions on topics that they have already been taught at some point so far.		

		Formal exams. Pupils will attempt one non-calculator paper, and one calculator allowed paper during this time.				
Home learning	Home learning is set on a weekly basis and will usually involve pupils working through a set task using their home learning books to record their written methods of working out.	Home learning is set on a weekly basis and will usually involve pupils working through a set task using their home learning books to record their written methods of working out.	Home learning is set on a weekly basis and will usually involve pupils working through a set task using their home learning books to record their written methods of working out.	Home learning is set on a weekly basis and will usually involve pupils working through a set task using their home learning books to record their written methods of working out.		
Cultural Capital and extra-curricular opportunities	**Artful Maths Club** Where geometry meets creativity. Pupils can learn to fold their way into the wonders of maths with Artful Maths Club.	**Artful Maths Club** Where geometry meets creativity. Pupils can learn to fold their way into the wonders of maths with Artful Maths Club.	**Artful Maths Club** Where geometry meets creativity. Pupils can learn to fold their way into the wonders of maths with Artful Maths Club.	**Artful Maths Club** Where geometry meets creativity. Pupils can learn to fold their way into the wonders of maths with Artful Maths Club.		
Literacy	**Key Words** **Probability** Sample, biased, unbiased, theoretical, distribution, set, combinations, systematically, tables, grids, Venn diagram, tree diagram, probability, independent, dependent combined, events, conditional, expected, frequency **Congruence and Similarity** Congruent, SAS, SSS, ASA, RHS, Similar, Similarity, Scaling, Scale factor, Triangle, Similar, Corresponding, Enlargement, Reflection, Rotation, Similar, Length, Linear, Area, Volume, Square, Cube, Ratio, Scale **Equations, Quadratics, Rearranging Formulae and Identities** Expand, Multiply, Expression, Variables, Binomials, Brackets, Quadratic, Linear, Rearrange, Formula, Subject, Add, Subtract, Multiply, Divide, Factorise, Expand, Square, Root, Inverse, Operation, Fraction **Perimeter and Area** Perimeter, Area, Square, Rectangle, Parallelogram, Triangle, Trapezium (Trapezia), Square Millimetre, Square Centimetre, Square Metre, Square Kilometre, Formula, Formulae, Length, Breadth, Depth, Height, Width **Simultaneous Equations** Common solution, Same variables, Intersection point, Substitution,	**Key Words** **Circumference and Area** Circumference, Perimeter, Diameter, Radius, Square units, Surface, Circle, Centre, Radius, diameter, chord, Pi **Real Life Graphs** Gradient, speed, distance, time, intercept, zero-point, rise, decline, stable, constant, sharp, gradual, extrapolation, interpolation, peak, linear, **Sequences** Term, Term-to-term rule, Position-to-term rule, nth term, generate, linear, quadratic, difference, Fibonacci sequence, Geometric Progression **Standard Form** Large, Small, Standard Form, Ordinary Form, Power, Indices, Significant **Sketching Graphs** Intersection, Axes, Vertical, Horizontal, Gradient, Maximum, Minimum **2D Representations of 3D Shapes** Net, Surface, (Right) prism, cylinder, Cross-section, pyramid, cuboid, triangular, edge, face, vertices, front elevation, side elevation, plan view	**Key Words** **Volume** Volume, Area, Cross-Section, Circle, Prism, Cylinder, Length, Radius, Diameter, Multiply, Circumference, Sphere, Triangular, pyramid, volume, compound, composite, cuboid, triangular, edge, face, vertices, cone **Scatter Graphs** Scatter, Plot, Axis, Scale, Relationship, Trend, Categorical data, Discrete data, Continuous data, Scatter graph, Bivariate data, Correlation, Positive correlation, Negative correlation, Line of best fit, Interpolate, Extrapolate, Causation **Numerical Methods** Iteration, iterative, formula, sequence, substitution, convergence, divergence, accuracy, rearrange equation, starting value **Equation of a Circle** Circumference, Perimeter, Diameter, Radius, Square units, Surface, Circle, Centre, Radius, diameter, chord, standard form, origin, formula, square root, Pythagoras' Theorem **Further Equations and Graphs** Linear, Quadratic, Equation, Solve, Intersect, approximate, solutions, quadratic, algebraically, factorise, sketch, roots, intercept, turning point **Direct and Inverse Proportion** Proportion, Direct, Similar, Multiplicative, Fraction, Improper, Mixed, Scale, Multiplier, Quantity, Integer, Ratio, Compare, comparison, Part, Unit, Proportional, Multiplier, Unitary method, Direct proportion, Inverse proportion	**Key Words** **Inequalities** Integer, Negative, Greater than, Less than, Equal to, Greater than or equal to, Less than or equal to **Vectors** Column Vector, Movement, Direction, Scalar, Vector, coordinates, Axis, axes, x-axis, y-axis, Origin, Quadrant, Translation, Object, Image, Congruent, congruence, Mirror line, Vector, Centre of rotation **Transforming Functions** Congruent, similar shapes, co-ordinate, axis, axes, rotation, reflection, translation and enlargement, vector, invariance, combination **Gradients and Rates of Change** Gradient, proportional, equivalent, rate of change, tangent, average **Pre-Calculus and Area Under a Curve** Formula, area, trapezium, curve, axis, axes **Algebraic Fractions** Mixed numbers, improper fractions, add, subtract, multiply, divide, fraction, factorise, bracket, variables, factors, quadratics		
Numeracy	**Vocabulary** Mathematical vocabulary is precise and rigorously defined. It should be used carefully to avoid misinterpretation and confusion with the same similar words used elsewhere. **Approach** Pupils must be encouraged to always show their working out, regardless of whether they are using a calculator or not.	**Scientific Calculator** First and foremost, we always try and use our mental and written method when attempting a calculation. If a calculator is need then this needs to be a scientific calculator. This is a requirement, and pupils are expected to have their own calculator in school. Pupils need to know how to use a scientific calculator correctly and they are taught this in their Maths lessons.	**Estimation** Errors are commonly made when students fail to check the reasonableness of their answer in the context of the question. Recognising that estimation is not just a guess, but rounding needs to be used.	**Talk Through Problems** Pupils encouraged to talk through their methods of working out (explain their thinking out loud) to help clarify understanding. **Break Down Word Problems** Focus on reading questions carefully, underlining key facts, and planning step-by-step how to solve them.		
Careers Information, Education, Advice and Guidance (CEIAG)	**Probability** • Geography: Using probability in weather forecasting. • Science: In any experiment to predict the chance of an outcome. In Biology probability is used for predictions of genetics and births. • PE: Making predictions on sporting events using previous data and analysis. **Where are these skills transferred to real life contexts?**	**Circumference and Area** Area of a circle • Art: When working with 3D shapes in art, area of a circle will be need to be calculated for certain surface areas. • Technology: In textiles and RM, pupils need to calculate area and circumference of circles when	**Volume** • Geography: Calculating space of territories, land, and sea. • Science: Volume is used across a lot of the Physics curriculum with regards to density and mass of objects. Chemistry also uses volumes for substances, and volume of	**Inequalities** Algebraic notation, Substitution, Function Machines and Rearranging formulae, Forming and solving linear equations and inequalities • Science: Equations, Substitution, Formulae and manipulating formulae are used in Science regularly, particularly in Physics and Chemistry.		

- Engineering: requires probability analysis. Engineers must calculate the probability of such things as a heavy gust of wind or a car's front suspension hitting a pothole on an average day.
- Computer programmers sharpen their products by using statistics
- Biologists and medical experts use probabilities to better understand sophisticated mechanisms within the human body and to develop drugs.
- Physicists deal with uncertainty as they delve into the realm of sub-atomic particles and model these interactions by using probability models.
- Weather forecasting: Probability is needed to foresee the chance or rain/sun etc.
- Economics and business: Economists use probability as a tool to analyse economic competition and phenomena such as bargaining, voting theory, auction, mechanism design. Executives, investors, and managers in the business world use probability for investments, launching of new products, or entering a new business.
- In politics: Diplomats and politicians use probability to analyse any situation of conflict between individuals, companies, states, and political parties. It is also used in war strategies, political voting, and political affairs.

Congruence and Similarity

- Technology: When creating and designing scale diagrams are used for the initial planning phase.
- Geography: Maps are scale diagrams of larger scale places (countries, continents etc)
- Art: Scale drawings are required for design and creating of projects. The use of congruence and similarity is used for some drawings.

Where are these skills transferred to real life contexts?

- Architects/interior designers: Scale drawings are used in the planning and design of houses, offices and any other areas.
- Builders/Plumbers/Electricians: Will need to use scale diagrams and floor plans to ensure safety in building, plumbing and design.
- Athletes: Loci is used to calculate the best path to take for the shortest possible distances in running.
- Phone networking: Pylons need to be placed in exact locations to ensure efficient signalling to certain areas.
- Farmers: When planning the dimensions of their land in regards to pens, fencing and animal space, loci is needed.

Equations, Quadratics, Rearranging Formulae and Identities

- Science: Equations, Substitution, Formulae and manipulating formulae are used in Science regularly, particularly in Physics and Chemistry.
- Science: Quadratic equations are used in science when working out acceleration, deceleration and stopping distances. Formulae and manipulating formulae are used in Science regularly.
- Business: Quadratic equations can be used for calculating maximum revenues. Formulae is also commonly used across Business/ICT and computing.
- Business: Formulae is also commonly used across Business/ICT and computing in spreadsheets and revenue calculations. Functions and function machines are often used for showing processes.
- Technology: Substitution is used when working out areas and volumes of objects or materials.
- Science: Equations are used in Science regularly, particularly in Physics and Chemistry.
- Business: Equations are used when forecasting future trends, profits, revenue, customer numbers etc

Where are these skills transferred to real life contexts?

- Accountancy: Formulae is used regularly when working with financial planning. They use formulas everyday to measure rates of interest and tax forms.
- Computer programmer: Uses formulae and substitution when evaluating and analysing designs.
- Financial analyst: Use formulae when analysing risk and reward of investments. Substitution of values is key for forecasting pay offs.

making clothing, and other objects. In food tech, making cakes, pizzas, and any other circular foods may require the calculation of area.

- Science: Area of a circle can be used when calculating with vehicles (wheels) and other cylindrical objects.

Where are these skills transferred to real life contexts?

- Architecture: Architects and builders use the symmetrical properties of a circle to design Ferris-wheels, buildings, athletic tracks, roundabouts etc.
- Engineering: The circular measurements are significant in the designing and manufacture of airplanes, bicycles, rockets etc.
- Pizza factory/restaurant: Areas of circles are need when making and selling pizzas for pricing and sizing purposes.
- Bakery/cake shop: For the same reasons as above, area of a circle is needed in baking cakes.

Real Life Graphs

Sequences

.

- Science: Geometric sequences can be used for growth and decay including bacteria and infection growth.
- Geography: Geometric sequences can be used to determine population growth.
- Drama: Set production and plays follow sequences.
- Business: Arithmetic sequences can be used to make estimations about how something will change in the future.

Where are these skills transferred to real life contexts?

- Business/Demographics: The ability to forecast growth and population using sequencing including pricing and profits.
- Farmers/agriculture: Need sequencing to predict crop growth and corresponding revenue growth.
- Food production/factory production: Preparation of food/goods need to be followed in a sequenced order. Machinery will need to be programmed to follow a certain sequence.
- Theatre production/Media: Plays and production follow sequencing for running orders.

Standard Form

- Science: Standard form is used when calculating large distances (eg between planets), sizes, or working with speed of light in Physics.
- In Chemistry standard form is used for small measurements such as the distance between sub-atomic particles. In Biology, the size of bacteria may be measured in standard form due to the small size.

Where are these skills transferred to real life contexts?

- Astronomer: Working with planets requires the use of standard form from measuring distances to mass.
- Scientists/Astrophysicists/Chemists: Large and small values ranging from speed of light to atomic particles.
- Engineers: Engineers may use standard form when calculating distances, lengths and mass of materials.

gases. In Biology, Volume is calculated for cells.

- Art: 3D shapes are commonly drawn and volume is calculated from these. In Art they may need to create 3D objects linked to scale drawings and therefore will need to scale the volume.
- DT: When creating 3D models in textiles/RM, pupils will need to consider the volume of the 3D shape.

Where are these skills transferred to real life contexts?

- Gardeners/landscaping/ construction: They will need to consider the volume of spaces, land, or buildings when purchasing materials, pricing, and costing,
- Medicine: Any NHS worker who needs to administer drugs/medication needs to be aware of the volume of the substance to be given linked tp the rate at which It is administered.
- Product packaging/manufacturing: Product packaging needs to be made to fit the quantity of the item inside and therefore volume needs to be accurately measured to minimise waste.
- Transportation of goods: The volume of space inside the lorry/boat/van would need to be sufficient to carry certain amounts of goods.

Scatter Graphs

Correlation and scatter graphs

- Geography: Using scatter graphs to plot two variables such as death rates, earthquakes, population changes etc. Correlation is used to recognise trends and patterns in data.
- Science: Scatter graphs are used as above to plot two variables and compare using lines of best fit and correlation.

Where are these skills transferred to real life contexts?

- Economists conduct research and analyse trends on a wide range of economic phenomena, including prices, employment, production, inflation and business cycles. Scatter graphs help visually illustrate relationships between two economic phenomena, such as employment and output, inflation and retail sales, and taxes and economic growth.
- Market research analyst - Market research involves conducting consumer surveys and focus groups, as well as gathering and analysing data on prices, sales and distribution. Often researchers analyse data on past sales to project future revenues. Market research often involves writing reports that include statistical charts that report past sales and predict future sales.

Numerical Methods

- Business: Formulae is also commonly used across Business/ICT and computing in spreadsheets and revenue calculations. Functions and function machines are often used for showing processes.
- Technology: Substitution is used when working out areas and volumes of objects or materials.
- Science: Equations are used in Science regularly, particularly in Physics and Chemistry.
- Business: Equations are used when forecasting future trends, profits, revenue, customer numbers etc

Where are these skills transferred to real life contexts?

- Accountancy: Formulae is used regularly when working with financial planning. They use formulas everyday to measure rates of interest and tax forms.
- Computer programmer: Uses formulae and substitution when evaluating and analysing designs.
- Financial analyst: Use formulae when analysing risk and reward of investments. Substitution of values is key for forecasting pay offs.
- Pharmacy Technician: Substitution and formulae is used when calculating quantities, counting and pricing.
- Management analysts: Use function machines to analyse outputs/rewards/profits for businesses based upon their inputs and the process of the business.
- Almost any situation where there is an unknown quantity can be represented by a linear equation, like figuring out income over time, calculating mileage rates, or predicting profit. Many people use linear equations every day, even if they do the calculations in their head without drawing a line graph.
- Event planners: A party planner has a limited budget for an upcoming event. They will need to figure out how much it will cost the client to rent a space and pay per person for meals. A linear equation can be constructed to show the total cost, expressed for any number of people in attendance.
- Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible.

Vectors

Cross curricular and career links

- Science - Most commonly in physics, vectors are used to represent displacement, velocity, and acceleration

Where are these skills transferred to real life contexts?

- Engineering - Vectors are used in engineering mechanics to represent quantities that have both a magnitude and a direction. Many engineering quantities, such as forces, displacements, velocities, and accelerations, will need to be represented as vectors for analysis.

Transforming Functions

	• Pharmacy Technician: Substitution and formulae is used when calculating quantities, counting and pricing. • Management analysts: Use function machines to analyse outputs/rewards/profits for businesses based upon their inputs and the process of the business. • Almost any situation where there is an unknown quantity can be represented by a linear equation, like figuring out income over time, calculating mileage rates, or predicting profit. Many people use linear equations every day, even if they do the calculations in their head without drawing a line graph. • Event planners: A party planner has a limited budget for an upcoming event. They will need to figure out how much it will cost the client to rent a space and pay per person for meals. A linear equation can be constructed to show the total cost, expressed for any number of people in attendance. • Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible. • Military and law enforcement: Quadratic equations are often used to describe the motion of objects that fly through the air. Police also use it in determining the trajectories of bullets and in figuring out the speeds of cars that have been involved in accidents. • Engineering: Engineers of all sorts use these equations. They are necessary for the design of any piece of equipment that is curved, such as auto bodies. Automotive engineers also use them to design brake systems. For similar reasons, aerospace engineers work with them on a regular basis. Electrical and chemical engineers work with many complex systems that involve quadratic equations. So do computer engineers. Audio engineers use these equations to design sound systems that have the best sound quality possible. • Scientists: Astronomers use quadratic equations to describe the orbits of planets, solar systems and galaxies. Physicists use them to describe different types of motion. Even chemists need them in order to describe certain types of chemical reactions. • Agriculture: Quadratic equations are also used in agriculture. One of these uses is in finding out the optimal arrangement of boundaries to produce the biggest fields and pens given the materials on hand. **Perimeter and Area** • Art: Area: Used to determine the amount of material or space for painting, sculpture bases, or installations. Perimeter: Planning frame sizes, borders, and edging designs for artwork. • Textiles: Calculating the fabric required for garments or cushions, often involving rectangular or triangular patterns. • Resistant Materials (RM): Cutting wood or metal pieces to specific dimensions (e.g. rectangular panels, triangular supports). • Food Technology: Portioning and packaging foods (e.g. brownies, flapjacks, sandwiches) often requires working with rectangular or triangular shapes for consistency. • Physics: Surface area and perimeter are used when designing experiments (e.g. calculating heat loss from surfaces, pressure distribution). • Biology: Estimating areas of leaves or habitats during ecological surveys. • Chemistry: Shapes of reaction surfaces (e.g. catalyst plates) are measured to understand rates of reaction. • Geography: Area: Measuring land use (e.g. rectangular plots on a farm, triangular zones on a map). Perimeter: Calculating boundaries for fields, development zones, or natural features. • Physical Education (PE): Perimeter: Marking out playing fields and courts (e.g. rectangular pitches, triangular zones in athletics).Area: Ensuring safe space per student for warm-ups or activities. **Where are these skills transferred to real life contexts?** • Construction & Architecture: Area: Calculating floor space for rooms (usually rectangular), wall coverage for painting or	**Sketching Graphs** • Science: Linear equations formed in Physics from real life contexts can be plotted onto graphs and used for forecasting trends, solving problems and making predictions for experiments. • Business: Again, used for predictions, trends and forecasting. • Geography: Graphs used to compare and contrast data and information. Where are these skills transferred to real life contexts? • Politics: Used for election votes, predictions and trends. The government use graphs to support their data on the economy and health (eg covid). • NHS: Graphs will be used to compare and make predictions from regarding treatments, for monitoring purposes for example heart rates, blood sugar levels etc. • Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible and is made even clearer by representing this information on a graph. **2D Representations of 3D Shapes** **Design & Technology** • Product Design: Students sketch and design 3D products using 2D techniques like isometric drawing and orthographic projection. • Textiles: Creating patterns and templates (2D) to form 3D garments or bags. • Graphics: Used to design packaging, model boxes, and promotional material, requiring accurate nets and flat representations of 3D forms. • Engineering/Resistant Materials: Interpreting blueprints and component diagrams to build accurate structures. **Art** • Drawing: Learning how to represent 3D objects (e.g. cubes, cylinders, pyramids) on paper using shading, perspective, and geometric breakdowns. • Sculpture: Designing 3D pieces from 2D sketches or nets. • Architecture sketching: Planning buildings or installations using front, side, and top views. **Science** • Physics & Chemistry: Drawing molecular structures or lab apparatus in 2D to show 3D relationships (e.g. crystalline structures, 3D graphs, lab setups). • Biology: Visualising organs or body parts using 2D diagrams to represent 3D forms (e.g. cross-sections of the heart, eye, etc.). **Geography** • Interpreting and drawing topographical maps with contour lines (2D) that represent 3D landscapes like hills and valleys. • Planning land use or buildings using scaled 2D representations. **Computer Science** • Used in game design, 3D modelling, and animation where 3D objects are created through 2D programming instructions.	Cross curricular and career links Although iteration is not explicitly taught in other subjects; the main focus is on forming and solving linear equations • Science: Equations are used in Science regularly, particularly in Physics and Chemistry. • Business: Equations are used when forecasting future trends, profits, revenue, customer numbers etc **Where are these skills transferred to real life contexts?** • Almost any situation where there is an unknown quantity can be represented by a linear equation, like figuring out income over time, calculating mileage rates, or predicting profit. Many people use linear equations every day, even if they do the calculations in their head without drawing a line graph. • Event planners: A party planner has a limited budget for an upcoming event. They will need to figure out how much it will cost the client to rent a space and pay per person for meals. A linear equation can be constructed to show the total cost, expressed for any number of people in attendance. • Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible. **Equation of a Circle** Cross curricular and career links Although this topic is not explicitly taught in other subjects, the skills required are transferrable. • Science: Use of large and small numbers represented in index form. Substitution into formulae used which included powers and roots. Equations are used in Science regularly, particularly in Physics and Chemistry. • Business and Computing: Substitution into formulae, using powers and roots. Equations are used when forecasting future trends, profits, revenue, customer numbers etc **Where are these skills transferred to real life contexts?** Although not specifically linked to a career, equation of a circle sits at the foundation of trigonometry. Trigonometry was originally developed to solve problems in navigation and in astronomy. (See Year 11H Unit 2 for more on Trigonometry) • GPS systems – are primarily built using circle geometry. **Further Equations and Graphs** Cross curricular and career links	Cross curricular and career links Although the topic of transforming functions is not specifically taught in other subjects, the concepts of graphs is used as an underlying theme • Science: Linear equations formed in Physics from real life contexts can be plotted onto graphs and used for forecasting trends, solving problems and making predictions for experiments. • Business: Again, used for predictions, trends and forecasting. • Geography: Graphs used to compare and contrast data and information. **Where are these skills transferred to real life contexts?** • Politics: Used for election votes, predictions and trends. The government use graphs to support their data on the economy and health (eg covid). • NHS: Graphs will be used to compare and make predictions from regarding treatments, for monitoring purposes for example heart rates, blood sugar levels etc. • Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible and is made even clearer by representing this information on a graph.		

	wallpapering, or tiling. Perimeter: Fencing, baseboards, and skirting around rooms. • Engineering & Manufacturing: Rectangles and triangles are used when cutting, welding, and assembling materials. Engineers use area to estimate surface finishes or load distribution. • Catering, Baking & Food Industry: Area: Used when preparing trays or packaging for uniform food portions (e.g. slicing brownies into equal rectangles or sandwiches into triangles). Perimeter: Wrapping food, cutting edges neatly, and measuring for packaging. • Landscaping & Gardening: Area: Calculating lawn space, paving areas, or planting beds (often rectangular or triangular plots). Perimeter: Measuring garden borders, fencing lines, or edging paths. • Interior Design & Home Improvements: Area: Estimating wallpaper, paint, or flooring needed for rectangular or triangular walls and rooms. Perimeter: Planning skirting boards, curtain tracks, or perimeter lighting. • Retail & Business: Area: Display floor planning, shelving space, window display dimensions. Perimeter: Shop layout planning, calculating materials for signage or decoration. • Transport & Automotive: Area and perimeter used in designing vehicle components, boot spaces, and loading areas—usually involving basic shapes like rectangles or right-angled triangles. • Simultaneous Equations • Science: Physics: Used to solve for unknowns in formulae involving motion (e.g. speed and distance problems), forces, or electricity (e.g. solving for voltage and resistance using Ohm's law). Chemistry: Balancing equations for chemical reactions and calculating molar relationships in multiple-step reactions. Biology: Modelling population growth and decay involving multiple interacting species or processes. • Geography: Climate modelling or population studies can involve solving simultaneous equations to compare changing variables (e.g. population vs resource availability). Used in analysing data sets and trends, such as rainfall vs. crop yield. • Design & Technology: Product Design: Calculating cost of materials and labour within budget constraints. Engineering Design: Optimising dimensions and performance by balancing constraints (e.g. weight and strength). Nutrition Calculations: Balancing multiple food items to meet target nutritional values (e.g. protein + carbs = total calories). • Business & Economics: Simultaneous equations model supply and demand problems to find market equilibrium. Used to calculate break-even points and predict profits given multiple cost and revenue constraints. Helps businesses make informed decisions when facing trade-offs. • Computer Science: Applied in algorithm design, coding logic, and in game or simulation programming where multiple changing variables must meet specific conditions. **<u>Where are these skills transferred to real life contexts?</u>** • Finance & Budgeting: Personal Finance: Working out two unknowns like how much to save and spend within a budget. Business: Calculating multiple unknown costs to meet total budget and performance targets (e.g. wages and production costs). • Engineering: Frequently used when designing systems with multiple constraints, e.g. tension in bridges, angles in structures, or solving for forces acting on an object. Used in electrical circuits, where voltage, current, and resistance must be calculated together. • Construction & Architecture: Used to determine quantities of different materials when given total volume or cost limits. Calculating how different factors (e.g. wall lengths and heights) must work together to fit a plan. • Healthcare & Diet: Dieticians use simultaneous equations to create meal plans that meet multiple nutrient targets (e.g. protein and calorie intake). Used in calculating drug dosages based on weight and frequency constraints. • Travel & Logistics: Solving problems like "two trains leaving different cities" to determine where they'll meet, or how long a journey will take when dealing with two changing speeds/distances.	• Understanding how shapes are rendered on screen. 🌍 **Real-World Applications** **Architecture & Construction** • Plans and elevations are essential for designing buildings, rooms, and infrastructure. • Builders and engineers use 2D blueprints to visualise and construct accurate 3D spaces. • Nets help visualise structures before physical building begins. **Engineering & Manufacturing** • Orthographic projections and technical drawings guide the manufacture of components and machinery. • Engineers must convert 2D design plans into real-world 3D objects with precision. **Interior Design:** Floor plans are 2D representations used to lay out furniture and design room layouts. Helps visualise space, storage, and traffic flow in a room. **Packaging & Product Design: Nets** are used to design boxes, cartons, and containers. Designers must translate flat layouts into foldable 3D products (e.g. food packaging, electronics boxes). **Medical Imaging:** Scans like **CT** and **MRI** produce 2D "slices" of the body that represent 3D internal structures. Doctors interpret these to diagnose and plan treatments. **Transport Design:** Car, aircraft, and ship designs begin as 2D technical drawings representing 3D forms. Used in simulations and prototyping. **Fashion & Tailoring:** 2D patterns are cut and shaped into 3D garments. Designers use flat templates to fit the 3D human body. **Animation & Film:** Animators start with 2D character sheets that guide the modelling of 3D figures. Storyboarding uses 2D images to visualise movement and camera angles.	• Graphs (Linear, Quadratic, Exponential, Reciprocal) • Science: Linear equations formed in Physics from real life contexts can be plotted onto graphs and used for forecasting trends, solving problems and making predictions for experiments. • -Business: Again, used for predictions, trends and forecasting. • Geography: Graphs used to compare and contrast data and information. **<u>Where are these skills transferred to real life contexts?</u>** • Politics: Used for election votes, predictions and trends. The government use graphs to support their data on the economy and health (eg covid). • NHS: Graphs will be used to compare and make predictions from regarding treatments, for monitoring purposes for example heart rates, blood sugar levels etc. • Any business setting: One of the most helpful ways to apply linear equations in everyday life is to make predictions about what will happen in the future. While real world factors certainly impact how accurate predictions are, they can be a good indication of what to expect in the future. Linear equations are a tool that make this possible and is made even clearer by representing this information on a graph. **<u>Direct and Inverse Proportion</u>** <u>Direct Proportion and Inverse Proportion</u> • Technology: When working with recipes, proportion is used for scaling up or down ingredients measures. • Science: Speed, distance and time of vehicles. Distance of planets and sunlight. <u>Where are these skills transferred to real life contexts?</u> • Architecture: Architects and designers will need ratio and proportions when using scale drawings and creating designs in real life. • Construction: Will need to work with scale ratios and proportion in the same way as above. • Chefs/Bakers: Any profession which works with ingredients will need to use ratio and proportion when working with ingredients. Specifically, when baking/cooking on a large scale. • Business: Most businesses which require purchases of stock (clothes, ingredients etc), will need to use proportion when calculating 'best buys. Businesses need to calculate the best possible price of buying stock based upon the units they are purchasing when buying in bulk. • Physicists: When working with acceleration and velocity, inverse proportion is used.			

	• Retail: Used in pricing strategy—figuring out combinations of products and their prices to meet a target profit or cost. Helps determine offers (e.g. "Buy 3 for £5" mixed with regular pricing) and still meet revenue targets. • Sports & Event Planning: Used to solve for team sizes and ticket sales (e.g. adult vs child tickets sold) when given total attendees and revenue.					
Spirituality	Zero (0) and Emptiness: • In Eastern philosophy (Buddhism, Taoism), zero resonates with the void, emptiness, and potential. • In Hinduism, linked to the concept of Shunyata (emptiness) and cosmic cycles.	Geometric shapes with symbolic and sacred meanings. Fibonacci sequences can be seen as a natural blueprint. Platonic Solids: Used by Plato to represent the classical elements (earth, air, fire, water, ether).	The golden ratio: A unique ratio that appears in nature, art, and architecture. Pythagorean Mysticism: Numbers are the essence of all things. Platonic Solids: Used by Plato to represent the classical elements (earth, air, fire, water, ether).	Mathematical infinity: Symbol of the infinite nature of the divine or the soul.		
How can parents support the curriculum?	**Talk with your child about what they are learning about in Maths** • Be positive about Maths. Try not to say things like 'I can't do Maths' or 'I hated Maths at school' - your child may start to think like that themselves. • Emphasize effort over innate talent. Praise your child's hard work rather than solely focussing on whether they get the right answer. • Celebrate mistakes as learning opportunities. Frame errors as chances to learn and improve, rather than as failures. • Be patient and encouraging. Take it slow, provide support, and celebrate even small successes.	**Literacy and Oracy** • Discus the key words, that can be found in the 'Literacy' section of this document, that are associated with units of work covered throughout the corresponding half-term. • Can they pronounce these words correctly? • Can they spell them correctly? • Can they explain what the mathematical meaning of these words is? • Can they give an example to show how the words are relevant to what they are learning about?	**Revision and Preparation for the GCSE exam** • Support your child in creating a revision schedule to help them prepare for the GCSE exams. • Refer to the 'Knowledge & Skills' sections, and the 'Links to prior learnings sections of this document, to help populate the schedule. • Monitor your child to ensure that they are developing good habits by sticking to the agreed schedule	**Equipment** Check that your child has the relevant equipment in readiness for units of work coming up next half-term, and that they are bringing it to school with them. • Pencils • Sharpener • Eraser • Ruler • Protractor • Compass Please note that black pens, a scientific calculator, a green pen, a purple pen and a mini-whiteboard pen, will still be required.		