Year 10 Curriculum Implementation: Mathematics

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Knowledge & Skills	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.					
	Rounding • Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures) • Use inequality notation to specify simple error intervals due to truncation or rounding • Apply and interpret limits of accuracy including upper and lower bounds **Algebra Recap** • Use and interpret algebraic notation, including: • $3y$ in place of $y+y+y$ and $3\times y$ • a^2 in place of $a\times a$, a^3 in place of $a\times a\times a$, a^2b in place of $a\times a\times b$ • $\frac{a}{b}$ in place of $a\div b$ • coefficients written as fractions rather than as decimals • brackets • Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals • understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors • Simplify and manipulate algebraic expressions (including those involving surds) by: • collecting like terms • multiplying a single term over a bracket • taking out common factors **Fractions and Decimals** • Order positive and negative decimals and fractions • Apply the four operations, including formal written methods, to simple fractions (proper and improper) and mixed numbers - both positive and negative • Apply the four operations, including formal written methods, to decimals – both positive and negative • Understand and use place value (e.g. when calculating with decimals) • Calculate exactly with fractions • Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and `7/2` or 0.375 and `3/8`) including ordering • Change recurring decimals into their corresponding fractions and vice versa	**Collecting and representing Data** • Interpret and construct tables, charts and diagrams including, for categorical data: ○ Frequency tables ○ Bar charts ○ Pie charts ○ Pictograms ○ Vertical line charts for ungrouped discrete numerical data ○ Tables and line graphs for time series data ○ Know their appropriate uses • Interpret, analyse and compare distributions of data sets from univariate empirical distributions through appropriate graphical representation involving discrete, continuous and grouped data, including boxplots • Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use **Indices** • Use positive integer powers and associated real roots (square, cube and higher) • Recognise powers of 2, 3, 4, 5 • Estimate powers and roots of any given positive number • Calculate with roots, and with integer and fractional indices **Surds** • Calculate exactly with surds • Simplify surd expressions involving squares • Rationalise denominators • Recognise and use simple geometric progressions	**Pythagoras' Theorem and Basic Trigonometry** • Know the formula for Pythagoras' Theorem `a2+b2=c2` • Apply it to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures • Know and use the trigonometric ratios • Know the exact values of sinθ and cosθ = 0°, 30° 45°, 60° and 90° • Know the exact values of tanθ = 0°, 30° 45° and 60° • Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides including Pythagoras' Theorem and use known results to obtain simple proofs • Compare lengths using ratio notation; make links to trigonometric ratios **Further Trigonometry** • Know and apply the Sine rule $\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$ - • **and Cosine rule** $a^2=b^2+c^2-2bc\cos A$ **to find unknown lengths and angles** • **Know and apply** $=\frac{1}{2}abs\sin C$ **to calculate the area, sides or angles of any triangle**	**Percentages and Growth and Decay** • Define percentage as 'number of parts per hundred' • Interpret percentages and percentage changes as a fraction or decimal and interpret these multiplicatively • Express one quantity as a percentage of another • Compare two quantities using percentages • Work with percentages greater than 100% • Interpret fractions and percentages as operators • Solve problems involving percentage change, including: • percentage increase / decrease problems • original value problems • simple interest, including in financial mathematics • Set up, solve and interpret the answers in growth and decay problems including compound interest and work with general iterative processes **Functions** • Where appropriate, interpret simple expressions as functions with inputs and outputs • Interpret the reverse process as the 'inverse function' • Interpret the succession of two functions as a 'composite function'	**Coordinates and Linear Graphs** • 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 **Transformations** • 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	**Angles, Scales Diagrams and Bearings** • Use conventional terms and notations: ○ points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries • Use the standard conventions for labelling and referring to the sides and angles of triangles • Draw diagrams from written descriptions • Apply the properties of: ○ angles at a point ○ angles at a point on a straight line ○ vertically opposite angles • Understand and use alternate and corresponding angles on parallel lines • Use scale factors, scale diagrams and maps • Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings **Properties of Polygons** • Derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons) • Derive and apply the properties and definitions of: • special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus • and triangles and other plane figures using appropriate language **Circle Theorems** • Apply and prove the standard circle theorems concerning angles, radii, tangents and chords and use them to prove related results **Constructions and Loci** • Use the standard ruler and compass constructions: • perpendicular bisector of a line segment • constructing a perpendicular to a given line from / at a given point • bisecting a given angle • Know that the perpendicular distance from a point to a line is the shortest distance to the line • Use these to construct given figures and solve loci problems
Links to prior learning	**Rounding** • KS3 • Understand and use place value for decimals, measures and integers of any size • Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols • Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals	**Collecting and representing Data** • KS3 • Reading scales on axes and can use tally charts • Using a protractor to draw and measure angles • Interpret and construct tables, charts and diagrams including, for categorical data: ○ frequency tables	**Pythagoras' Theorem and Basic Trigonometry** • KS3 • Solve linear equations, including those with the unknown in the denominator of a fraction. • Understand and use Pythagoras' theorem	**Percentages and Growth and Decay** • KS3 • Define percentage as 'number of parts per hundred' • FDP conversion	**Coordinates and Linear Graphs** • KS3 • Use symbols (including letters) to represent missing numbers • Substitute numbers into worded formulae • Substitute numbers into simple algebraic formulae • Know the order of operations	**Angles, Scales Diagrams and Bearings** • KS3 • Apply the four operations • Work with negative numbers • Accurately reading from scales • Understand that an acute angle is less than a right angle • Understand that an obtuse angle is greater than a right angle and less than two right angles

	Algebra Recap • KS3 • Be able to add, subtract, multiply and divide integers • Be able to add and subtract fractions • Know the first 15 square numbers and their square roots • Know the first 5 cube numbers and their cube roots **Fractions and Decimals** • KS3 • Ordering numbers including fractions and decimals. • Converting mixed number to improper fractions and vice versa • Solving problems involving adding and subtraction of fractions • Be able to find the common denominator of common fractions • Calculate exactly amounts with fractions • Solve fractions in contextualised situations • Ordering numbers including fractions and decimals • Using the four operations with simple decimal problems up to 3 digits • Solving problems involving adding and subtraction of decimals • Understand place value and one decimal place • Working with pounds and pence which lends itself to working with decimals • Knowledge that numbers below zero can be non-integers and be written in a decimal format	○ bar charts ○ pie charts ○ pictograms **Indices** • KS3 • Ability to define and calculate a square number • Calculate with negative numbers • Know basic algebraic notation (the rules of algebra) • Simplify an expression by collecting like terms **Surds** • KS3 • Know the square numbers to 152 and their roots – both positive and negative • Be able to identify factor pairs of numbers • Multiply algebraic terms • Multiply fractions • To be able to expand double brackets	**Further Trigonometry** • Apply Pythagoras' theorem in two dimensions • Know the trigonometric ratios, $\sin\theta$ = opp/hyp, $\cos\theta$ = adj/hyp, $\tan\theta$ = opp/adj • Choose an appropriate trigonometric ratio that can be used in a given two-dimensional situation • Set up and solve a trigonometric equation to find a missing side or angle in a right-angled triangle	• Interpret percentages and percentage changes as a fraction or decimal and interpret these multiplicatively • Express one quantity as a percentage of another • Compare two quantities using percentages • Work with percentages greater than 100% • Writing numbers in index form • Calculating percentages of amounts • Increasing and decreasing amounts by a given percentage • Using multipliers for percentage increases or decreases **Functions** • KS3 • Given a function, establish outputs from given inputs • Given a function, establish inputs from given outputs • Use a mapping diagram (function machine) to represent a function • Use an expression to represent a function	• Use coordinates in all four quadrants • Write the equation of a line parallel to the x-axis or the y-axis • Draw a line parallel to the x-axis or the y-axis given its equation • Identify the lines $y = x$ and $y = -x$ • Draw the lines $y = x$ and $y = -x$ • Substitute positive and negative numbers into formulae **Transformations** • KS3 • Use coordinates in all four quadrants • Identify the lines $y = x$ and $y = -x$ • Draw the lines $y = a$, $x = a$ and $y = -a$, $x = -a$ • Draw the lines $y = x$ and $y = -x$ • Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures • Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids	• Identify acute angles • Identify obtuse angles • Identify acute, obtuse and right angles in shapes • Compare angles up to two right angles in size • Order angles up to two right angles in size • Drawing lines accurately and reading simple scales. • Conversion of mm to cm and cm to m and m to km. • Drawing and calculation of angles up to 360° • Reading of simple maps and ability to convert from drawn lengths to actual lengths using simple scales • Use a protractor to measure angles to the nearest degree • Work out a multiplier given two numbers • Understand the concept of an enlargement (no scale factor) **Properties of Polygons** • KS3 • Types of angles. • Apply basic angle rules: ○ Angles on a straight line ○ Angles in a triangle ○ Angles around a point • Solve basic linear equations in one variable. • Some understanding of sharing in a ratio might be useful for harder problems. **Circle Theorems** • KS3 • Know the vocabulary of circles • Know angle facts including angles at a point, one a line and in a triangle • Know angle facts involving parallel lines and vertically opposite angles • Know the properties of special quadrilaterals **Constructions and Loci** • KS3 • Measure distances to the nearest millimetre • Create and interpret scale diagrams • Use compasses to draw circles • Interpret plan and elevations
Assessment	**Unit Reviews** These will be completed on a regular basis after a unit of work has been completed. **Half Termly 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. **Half Termly 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. **Half Termly 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. **Half Termly 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. **Half Termly 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. **End of Year Assessment** This involves attempting a set of past exam paper questions on topics that they have already been taught at some point so far.
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.	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	**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	**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.

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Literacy	**Key Words** **Rounding** Round, integer, whole number, place value **Algebra Recap** Multiply, bracket, expand, simplify, like terms, indices, coefficient, expression **Fractions and Decimals** Decimal, place value, order, compare, add, subtract, multiply, divide, recurring	**Key Words** **Collecting and representing Data** Index, indices, multiply, power, divide, base **Indices** Index, indices, multiply, power, divide, base **Surds** Surd, Rational, Irrational, Simplify, Square, Conjugate, Root, Rationalise. **Famous Mathematicians** Short reading and comprehension exercise through Microsoft Forms on 'Famous Mathematicians – Euler'.	**Key Words** **Pythagoras' Theorem and Basic Trigonometry** Trigonometry, opposite, adjacent, ratio, angle, square, root, right-angle, triangle, hypotenuse **Further Trigonometry** Trigonometry, opposite, adjacent, ratio, angle, square, root, right-angle, triangle, hypotenuse	**Key Words** **Percentages and Growth and Decay** Fractions, decimals, percentages, convert, equivalent, increase, decrease, reduce, multiplier, percentage change, simple interest, compound interest, depreciation **Functions** Forward, reverse, reciprocal, composite **The Brooklyn Bridge** Short reading and comprehension exercise through Microsoft Forms on 'The Brooklyn Bridge'.	**Key Words** **Coordinates and Linear Graphs** Axes, x-axis, y-axis, origin, coordinates, quadrants, plot, ordered pair, coordinate plane **Transformations** Translation, object, move, vector, up, down, left, right, positive, negative, horizontal, vertical, reflection, symmetry, mirror line, linear equation, degrees, turn, (anti-)clockwise, centre, enlargement, scale factor, point of enlargement, transform	**Key Words** **Angles, Scales Diagrams and Bearings** Complementary, supplementary, opposite, alternate, angle, interior, co-interior, North, relative, bearing, scale factor, scale **Properties of Polygons** Angle, Degrees, Right angle, Acute angle, Obtuse angle, Reflex angle, Protractor, vertically opposite, Interior angle, exterior angle, Regular polygon **Circle Theorems** Centre, radius, diameter, chord, tangent circumference, arc, segment, sector, semicircle, cyclic quadrilateral, alternate segment, perpendicular, bisects **Constructions and Loci** Compass, protractor, Intersect, Arc, Line Segment, Perpendicular, Construct, Equal, Measure, Degrees, Accurate, Triangle, Angle, Equilateral, Isosceles, Bisector, Loci, Region, Equidistant
Numeracy	**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.	**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.	**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.	**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)	**Rounding** Rounding, estimation and error intervals • Science: Rounding in calculations and measures. Using estimations to make predictions in experiments • Geography: Using rounding and estimation when calculating percentage growths, losses, land space etc • Business: Estimation of costings, resources, profits and losses. • Tech; Using rounding when working with lengths and materials. Estimation of materials/ingredients needed to plan for production. **Where are these skills transferred to real life contexts?** • Business: The ability to estimate the time, resources and money needed to complete a project is necessary in almost any career. Teachers, for example, distribute supplies based upon their predictions of student use, managers use these skills for creating yearly budgets, and most businesses depend on this ability for cost effectiveness. **Algebra Recap** Algebraic notation, Substitution, Function Machines and Rearranging formulae • Science: Equations, Substitution, Formulae and manipulating formulae are used in Science regularly, particularly in Physics and Chemistry • 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	**Collecting and representing Data** Averages and range, Cumulative frequency, Data • Geography: Using averages and range on a wide variety of data sets from rainfall and temperature to populations. • History: The grouping of data in a cumulative manner. Data collection and classification of data. • Science: Averages, range and spread used on a wide variety of data sets in Science and can be used after experiments to analyse data. • PE: Working with measurements and times in sport. Averages can be used to analyse the data. **Where are these skills transferred to real life contexts?** • Financial planners: The mean or average value in financial planning is implied in calculating average monthly expenditure calculation. Considering the expenditures of the previous year, the financial planners can design the budget for the next year. Average expenditure value also helps find how much savings one can make in a year. • Sports analyst: Average goals per match, average runs scored by a batsman, etc. are some of the values analysts consider for drawing trends in sports performance.	**Pythagoras' Theorem and Basic Trigonometry** **Further Trigonometry** Where are these skills transferred to real life contexts? • Architecture and Construction: The Pythagorean theorem aids in the construction of stable buildings, bridges, etc. • Astronomers used the lengths of the sides of a triangle and angles to find distances between stars • Crime Scene Investigators: Investigators use trig to determine the position of individuals involved in the crime, entry and exit points of bullet wounds, etc. • Digital Imaging: Digital imaging in terms of animation or any type of computer-generated image use trigonometric equations to model movements and behaviour • Firefighters: Determining the angle at which a building can be entered after structural damage has occurred is important to the safety of the firefighter and the victim. Determining where to position the truck relative to the fire to ensure the maximum	**Percentages and Growth and Decay** • Geography: Calculating percentage increase and decreases in populations, GDP, or any other data. Percentages can be used to show the percentage of land compared to water in certain areas. Population density is expressed as a percentage. Economic depreciation and growth • Science: Calculating percentage quantities of amounts to compare and analyse data • Business: Profit/loss, percentage changes in business trends. Interest rates, and calculating interest on loans. Working out investments using compound interest or value of products/assets after depreciation. • Art: Proportion of shapes, diagrams for shading. Percentage of paper/space used for drawings.	**Coordinates and Linear Graphs** Linear 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 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	**Angles, Scales Diagrams and Bearings** Scale diagrams and Bearings • Technology: When creating and designing scale diagrams are used for the initial planning phase. • Geography: Maps are scale diagrams of larger scale places • Art: Scale drawings are required for design and creating of projects. 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. • Hiking: Bearings are used to plot routes on maps and guide hiker through unfamiliar terrain. • Sailing: Sailors use bearings to navigate using compasses and charts, ensuring they stay on course. • Aviation: Pilots rely on bearings to guide their flights, ensuring they reach their destination safely and efficiently. • Urban planning: Bearing help in laying out streets, buildings, and other structural infrastructure in a planned and organised manner. • Military Operations: Bearings play a crucial role in military operations, ensuring troops can move and coordinate effectively. **Properties of Polygons**

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

Fractions and Decimals

Calculations with fractions

- Technology: In food tech, fractions are used in baking, cooking and measuring ingredients. In RM and Textiles, measurements are important and therefore calculating fractional lengths can be used
- Science: Fractions can be used when substituting into equations, formulae and be used as variables in experiments. Liquids may well need to be measured in fractional quantities
- Business: Profit, loss and accounts may well use fractional quantities, including working with time and money

Where are these skills transferred to real life contexts?

- Any business setting: Whether that be a restaurant, a hairdresser, or a car garage, all workers within a business need to be able to work with fractional quantities. They use these to work out what resources they need to buy, work out prices, calculate profit and losses and much more
- Nurse/NHS: Fractions are very important for pharmacists and nurses, particularly because errors can have serious consequences. For example, nurses need to be able to use the following stock equation in order to know how to dilute a solution
- Engineering: There would be no buildings, cars, aeroplanes or manufacturing without engineering, it is the foundation of the modern world. An example of the use of fractions is in air-fuel ratios. Inside a car's engine you need both air and fuel to burn together and you need fractions to decide on the right proportions
- Set design and architecture: If you are making a scale model such as in architecture or set design, then you will definitely need fractions. If your model is at a scale of 1:200 then this means that you need to take the real lengths and multiply them by a fraction get the model length. Another interesting use of fractions is in movie making and the technique of forced perspective
- Chef (cooking & baking): Cooking is full of fractions, you need to be able to scale recipes so will require to work with fractions to work out the amount of ingredients required

- Media and production companies: The concept of average is applied in finding how many hours the people watch TV, which may help advertisers buy media space profitably.
- Insurance and motor vehicles: Using the speed and distance data, makers find the mileage of the vehicles and advertise it as a selling point

Indices

Powers and roots

- Science: Use of large and small numbers represented in index form. Formulae used which included powers and roots
- ICT/Business/Computing: Cryptography and programming

Where are these skills transferred to real life contexts?

- Astronomer: Working with planets requires the use of indices in standard form from measuring distances to mass. Scientists/Astrophysicists/Chemists also use large and small values ranging from speed of light to atomic particles
- Computer game designers: Game engines inside the game calculate the movement, interactions, and geometry involved in the game. The programs use lots of formulas in their algorithms, and many involve multiplying power terms
- Investment and finance: Indices are used in compound interest and other interest and financial formulas
- Data analysts: Will monitor trends and growth using exponents

Surds

- Science: Use of large and small numbers represented in index form. Formulae used which included powers and roots
- To calculate with surds basic numeracy skills such as multiplying, dividing, adding and subtracting are required which are skills transferred through all subjects

Where are these skills transferred to real life contexts?

- Surds are used when numbers need and calculations need to be precise. Surds often come into play when using Pythagoras' Theorem therefore the career links will be the same
- Construction worker and management: Determining lengths of support beams, scaffolding and material usage. This applies to construction of bridges, buildings, theme park rollercoasters and much more
- Agriculture: Any job where precise lines need to be drawn and measured. Working directly with boundaries surrounding crops, animals, trees and plants involves the use of Pythagoras' Theorem
- Surveyors: Determining length and distance to measure and map properties. They also need to set official land, air and water boundaries for homeowners, businesses and even the government
- Production workers: Including machinists and welders. Being able to efficiently calculate specialised items for production

amount of water douses the fire ensures minimal water waste

- Oil Drilling: It's all about angles. When an oil well is found, trajectories are calculated which ensure the maximum extraction of oil with minimal waste
- Pilots: Pilots are required to have an extensive knowledge of trig. If you bring the plane in at too steep of an angle, you will crash
- Sailors: Waves in the ocean act as sine and cosine waves. Using trigonometry enables sailors and naval officers to determine sailing conditions and storm potentials
- Timber industry: Trees must be cut at the correct angle in order to make sure that the tree does not fall on equipment

Where are these skills transferred to real life contexts?

- Any business setting: Workers within a business, but more importantly managers and owners, need to be able to calculate percentages of amounts, percentage increase and decreases and percentage changes. They use these skills to efficiently forecast trends, work out what resources they need to buy, work out prices, calculate profit and losses and much more
- Retail: Retailers use percentages in promotions and sales. This links to the businesses above
- Banks: Compound interest is calculated on savings, investments, mortgages, loans and more
- Tax/Pensions: Percentage proportions are taking from wages to contribute to pensions and pay tax
- Finance on assets: When cars, electronic goods, or household essentials are bought on finance, compound interest is calculated to be added on top as an extra payment
- Functions
- Science: In physics functions describe motion, forces and other physical phenomena. For example, Newton's second Law (F=ma) is a function that relates force, mass and acceleration
- Computer Science: Functions are fundamental to algorithms, data structures, and programming languages

Where are these skills transferred to real life contexts?

- Cooking: Recipes use functions to relate ingredient quantities to the final dish. For example, the cooking time for a roast is a function of its weight
- Finance: Functions are used in calculating loan payments, interest rates, and investment returns
- Travel: Functions help determine the best routes, estimate travel time, and calculate fuel consumption
- Personal Finances: Functions are used to track

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.

Transformations

Enlargements/Rotations/Reflections/ Translation

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

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 and Electricians: Will need to use scale diagrams and floor plans to ensure safety in building, plumbing and design

Angle and shape properties

- Art: Shape properties will be widely used in drawings, constructions and creating 3D drawings. Pupils in art will need to be able to measure and draw angles as well as calculate using angle facts.
- Technology: Shape properties are needed in design projects especially in resistant materials and textiles.
- Science: Angles are used in Science when working with elevations and positionings.

Where are these skills transferred to real life contexts?

- Construction workers: Construction workers and builders need to accurately work with angles and dimensions to ensure the safety of the designs
- Interior designers: Need to know properties of room spaces to ensure maximum efficient use of space
- Animation and games design: Creation of objects and people in games rely on properties of shapes and angles
- Architect: The building of offices, homes and buildings requires extensive knowledge of shapes (of rooms), to ensure well designed and manufactured spaces

Circle Theorems

- 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 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?

- Navigation - using circle theorems, a ship navigator uses the nautical radar to figure out where they are or if there's any incoming. he would see lines or points at certain distances from where the ship may be using theorems to find the distance of the ship to the objects in the water
- Construction workers - being a construction worker is a career that involves using theorems of circles. construction workers use theorems of circles when they create stadiums or domes that are circular
- Artist - A career in which circle theorems would be used is an artist. They would use circle theorems for proportionate masterpieces and sculptures
- Astronomer - Astronauts and astronomers may use circle theorems to find out how much energy a planet or a star has when orbiting a larger planet or star. When a planet moves in a circular orbit, its potential and kinetic energy do not change. However, when it moves in an elliptical orbit, the more likely case, its potential and kinetic energy will change with its position

Constructions and Loci

Where are these skills transferred to real life contexts?

- 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

		• Military: In the army, Pythagoras is used in pathfinder courses to determine drop zones. It is also regularly used when constructing assault courses		expenses, manage budgets and calculate savings • Engineering: Functions are used in designing structures, machines and electric circuits • Robotics: Functions control the movements and actions of robots • Medicine: Functions are used in modelling drug dosages, disease spread, and physiological processes • Economics: Functions represent supply and demand curves, economic growth models and market behaviour • Navigation Systems: Functions are used to develop GPS and other location- based services • Disaster Prediction: Functions are used to model and predict natural disasters like earthquakes and tsunamis		
Spirituality		Discussions on the infinite nature of numbers and the concept of zero can stimulate profound reflections on existence and the mysteries of the universe. Encouraging children to reflect on these abstract concepts nurtures their spiritual awareness and curiosity.	Geometric shapes with symbolic and sacred meanings. Pythagorean Mysticism: Numbers are the essence of all things	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.	Exploring patterns and connections in mathematics, fostering a sense of wonder and awe at the beauty and order in the universe.	Links to sacred geometry refers to geometric shapes and proportions believed to have spiritual significance. These patterns are often seen as reflections of the underlying order of the cosmos. For example, the Metatron's Cube: Linked to angelic energies and the platonic solids, symbolizing the structure of the universe.
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?	**Point out Maths in the Real World** • Refer to the information given in the 'CEIAG' sections of this document to help • Is your child aware of the different subjects in which they might use some of the same key skills as listed in the 'Knowledge & Skills' sections of this document? • Is your child aware of, and maybe interested in, some of the careers in which they might use some of the same key skills as listed in the 'Knowledge & Skills' sections of this document?	**Revision and Preparation for End of Year Assessments** • Support your child in creating a revision schedule to help them prepare for the end of year assessments • 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 that they have created • We recommend a minimum of 2 hours revising and practising their Maths skills, spread out over the course of each week	**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.	**Summer Home Learning** • All students will be provided with a bespoke list of topics for which they need to work on to progress and improve in Mathematics. • Their performance in the end of year exams will help to inform this. • The list will be provided before they break for the Summer • Monitor your child's progress in working through their list so that they may make an optimum start to studying Maths in the next academic year.