In Year Progression Plan & Curriculum Overview for Maths
YEAR 10 2024/25

	Autumn	Spring	Summer
	Unit Titles Overview		
What are students learning?	1. Number - Calculation 2. Geometry - Shape 1 3. Algebra - Simplifying 4. Ratio & Proportion - Fractions, Decimals, Percentages	5. Number & Algebra - Pattern Sniffing 6. Algebra - Solving 1 7. Geometry - Measuring 8. Algebra - Graphing	9. Geometry - Visualising 10. Ratio & Proportion - Proportion 11. Statistics - Probability 12. Statistics - Data
Understanding:	**What will these units of work help students to understand, what does it build on and where does it lead to?**		
	Unit 1 **Core Learning** ➢ *apply and interpret limits of accuracy, including upper and lower bounds* ➢ *estimate powers and roots of any given positive number* ➢ calculate with roots, and with fractional indices	**Unit 5** **Core Learning** ➢ *deduce expressions to calculate the nth term of quadratic sequences* ➢ recognise and use simple geometric progressions (r^n where n is an integer, and r is a rational number or a surd > 0)	**Unit 9** **Core Learning** ➢ identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection and translation and enlargement (including fractional and *negative*

➢ *calculate exactly with surds*
➢ *simplify surd expressions involving squares (e.g. $12 = \sqrt{(4 \times 3)} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators*

Unit 2
Core Learning
➢ *know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and apply it to find lengths in right-angled triangles and, where possible, general triangles and in three dimensional figures*
➢ *know the trigonometric ratios, $\sin\theta = $ opposite/hypotenuse, $\cos\theta = $ adjacent/hypotenuse, $\tan\theta = $ opposite/adjacent*
➢ *apply them to find angles and lengths in right-angled triangles in two 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 $60°$*
➢ *apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results*

Learning Leads to
➢ *apply them to find angles and lengths in right-angled triangles and, where*

Unit 6
Core Learning

➢ solve quadratic equations (including those that require rearrangement) algebraically by factorising; find approximate solutions using a graph
➢ *solve two simultaneous equations in two variables where one is quadratic algebraically*
➢ *solve quadratic inequalities in one variable*

Learning Leads to
➢ *solve quadratic equations by completing the square and by using the quadratic formula*

Unit 7
Core Learning
➢ calculate surface area and volume of spheres, pyramids, cones and composite solids
➢ apply the concepts of congruence and similarity, including the relationships between length, areas and volumes in similar figures

Unit 8
Core Learning

scale factors); describe translations as 2D vectors
➢ *describe the changes and invariance achieved by combinations of rotations, reflections and translations*
➢ *apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors*
➢ *use vectors to construct geometric arguments and proofs*

Unit 10
Core Learning
➢ 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

Learning Leads to
➢ *recognise, sketch and interpret graphs of exponential functions*

Unit 11
Core Learning

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possible, general triangles in three dimensional figures
➢ know and apply the sine rule, a/sinA = b/sinB = c/sinC, and the cosine rule, a² = b² + c² - 2bc cosA, to find unknown lengths and angles
➢ know and apply Area = ½ab sinC to calculate the area, sides or angles of any triangle.

Unit 3
Core Learning
➢ 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 quadratics of the form $x^2 + bx + c$ including the difference of two squares, simplifying expressions involving sums, products and laws of indices

Learning Leads to
➢ simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by

➢ use the form y = mx + c to identify perpendicular lines
➢ 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
➢ interpret the gradient at a point on a curve as the instantaneous rate of change
➢ plot and interpret graphs (including reciprocal 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
➢ calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts

Learning Leads to

➢ recognise, sketch and interpret graphs of exponential functions y = k^x for positive values of k, and the trigonometric functions (with

➢ calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.

Unit 12
Core Learning
➢ construct and interpret diagrams for grouped discrete data and continuous data, i.e. 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
➢ interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency and spread including quartiles and interquartile range
➢ construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class

factorising quadratics of the form

$ax^2 + bx + c$

Unit 4
Core Learning
➢ *change recurring decimals into their corresponding fractions and vice versa*
➢ *set up, solve and interpret the answers in growth and decay problems, including compound interest*

Learning Leads to
➢ *work with general iterative processes*

arguments in degrees) *y = sin x, y = cos x* and *y = tan x* for angles of any size
➢ *apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts*
➢ *work with general iterative processes*

intervals and know their appropriate use
➢ *infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling*

Knowledge:	What Substantive Knowledge will students gain?		

Unit 1
can state the upper and lower bounds of a measurement
can write an inequality to specify an error interval caused by rounding
can calculate the upper and lower bound of a compound measure
can estimate any power of any (positive) integer
can estimate the square root, cube root and other roots of any positive integer
can evaluate a base number with an integer index

Unit 5
can find the nth term of simple quadratic number sequences
can find the nth term of more complex quadratic number sequences
can find the nth term direct from a pattern or visual image of a quadratic sequence
can generate a geometric progression
can find the nth term of a geometric progression where the multiplier is rational
can find the nth term of a geometric

Unit 9
can carry out and describe a rotation
can carry out and describe a reflection
can carry out and describe a translation
can carry out an enlargement with a positive or negative integer or fractional scale factor
can describe an enlargement
can recognise congruent and similar shapes arising from transformations
can combine transformations and solve problems involving these

can evaluate a base number with a unit fractional index

can evaluate a base number with a non-unit fractional index

can evaluate a base number with a negative fractional index

can simplify calculations or expressions involving fractional and/or integer indices

can simplify, multiply and divide surds

can add and subtract surds

can expand brackets involving surds

can calculate with surds in real contexts

can understand the concept and rational and irrational numbers; I can rationalise the denominator of a simple fraction

can rationalise the denominator of any fraction

can solve complex problems involving surds

Unit 2

can find a missing side of a right-angled triangle using Pythagoras' Theorem

can solve more complex problems in 2D using Pythagoras' Theorem

can use Pythagoras' Theorem in 3 dimensions

can use the sine ratio to find the missing side of a right-angled triangle

can use the cosine ratio to find the missing side of a right-angled triangle

progression where the multiplier is a surd

Unit 6

can solve a quadratic equation $x^2+bx+c=0$ by factorising ($b, c>0$)

can solve a quadratic equation $x^2+bx+c=0$ by factorising ($b<0, c>0$)

can solve a quadratic equation $x^2+bx+c=0$ by factorising ($c<0$)

can solve a quadratic equation $ax^2+bx+c=0$ by factorising (a is prime)

can solve a quadratic equation $ax^2+bx+c=0$ by factorising (a is not prime)

can solve a quadratic equation $ax^2+bx+c=dx^2+ex+f$ by rearranging first

can derive and solve quadratic equations from real problems

can solve a quadratic inequality in one variable

can solve a pair of linear simultaneous equations by substituting

can solve a pair of simultaneous equations, one quadratic, by substituting

can derive and solve a pair of simultaneous equations (one quadratic) to solve a problem

can solve a quadratic equation $x^2+bx+c=0$ graphically

can represent vectors as column vectors or diagrams; I can find the magnitude and direction of a vector

can add, subtract and multiply vectors (by a scalar)

can find a given vector by adding combinations of other known vectors appropriately

can prove results using vectors

Unit 10

can recognise and solve simple problems involving direct proportion

can understand the connection between the multiplier, the expression and the graph that represents a direct proportion situation

can construct and use equations to represent direct proportion relationships

can recognise and solve problems involving inverse proportion

can construct and use equations to represent inverse proportion relationships

can recognise and sketch graphs of proportional relationships

Unit 11

can construct and use two-way tables to solve probability problems,

can use the tangent ratio to find the missing side of a right-angled triangle

can select the appropriate trigonometric ratio and use it to find a missing side of a right-angled triangle

can find a missing angle in a right-angled triangle where 2 sides are given

can recall key values of trigonometric functions

can recognise and use the vocabulary of a circle

can recall and use basic angle facts in polygons, around a point, on a line and on parallel lines to find missing angles

can show and use the fact that the angle subtended at the circumference by a semicircle is 90°

can show and use the fact that the angle subtended by an arc at the centre is twice the angle subtended at any point on the circumference

can show and use the fact that angles in the same segment are equal

can show and use the fact that a tangent at any point on a circle is perpendicular to a radius at that point

can show and use the fact that the perpendicular from the centre to a chord bisects the chord

can show and use the fact that opposite angles in a cyclic quadrilateral sum to 180°

can solve a quadratic equation $ax^2+bx+c=0$ graphically

Unit 7
can find the surface area of a prism or cylinder

can find the surface area of a cone or sphere given the formula

can solve problems involving surface area

can find the volume of a prism or cylinder

can find the volume of a pyramid

can find the volume of a cone or sphere given the formula

can solve more complex volume problems

can solve interlinked volume and surface area problems

can solve mass and density problems using volume skills

can find missing lengths in similar shapes

can find missing areas in similar shapes

can find missing volumes in similar shapes

Unit 8
can use the form y=mx+c to plot, sketch and state the equation of straight lines

can construct and find the equation of a

including conditional probability.

can construct and use Venn diagrams to solve probability problems, including conditional probability.

can construct and use tree diagrams for independent events

can construct and use tree diagrams for dependent events, i.e. with conditional probabilities

can calculate probabilities directly in conditional situations

can calculate probabilities in algebraic situations

Unit 12
can construct a box plot from a list of data

can interpret and compare two box plots

can construct a cumulative frequency graph

can analyse a cumulative frequency graph

can construct a box plot from a cumulative frequency curve

can construct a histogram from a frequency table

can construct a frequency table from a histogram

can solve problems involving histograms

can show and use the fact that tangents from an external point are equal in length

can show and use the alternate segment theorem

can apply a combination of the above circle theorems to a problem to find a missing angle

Unit 3

can cancel common factors in an algebraic fraction

can add and subtract algebraic fractions

can multiply and divide algebraic fractions

Can factorise a quadratic expression

can simplify an algebraic fraction using the factorisation of quadratics

can find the product of two binomials containing integers or fractions

can find the product of two binomials containing surds

can find the product of three binomials

can simplify more complex expressions containing products of binomials

Unit 4

can convert any fraction to a decimal using division, including where this decimal recurs

can predict when a fraction will convert to a recurring decimal

can recognise and recall common

line perpendicular to a given line at a given point

can explain the properties of the equations of perpendicular lines

can find the equation of a line perpendicular to a given line at a given point algebraically

can plot the graph of a given function, including a piecewise function to represent a real situation

can recognise and sketch the graphs of a range of functions

Know the equation of a circle

can recognise and draw the graph of the equation of a circle centred at (0,0)

can find the equation of a tangent to a circle at a given point

can solve algebraic problems involving equations of circles and lines, including tangents

can interpret and draw distance-time graphs (straight lines or curves)

can draw and interpret velocity-time graphs

can draw and interpret other real-life graphs

can estimate the gradient of a curve at a given point to find the instantaneous rate of change

can calculate an estimate of the area under a curve and interpret this

can understand the sampling process

can use sampling to infer properties of a population

	equivalent fractions and recurring decimals	
	can convert a simple recurring decimal to a fractions	
	can prove the equivalence of a recurring decimal to a given fraction.	
	can identify a number as rational or irrational	
	can calculate the result of a repeated percentage change	
	can calculate an original amount prior to a repeated percentage change	
	can set up and solve a compound interest problem	
	can set up and solve a different growth or decay problem	

What Disciplinary knowledge and skills will students gain?

Behaviours and attitude associated with disciplinary knowledge in Maths
Thinking is highly organised. It draws on a well-connected knowledge base of facts, methods and strategies that have been used to solve problems with a similar deep structure before. Successful problem-solving is therefore not just an activity but an outcome of successful learning of the facts and methods, and their useful combinations as strategies.

Ability to;
Investigate and recognise the problem type
Conjecture
Prove
Reason
Problem solving using a combination of facts and methods.
Understand the deep structure that the strategies are paired to.

Outcomes	
What will students be able to do?:	**Unit 1** This unit is focused on ● taking the concepts of rounding to their limits in finding error intervals for measures in compound calculations ● exploring the full range of indices and how to evaluate and simplify calculations and expressions involving these ● introducing the concept of surds and how to work with these numbers **Unit 2** ● Students have already encountered Pythagoras' Theorem in Stage 9 and hence the focus here is on application to more complex cases, including 3D. ● However, this is the first introduction to trigonometry and hence it is important to spend time explaining and exploring where it comes from. **Unit 3** ● This unit builds on earlier work of basic numeric fractions, expanding double brackets, factorising quadratics and more recently using surds to support simplification of the most complex type of expressions. Students have previously expanded double brackets but not three or more and they may have more limited experience in applying these techniques to surds, fractions and so on. **Unit 4** ● Students will have already converted simple recurring decimals (such as $\frac{1}{3}$=0.333…) but this is the first time they will do so with more complex examples and will need to be confident with their use of algebra to do so ● The second part of the unit focuses on setting up and solving an equation involving an original amount, multiplier, compounding power and final amount and hence a systematic (algebraic) approach to these problems should be modelled. This will help students see all of these problems as similar and related rather than treating interest different to other growth/decay **Unit 5** ● Students have come across quadratic and geometric sequences in earlier work but this is their first introduction to finding a nth term for them. **Unit 6** ● Students have already learned to factorise quadratics of the form x^2+bx+c but have not yet solved quadratic equations. ● This is also the first encounter with quadratic expressions with a coefficient of x^2 not equal to 1

- Simultaneous Equations have been previously encountered with linear equations and solutions using elimination and substitution have been covered. In this unit we are mostly interested in substitution because the focus is on moving to simultaneous equations where one is quadratic (and these equations require a substitution approach).
- Solving inequalities in one variable and their solution sets as intervals marked on a number line have been previously encountered (as has linear programming). The use of inequalities for quadratic situations is new to this unit.

Unit 7

- Students have previously explored the volume and surface area of cuboids, right prisms and cylinders (including cylindrical sectors). However, the content for spheres, cones, pyramids and their combinations is new.

Unit 8

- This unit builds from Stage 9 work focused on using $y=mx+c$ to find the equations of lines and parallel lines.
- This is the first time that students have encountered the equation of a circle, although there are lots of nice links and applications to Pythagoras' Theorem and Circle Theorems to be exploited and revisited here.

Unit 9

- This unit initially consolidates work on transformations in KS3 and extends this to considering enlargements under negative and/or fractional scale factors as well as the concept of invariance.
- The subsequent content on vectors is entirely new and represents a significant higher tier topic.

Unit 10

- This unit builds on the scaling and informal proportion work of the previous year, with a focus on developing the algebraic methods to construct and use equations for direct and inverse proportion relationships

Unit 11

- Students will use previously encountered tools (tree diagrams, Venn diagrams and 2-way tables) but will extend their use to situations involving conditional probability

Unit 12

- Box plots (and their use in comparing populations), cumulative frequency graphs and histograms are all new topics covered in this unit

Literacy Knowledge and skills:	Vocabulary Acquisition
	• Students will be explicitly taught new tier 2 and tier 3 vocabulary across all units. • Students will be encouraged to incorporate newly taught vocabulary in their tasks. • Students will be encouraged to highlight when they have used new vocabulary in written responses.

• Students will be supported to use and spell the correct terms in their written work.
• Students will self-assess the accuracy of their own spelling and grammar in their writing.
• Teachers will address common misspellings in whole class feedback and may test students if they feel it is appropriate.
• Students will revisit previously learned vocabulary and concepts through interleaved recall quizzing.

KEY VOCAB

Bound	triangle	Circle	Linear
upper bound	Pythagoras' Theorem	Centre	Binomial
lower bound	right-angled triangle	Radius	Product
measurement	hypotenuse	Chord	Expand
error	root	Diameter	Cancel
error interval	surd	Circumference	Divide
compounded	(Pythagorean) triple	Tangent	numerator
accuracy	trigonometry	Arc	denominator
power	opposite	Sector	recurring decimal
root	adjacent	Segment	equivalent
estimate	sine	Chord	terminating decimal
nearest squares/cubes	cosine	Bisect	rational number
base number	tangent	Subtend	irrational number

index/indices	ratio	Theorem	notation of recurring
unit fraction	similar (triangles)	Justification	multiplier
non-unit fraction	known	Proof	percentage change
surd	exact value	Reasons	compound interest
simplify	denominator	Simplify	compounded
equivalent	numerator	Algebraic	original
rational	sin^-1	Fraction	growth
irrational	cos^-1	Numerator	decay
rationalise (the denominator)	tan^-1	Denominator	exponential
term	proof	Factorise	initial value
first term	position (n)	Indices	appreciate
linear sequence	nth term	Brackets	depreciate
arithmetic	notation: T(n) or Tn	Expression	quadratic
progression	first differences	Quadratic	quadratic equation
Fibonacci	second differences	Factorise	coefficient
sequence	delta1, delta 2	surface area	factorise
Fibonacci-type	geometric	net	product
recurrence relation	progression	cube	solution

notation: Un	ratio	cuboid	rearrange
quadratic	multiplier	prism	$ax^2 + bx + c$
sequence	convergent	cross-section	function
Coefficient	Divergent	curved surface area	root
function	exponential	cylinder	approximate
equation of a line	approximate	pyramid	graph
gradient	gradient	cone	construct
y-intercept	instantaneous rate of change	frustum	intersection
parallel	velocity	sector	simultaneous equations
perpendicular	velocity-time graph	slant height	substitute
reciprocal	acceleration	sphere	pair of solutions
product (of gradients)	rate of change	hemisphere	quadratic inequality
equation of a circle	transformation	Pythagoras' Theorem	directly proportional
radius, diameter, circumference	rotation	volume	∝
centre	reflection	similar	constant of proportionality
origin	translation	scale factor	multiplier
tangent	describe	area scale factor	inversely proportional
intersect	vertex	volume scale factor	reciprocal

Pythagoras' Theorem	centre	Proportion	List
sketch	angle of rotation	displacement	Systematically
plot	direction of rotation	velocity	Frequency
quadratic	equation of line	acceleration	Frequency Tree
cubic	horizontal	coordinate plane	Tree Diagram
reciprocal	vertical	parallel	Expected
Probability	column vector	line	Theoretical
Outcome	combination	line segment	Experimental
Event	congruent	proof	Random
Exhaustive	object	geometric problem	Repeated
Independent	image	box plot	Experiment
Dependent	similar	box and whisker diagram	Biased
Exclusive	enlargement	median	Unbiased
Mutually Exclusive	centre of enlargement	maximum	grouped data
Conditional	ray	minimum	continuous data
Two-way table	scale factor	range	estimate
Venn Diagram	inversion	upper quartile	limitation
Intersection ∩	proportion	lower quartile	histogram

Union U	describe	interquartile range	frequency
Not e.g. A'	vector	outlier	class interval
skew	magnitude	central tendency	equal and unequal
positive/negative skew	direction	spread	distortion
cumulative frequency	column vector	dispersion	construct
curve	Notation	consistency	frequency density
ogive	area of bar	compare	ratio (of frequency to class width)
	sample	infer	
	representative	variation	
	bias		
	random		

Oracy

• Students will be given a number of opportunities to express their opinions through discussion, debate, performance and presentations; on an individual and group basis.

	• Teachers will model spoken formal Standard language and encourage students to effectively structure verbal responses. • Poor communication and non-standard English responses will be challenged, and students will be encouraged to self-correct. • Students will be encouraged to practice turn taking in peer to peer conversations to aid speaking and listening skills.
	Reading for Meaning
	• Students will be encouraged to utilise reciprocal reading strategies to ensure that comprehension of the reading materials is cemented (e.g. articles, case studies, set texts etc.). • Students are expected to use the reading sources to support student responses and ideas. • Teachers are to utilise a range of DART (Directed Activities Related to Text) strategies to ensure that students are engaging with their reading e.g. use of summaries, gap fills, sequencing activities etc.); to support student responses. • Teachers will read aloud and model what effective reading sounds like (e.g. reading case studies, questions and articles).
	Literacy code - marking
	• The literacy marking code will be used to review student responses; identifying errors and expecting students to self-correct. • Particular attention on: spelling, punctuation, grammar, tense and written structure (use of paragraphing) will be highlighted. • Teachers to 'spotlight' literacy during the lesson to flag common misconceptions or spelling, punctuation or grammatical errors. • Teachers promote 'checking' phases of the lesson to encourage students to review their work for errors.
	Written Response Scaffolding
	• Within the subject; an agreed written structure for responses is shared and used. • Sentence starters are available in subject areas to support student responses. • Specific and tiered success criteria is given to before commencing extended tasks. • Live modelling of outcomes is expected. This should be constructed in the form of an 'I do, We do, You do'. 'I do' models should be curated beforehand and where possible, the model should be examples from students for authenticity.