Key Stage 4: Year 10 (Please note that the content in bold is for higher only; standard and underlined type is for both higher and foundation**)**

Overall Curriculum Goals

- To build on the foundations of number, algebra, geometry and measure and statistics from Key Stage Three through a detailed focus on the following topic areas: standard form and indices, equations and sequences, angles, Pythagoras' Theorem and trigonometry, probability, transformations and constructions, fractions, decimals, percentages and ratio, and area and volume.
- To develop fluent knowledge, skills and understanding of mathematical methods and concepts within each topic area
- To acquire, select and apply mathematical techniques to solve problems
- To reason mathematically, make deductions and inferences, and draw conclusions
- To comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Indices and Standard Form • order positive and negative integers, decimals and fractions; use the symbols **=, ≠, <, >, ≤, ≥** • apply systematic listing strategies, **including use of the product rule for counting (i.e. if there are m ways of doing one task and for each of these, there are n ways of doing another task, then the total number of ways the two tasks can be done is $m \times n$ ways)** • 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 • calculate exactly with fractions, **surds** and multiples of π**;** **simplify surd expressions involving squares**	**Angles, Pythagoras' Theorem and Trigonometry** • 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 description • 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; 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,	**MATHS MOCK BASED ON TOPICS TAUGHT UP TO CHRISTMAS** **Probability** • record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees • apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments • relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale apply the property that the probabilities of an exhaustive set of outcomes sum to one; • apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one • understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size	Sequences and Graphs (CONT): generate terms of a sequence from either a term-to-term or a position-to term rule recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and • simple geometric progressions (rn where n is an integer, and r is a rational number > 0 **or a surd**) **and other sequences** • deduce expressions to calculate the **n**th term of linear and quadratic sequences Graphs • work with coordinates in all four quadrants • plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form **y = mx + c** to identify parallel and perpendicular lines; find the equation of the line through two given points or through one point with a given gradient	FDP (CONT) • apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals) • calculate exactly with fractions, **surds** and multiples of π**;** **simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{(4 \times 3)} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators** • work interchangeably with terminating decimals and their corresponding fractions (such as **3.5** and **7 2** or **0.375** or **3 8**); change recurring decimals into their corresponding fractions and vice versa • identify and work with fractions in ratio problems	Area and Volume • know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders) • know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes**;** surface area and volume of spheres, pyramids, cones and composite solids • calculate arc lengths, angles and areas of sectors of circles

(e.g. √12 = √(4 × 3) = √4 × √3 = 2√3) and rationalise denominators

- calculate with and interpret standard form **A** × 10**n**, where $1 \leq \mathbf{A} < 10$ and **n** is an integer
- estimate answers; check calculations using approximation and estimation, including answers obtained using technology

Algebra: manipulation and equations

simplify and manipulate algebraic expressions (including those involving surds **and algebraic fractions**) by:

- collecting like terms
- multiplying a single term over a bracket
- taking out common factors
- expanding products of two **or more** binomials
- factorising quadratic expressions of the form $x2 + bx + c$, including the difference of two squares; **factorising quadratic expressions of the form** $ax2 + bx + c$

•	simplifying expressions involving sums, products and powers, including the laws of indices

- understand and use standard mathematical formulae; rearrange formulae to change the subject

know the difference between an equation and an identity; argue mathematically to show algebraic expressions are

parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language

know the formulae for: Pythagoras' theorem $a2 + b2 = c2$, and the trigonometric ratios, $\sin\theta =$ opposite, $\cos\theta =$ adjacent and

hypotenuse	hypotenuse

- $\tan\theta =$ opposite / adjacent; apply them to find angles and lengths in right-angled triangles **and, where possible, general triangles** in two **and three** dimensional figures
- know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0°$, 30°, 45°, 60° and 90°; know the exact value of $\tan\theta$ for $\theta = 0°$, 30°, 45° and 60

know and apply the sine rule	$\frac{a}{\sin A}$

=	$\frac{b}{\sin B}$

=	$\frac{c}{\sin C}$

- **, and cosine rule** $a2 = b2 + c2 - 2bc\cos A$**, to find unknown lengths and angles**
- **know and apply Area =** $\frac{ab\sin C}{12}$ **to calculate the area,**

- enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams construct theoretical possibility spaces for single and combined experiments
- 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

Sequences and Graphs: generate terms of a sequence from either a term-to-term or a position-to term rule

recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and

- simple geometric progressions (rn where n is an integer, and r is a rational number > 0 **or a surd**) **and other sequences**
- deduce expressions to calculate the **n**th term of linear and quadratic sequences

Graphs

- identify and interpret gradients and intercepts of linear functions graphically and algebraically

FDP

- apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)
- calculate exactly with fractions, **surds** and multiples of π; **simplify surd expressions involving squares (e.g. √12 = √(4 × 3) = √4 × √3 = 2√3) and rationalise denominators**
- work interchangeably with terminating decimals and their corresponding fractions (such as **3.5** and **7 2** or **0.375** or **3 8**); change recurring decimals into their corresponding fractions and vice versa
- identify and work with fractions in ratio problems
- interpret fractions and percentages as operators
- express one quantity as a fraction of another, where the fraction is

- interpret fractions and percentages as operators
- express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1
- use ratio notation, including reduction to simplest form
- divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
- define percentage as 'number of parts per hundred'; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics

Transformations

- identify, describe and construct congruent

equivalent, and use algebra to support and construct arguments **and proofs** 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' (the use of formal function notation is expected)** • find approximate solutions to equations numerically using iteration translate simple situations or procedures into algebraic expressions or • formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution	**sides or angles of any triangle**	• work with coordinates in all four quadrants • plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form **y = mx + c** to identify parallel 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	less than 1 or greater than 1 • use ratio notation, including reduction to simplest form • divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations) • define percentage as 'number of parts per hundred'; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional **and negative** scale factors) • describe the changes and invariance achieved by combinations of rotations, reflections and translations	
Key Vocabulary/Concepts/Ideas	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**
Integer, number, digit, negative, decimal, addition, subtraction, multiplication,	Quadrilateral, angle, polygon, interior, exterior, proof, tessellation, symmetry,	Probability, mutually exclusive, conditional, tree diagrams, sample space,	constructions, compasses, protractor, bisector, bisect,	Rotation, reflection, translation, transformation, enlargement, scale factor,	Quadratic, solution, root, linear, solve, simultaneous, inequality, completing the

division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd, surd, rational, irrational standard form, simplify Expression, identity, equation, formula, substitute, term, 'like' terms, index, power, negative and fractional indices, collect, substitute, expand, bracket, factor, factorise, quadratic, linear, simplify, approximate, arithmetic, geometric, function, sequence, *n*th term, derive	parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, segment, length	outcomes, theoretical, relative frequency, Venn diagram, fairness, experimental linear, simplify, approximate, arithmetic, geometric, function, sequence, *n*th term, derive Rotation, reflection, translation, transformation, enlargement, scale factor, vector, centre, angle, direction, mirror line, centre of enlargement, describe, distance, congruence, similar, combinations, single, corresponding, constructions, compasses, protractor, bisector, bisect, line segment, perpendicular, loci, bearing	line segment, perpendicular, loci, bearing Addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, reciprocal, integer, decimal, termination, percentage, VAT, increase, decrease, multiplier, profit, loss, ratio, proportion, share, parts	vector, centre, angle, direction, mirror line, centre of enlargement, describe, distance, congruence, similar, combinations, single, corresponding, Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, nets, isometric, symmetry, vertices, edge, face, circle, segment, arc, sector, cylinder, circumference, radius, diameter, pi, composite, sphere, cone, capacity, hemisphere, segment, frustum, bounds, accuracy, surface area	square, factorise, rearrange, surd, function, solve, circle, sets, union, intersection
CEIAGS AND Extra Curricular	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**
Scientist, Astronomer, Air traffic controller, carpenter, nutritionist **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Artist, /construction, astronomy, cartoonist, cartologist, crime scene investigators** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	Fashion designer, plumber, game developer, interior designer, cartologist, surveyor **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Accountant, banker, retail or food sector, pharmacist, doctor, health staff, chef, dietitian** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Painter, chemist, dentist, builder** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Business manager, financial analyst, computer programmer, research scientist** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**

Key Stage 4: Year 11 (Please note that the content in bold is for higher only; standard and underlined type is for both higher and foundation**)**

Overall Curriculum Goals

- To build on the foundations of number, algebra, geometry and measure and statistics from year 10 through a detailed focus on the following topic areas: simultaneous equations and quadratics, vectors, circle theorems, data, similarity and congruency, and trigonometric graphs and transformations of graphs.
- To develop fluent knowledge, skills and understanding of mathematical methods and concepts within each topic area
- To acquire, select and apply mathematical techniques to solve problems
- To reason mathematically, make deductions and inferences, and draw conclusions
- To comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context
- To establish examination techniques for three terminal papers of a synoptic nature

Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Graphs, including quadratics and simultaneous equations • identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically **and turning points by completing the square** • 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 • solve linear inequalities in one **or two** variable**(s)**, **and quadratic inequalities in one variable;** represent the solution set on a number line, **using set notation and on a graph** **Vectors** • describe translations as 2D vectors • apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic	Circle Theorems • apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results **Data** • infer properties of populations or distributions from a sample, while knowing the limitations of sampling • interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use • **construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and**	Mock feedback and PinPoint Learning Work in this half term will be based also on topic areas identified from the mock exam. **Trigonometric graphs and functions (HIGHER)** • recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, **exponential functions $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size** • **sketch translations and reflections of a given function**	**P**reparation for the second mock examinations through consolidation of topics.	• **Revision for GCSE Examinations**	**P**reparation for the terminal examinations

and column representations of vectors; **use vectors to construct geometric arguments and proofs**	**unequal class intervals and cumulative frequency graphs, and know their appropriate use** • interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, **including box plots** appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, **quartiles and inter-quartile range**) **Averages and Charts** • interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: appropriate graphical representation involving discrete, continuous and grouped data, **including box plots** appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of	**Similarity and congruency** • identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment • apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results • use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS) **S**imilarity and congruency (repeat) • apply the concepts of congruence and similarity, including the relationships between lengths, **areas and volumes** in similar figures Constructions • 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 description • use the standard ruler and compass constructions (perpendicular bisector of a line segment,			

	outliers, **quartiles and inter-quartile range**) • • use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends while knowing the dangers of so doing Preparation for the mock examination	constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line • 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; 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)			
Key Vocabulary/Concepts/Ideas	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**	**Key Vocabulary/Concepts/Ideas**
Quadratic, solution, root, linear, solve, simultaneous, inequality, completing the square, factorise, rearrange, surd, function, solve, circle, sets, union, intersection	Vector, direction, magnitude, scalar, multiple, parallel, collinear, proof, ratio, column vector Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem Congruence, side, angle, compass, construction, shape, volume, length, area, volume, scale factor, enlargement, similar, perimeter, frustum	Radius, centre, tangent, circumference, diameter, gradient, perpendicular, reciprocal, coordinate, equation, substitution, chord, triangle, isosceles, angles, degrees, cyclic quadrilateral, alternate, segment, semicircle, arc, theorem Axes, coordinates, sine, cosine, tan, angle, graph, transformations, side, angle, inverse, square root, 2D, 3D, diagonal, plane, cuboid			

	Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data, scatter graph, line of best fit, correlation, positive, negative, sample, population, stem and leaf, frequency, table, sort, pie chart, estimate				
CEIAGS AND Extra Curricular	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**	**CEIAGS AND Extra Curricular**
Business manager, financial analyst, computer programmer, research scientist, engineer, health care professional **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Data analyst, data scientist, logistics analyst, marketing analyst, logistics analyst. Market researcher, financial analyst, statistician, software engineer** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Sculptor, teacher, artist, jeweller** **Farming, electrician, actuaries, construction** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR**	**Farming, electrician, actuaries, construction** **ADDITIONAL MATHS FSMQ RUNS THROUGHOUT THE YEAR** **UKMT CHALLENGES THROUGHOUT THE YEAR** **KS4 STUDY SUPPORT THROUYGHOUT THE YEAR** **PUZZLE CLUB THROUGHOUT THE YEAR** **MEM CHALLENGE**		