

Curriculum Map: Year 10 Mathematics (Foundation tier pathway)

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<p>Content</p> <p>Declarative knowledge</p> <p>'I Know'</p>	<p><u>Indices and Standard Form</u></p> <ul style="list-style-type: none"> • Index notation • Estimating powers and roots. • Laws of indices • Writing numbers in standard form • Calculations with numbers in standard form <p><u>Algebraic Manipulation</u></p> <ul style="list-style-type: none"> • Simplifying expressions • Expanding brackets • Factorising expressions • Completing the square • Substitution 	<p><u>Algebraic Solutions of Equations</u></p> <ul style="list-style-type: none"> • Solving linear equations with one unknown • Solving quadratic equations <p><u>Fractions and Decimals</u></p> <ul style="list-style-type: none"> • Simplifying fractions and equivalent fractions • Fraction arithmetic • Algebraic fractions • Decimal arithmetic • Converting recurring decimals to fractions <p><u>Data Collection and Sampling</u></p> <ul style="list-style-type: none"> • Populations and samples • Averages and range • Construct charts for categorical data (frequency tables, bar charts, pie charts and pictograms) • Construct charts for ungrouped numerical data (vertical line charts) 	<p><u>Congruent and Similar Shapes</u></p> <ul style="list-style-type: none"> • Identify congruent triangles • Identify similar triangles • Compare lengths, areas and volumes using scale factors <p><u>Pythagoras' Theorem</u></p> <ul style="list-style-type: none"> • Find missing sides in right angled triangles • Apply Pythagoras' theorem in a 3D context <p><u>Trigonometry</u></p> <ul style="list-style-type: none"> • Find missing sides and angles in right angled triangles • Use trigonometry • Exact trigonometric values <p><u>Proofs and Formulae</u></p> <ul style="list-style-type: none"> • Formulate algebraic expressions • Change the subject of the formula • Algebraic terminology and proofs 	<p><u>Organising, Presenting and Analysing Data</u></p> <ul style="list-style-type: none"> • Time series graphs • Cumulative frequency • Box plots <p><u>Bivariate Data</u></p> <ul style="list-style-type: none"> • Scatter diagrams • Correlation • Lines of best fit <p><u>Accuracy and Bounds</u></p> <ul style="list-style-type: none"> • Upper and lower bounds • Error intervals • Problem solving with upper and lower bounds <p><u>Mensuration</u></p> <ul style="list-style-type: none"> • Circumference and area of a circle • Sector Area • Arc Length 	<p><u>Simultaneous Equations</u></p> <ul style="list-style-type: none"> • Linear simultaneous equations • Quadratic simultaneous equations • Forming and solving simultaneous equations <p><u>Percentage Change</u></p> <ul style="list-style-type: none"> • Compound and simple interest • Exponential growth and decay <p><u>Bearings and Scale Drawings</u></p> <ul style="list-style-type: none"> • Measure and draw bearings • Calculate bearings • Construct and interpret scale drawings 	<p><u>Prisms</u></p> <ul style="list-style-type: none"> • Volume of prisms • Surface area of prisms <p><u>Probability</u></p> <ul style="list-style-type: none"> • Relative frequency • Sample spaces • Enumeration • Venn diagrams • Probability trees <p><u>Constructions and Loci</u></p> <ul style="list-style-type: none"> • Perpendicular bisectors and angle bisectors • Perpendicular from a point to a line • Identify the loci of a set of points <p><u>2D and 3D Representation</u></p> <ul style="list-style-type: none"> • Plans and elevations • Properties of 3D shapes

<p>Skills</p> <p>Procedural Knowledge</p> <p>'I know how to'</p>	<p><u>Indices and Standard Form</u></p> <ul style="list-style-type: none"> • Write numbers using index notation • Use negative indices to represent reciprocals • Use fractional indices to represent roots • Estimate powers and roots • Apply the rules of indices • Interpret and order numbers expressed in standard form • Convert numbers to and from standard form. • Use a calculator to perform calculations with numbers in standard form • Add, subtract, multiply and divide numbers in standard form without a calculator <p><u>Algebraic Manipulation</u></p> <ul style="list-style-type: none"> • Simplify algebraic expressions by expanding a simple bracket • Expand products of two binomials • Factorise by taking out common factors • Factorise quadratic expressions where the coefficient of x^2 is 1 • Substitute positive or negative numbers into simple and complex formulae. 	<p><u>Algebraic Solutions of Equations</u></p> <ul style="list-style-type: none"> • Solve linear equations in one unknown • Solve linear equations with the unknown on both sides (including with brackets and fractions) • Set up and solve linear equations in mathematical and non-mathematical contexts • Solve quadratic equations through factorising <p><u>Fractions and Decimals</u></p> <ul style="list-style-type: none"> • Recognise and use equivalence between fractions and mixed numbers • Add, subtract, multiply and divide simple fractions including mixed numbers and negative fractions • Calculate a fraction of a quantity including with fractions greater than 1 • Express a simple fraction as a terminating decimal or vice versa • Use division to convert a simple fraction to a decimal • Add, subtract and multiply decimals including decimals that are negative • Divide a decimal by a whole number or by another decimal without 	<p><u>Congruent and Similar Shapes</u></p> <ul style="list-style-type: none"> • Prove two triangles are congruent using the cases SSS, ASA, SAS and RHS • Apply congruent triangles in calculations and simple proofs • Identify and prove that two triangles are similar • Compare lengths, areas and volumes using ratio notation and scale factors • Apply similarity to calculate unknown lengths in similar figures <p><u>Pythagoras' Theorem</u></p> <ul style="list-style-type: none"> • Apply Pythagoras' theorem ($a^2 + b^2 = c^2$) to find lengths in right angled triangles <p><u>Trigonometry</u></p> <ul style="list-style-type: none"> • Know and apply trigonometric ratios to find angles and lengths in right angled triangles. • Know exact values of $\sin \theta$, $\cos \theta$ and $\tan \theta$ where $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ or 90° 	<p><u>Organising, Presenting and Analysing Data</u></p> <ul style="list-style-type: none"> • Design tables to classify data • Define the population in a sample and understand the difference between population and sample • Understand what is meant by simple random sampling and stratified sampling • Interpret and construct line graphs for time series data and identify trends such as seasonal variations <p><u>Bivariate Data</u></p> <ul style="list-style-type: none"> • Plot and interpret scatter diagrams for bivariate data • Recognise and interpret correlation within the context of the variables • Draw a line of best fit by eye and use it to make predictions • Interpolate and extrapolate from given data • Identify an outlier on a scatter diagram 	<p><u>Simultaneous Equations</u></p> <ul style="list-style-type: none"> • Manipulate and solve algebraically two linear simultaneous equations in two variables • Set up and solve simultaneous equations in mathematical and non-mathematical contexts <p><u>Percentage Change</u></p> <ul style="list-style-type: none"> • Calculate simple interest, for instance in financial contexts • Solve problems step-by-step involving multipliers over a given interval for compound interest and depreciation <p><u>Bearings and Scale Drawings</u></p> <ul style="list-style-type: none"> • Understand how to measure and construct bearings • Understand how to work out bearings either from a given diagram or from a worded problem • Use trigonometry and bearings to solve problems • Use the scale of a map and work with bearings • Construct and interpret scale drawings 	<p><u>Prisms</u></p> <ul style="list-style-type: none"> • Calculate the surface area and volume of any prism including cylinders • Apply knowledge of surface area and volume to solve a variety of problems <p><u>Probability</u></p> <ul style="list-style-type: none"> • Use the 0 – 1 probability scale as a measure of likelihood of random events • Analyse and calculate the relative frequency of outcomes • Use relative frequency as an estimate of probability • Use tables and grids to list the outcomes of single events and to calculate theoretical probabilities • Use systematic listing strategies • Use a two-circle Venn diagram to enumerate sets and use this to calculate related probabilities • Use simple set notation to describe simple sets of numbers or objects • Use tree diagrams to enumerate sets and to record probabilities of successive events • Use the addition law for mutually exclusive events
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		<p>using a calculator</p> <p><u>Averages and Charts</u></p> <ul style="list-style-type: none"> • Calculate the mean, mode, median and range from ungrouped data • Calculate estimates of mean, mode and range from grouped data • Interpret and construct frequency tables, bar charts, pie charts and pictograms for categorical data • Interpret and construct vertical line charts for ungrouped, discrete numerical data • Interpret multiple bar charts and composite bar charts 	<p><u>Proofs and Formulae</u></p> <ul style="list-style-type: none"> • Recognise the distinction between an equation and an identity • Use algebra to construct arguments • Change the subject of formulae, where the subject only appears once 	<p><u>Accuracy and Bounds</u></p> <ul style="list-style-type: none"> • Use inequality notation to write down an error interval for a number or measurement rounded or truncated to a given degree of accuracy • Calculate the upper and lower bounds of calculations • Understand the difference between the bounds of discrete data and continuous data <p><u>Mensuration</u></p> <ul style="list-style-type: none"> • Find the circumference and area of a circle • Find the arc length of a sector • Find the area of a sector • Find the radius/diameter of a circle given the arc length/area of a sector 		<p><u>Constructions and Loci</u></p> <ul style="list-style-type: none"> • Use construct to find the midpoint of a line segment • Construct the perpendicular bisector of a line segment • Construct the bisector of an angle • Construct the perpendicular from a point to a line • Construct the perpendicular to a line at a point • Apply constructions using ruler and compasses to identify the loci of points, including for real world problems <p><u>2D and 3D Representations</u></p> <ul style="list-style-type: none"> • Use geometric terms to describe 2D and 3D shapes • Represent solids using plans and elevations • Draw solids from plans and elevations
<p>Strategies</p> <p>Conditional Knowledge</p> <p>‘I know when to’</p>	<p><u>Indices and Standard Form</u></p> <ul style="list-style-type: none"> • Apply the correct rules of indices • When and how to use fractional and negative indices • Know what methods to follow when adding, subtracting, multiplying and dividing with numbers 	<p><u>Algebraic Solutions of Equations</u></p> <ul style="list-style-type: none"> • Construct a chain of reasoning to justify the solution to an equation • Solve area, volume and kinematics problems given in worded form or diagrammatic contexts • Know when it is appropriate to solve 	<p><u>Congruent and Similar Shapes</u></p> <ul style="list-style-type: none"> • Know when to explain with reasoning whether shapes are congruent or similar • Use similar shapes to translate non-mathematical contexts into problems that can be analysed mathematically 	<p><u>Organising, Presenting and Analysing Data</u></p> <ul style="list-style-type: none"> • Design appropriate tables to analyse data • Infer properties of populations and distributions from a sample • Show clear chains of reasoning to present statistical arguments 	<p><u>Simultaneous Equations</u></p> <ul style="list-style-type: none"> • Know when to set up and solve simultaneous equations in two variables • Know when and how to manipulate one or both simultaneous equations in order to solve a problem • Construct clear chains of reasoning to solve simultaneous equations 	<p><u>Prisms</u></p> <ul style="list-style-type: none"> • Make deductions and inferences and draw conclusions regarding re-shaping solids assuming no loss of volume • Given the volume or surface area, work backwards to find an unknown radius/diameter/height

	<p>in standard form</p> <ul style="list-style-type: none"> • Know when to apply the appropriate rules of arithmetic when answering problem solving and worded questions involving standard form <p><u>Algebraic Manipulation</u></p> <ul style="list-style-type: none"> • Understand the difference between expanding double brackets and expanding single brackets • Understand how to fully factorise an expression • Understand when an expression will be factorised into two brackets rather than one 	<p>quadratic equations through factorisation or completing the square or using the quadratic formula</p> <p><u>Fractions and Decimals</u></p> <ul style="list-style-type: none"> • Use fractions and decimals in a series of mathematical processes • Know when it is more appropriate to leave answers in either fraction or decimal form. <p><u>Averages and Charts</u></p> <ul style="list-style-type: none"> • Recognise graphical misrepresentation, for instance through incorrect scales or labels 	<p><u>Pythagoras' Theorem</u></p> <ul style="list-style-type: none"> • Know whether to add or subtract the squares of the sides • From the three side lengths of a triangle, make a deduction about whether a triangle contains a right angle • Make and use connections between similar and congruent triangles, units of measurement, error intervals and bounds, estimation and rounding <p><u>Trigonometry</u></p> <ul style="list-style-type: none"> • Identify when to use the correct trigonometric ratio • By considering the three sides of a triangle, make deductions about whether a triangle includes all acute angles or one right-angle or one obtuse angle • Know and when it is most sensible to apply either trigonometry or Pythagoras' theorem <p><u>Proofs and Formulae</u></p> <ul style="list-style-type: none"> • Understand how to rearrange formulae and when taking a factor of the subject is necessary. 	<p><u>Bivariate Data</u></p> <ul style="list-style-type: none"> • Make deductions, inferences and draw conclusions taking care to recognise the limitations of those findings • Extrapolate and interpolate data using a line of best fit and be aware of the limitations of these techniques • Interpret results in the context of a given problem <p><u>Accuracy and Bounds</u></p> <ul style="list-style-type: none"> • Know when your answer must be an integer dependent on whether the data is discrete or continuous • Know when to use either the upper or lower bound dependent on the context of the question <p><u>Mensuration</u></p> <ul style="list-style-type: none"> • Present arguments and proofs to solve problems giving answers in terms of pi • Given the area/circumference, work backwards to find an unknown radius/diameter 	<p>and interpret the answers, with justification.</p> <p><u>Percentage Change</u></p> <ul style="list-style-type: none"> • Express the effect of successive growth and decay as an overall percentage change • Apply either simple or compound interest to a problem <p><u>Bearings and Scale Drawings</u></p> <ul style="list-style-type: none"> • Know when to draw a diagram to help solve a problem involving bearings • Make connections between different parts of mathematics, for instance using ratios and converting units 	<p><u>Probability</u></p> <ul style="list-style-type: none"> • Know when to use different terminology and mathematical vocabulary when working through probability problems • Apply Venn diagrams and tree diagrams to solve probability problems in a variety of mathematical and non-mathematical contexts <p><u>Constructions and Loci</u></p> <ul style="list-style-type: none"> • Justify loci using clear mathematical reasoning. • Know when to solve problems using constructions, and how to determine which construction is the most appropriate to use <p><u>2D and 3D Representations</u></p> <ul style="list-style-type: none"> • Know when to apply correct terminology to 2D and 3D shapes
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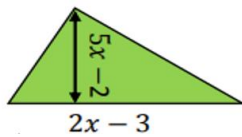
Key Questions

Indices and Standard Form

- Write 0.000809 in standard form.
- Leaving your answer in standard form, work out $(3.6 \times 10^3) \div (9 \times 10^{-3})$.
- The distance of the moon to the Earth is 384,000 km. The speed of light is 2.998×10^8 m/s. Work out how long it will take light to travel from the moon to Earth.

Algebraic Manipulation

- Expand and simplify $(2x + 3)(x - 1)$
- Factorise $x^2 - 16$.
- Write an expression for the area of the following shape:



Algebraic Solutions of Equations

- Solve $5x + 4 = 2x + 5$
- By factorising, solve $x^2 - 2x - 6 = 2$.
- Tom is 5 years older than Ben. Sam is double Ben's age. The sum of their ages is 74. How old is Tom?

Fractions and Decimals

- 0.06×0.4
- $0.048 \div 0.006$
- Find $\frac{5}{4}$ of £64
- In a class, $\frac{3}{5}$ of students are girls. Of these girls, $\frac{2}{3}$ wear glasses. What fraction of the class are girls who wear glasses?

Averages and Charts

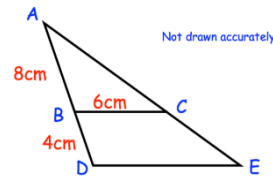
- Find an estimate for the mean:

Height, h (cm)	Frequency
$150 < h \leq 160$	14
$160 < h \leq 170$	50
$170 < h \leq 175$	32
$175 < h \leq 180$	19
$180 < h \leq 190$	8

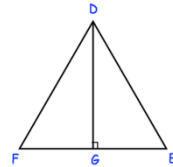
- The mean of 4 numbers is 10. Three of the numbers are 4, 10 and 19. Find the value of the final number.

Congruent and Similar Shapes

- Calculate missing length DE.



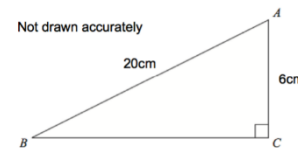
- DEF is an equilateral triangle.



G lies on EF.
DG is perpendicular to FE.
Prove DFG is congruent to DEG.

Pythagoras' Theorem

Find length BC.



Organising, Presenting and Analysing Data

Parker wants to take a random sample of people who live in his street. Explain what is meant by a random sample and describe a sampling method which Parker could use.

Bivariate Data

- Plot a scatter graph for
- Identify the outlier from your scatter graph.
- Draw a line of best fit onto your scatter graph.
- Estimate from your line of best fit. Does this seem reliable?

Accuracy and Bounds

- A length has been recorded as 4.5cm correct to the nearest mm. Represent this in an error interval.
- A car is travelling at 50 mph (correct to the nearest 10 mph) for 3 hours (correct to the nearest hour). What is the shortest distance the car could have travelled?

Simultaneous Equations

- Solve the following simultaneous equations:
 $4x + 3y = 20$
 $3x + 5y = 24$

- Two numbers have a sum of 20 and a difference of 8. By forming and solving two equations, find the values of the two numbers.

Percentage Change

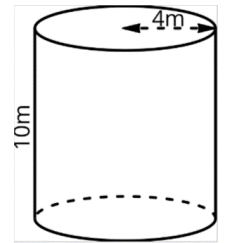
- A car depreciates in value by 3.2% each year for 6 years. The car is valued at £4000 at the end of the 6th year. How much did it cost originally?
- Paul has two options for his savings. Either he can put it in a compound interest account of 4.2% per annum, or a simple interest account of 5% per annum. Where should Paul invest his savings if he wants to withdraw his money in 4 years' time?

Bearings and Scale Drawings

- The bearing of a ship from a lighthouse is 055° . Work out the bearing of the lighthouse from the ship.

Prisms

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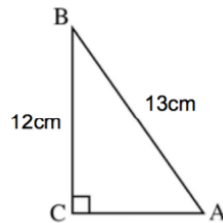
For the cylinder above, find a) its volume, b) its surface area.

Probability

- Laura observed 20 cars and found that 3 of them were blue. Based on this evidence, if Laura were to observe another 100 cars, how many of them would she expect not to be blue?
- At a restaurant there are 3 options for starter, 3 for a main course and 4 for dessert. Sam would like a 2-course meal. How many possible meal combinations does he have?
- Paul asked the 30 students in his class whether they liked tea and coffee. 10 said they liked tea, 15 said they liked coffee and 12 said they liked neither.

Trigonometry

Find angle BAC.



Proofs and Formulae

Rearrange the formula

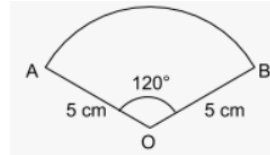
$$y = (2x + 3)^2$$

to make x the subject.

Mensuration

1) The circumference of a circle is 32 cm. What is the radius of the circle?

2) Find the perimeter of the sector below.



2) From town B, town A is 6 km due north and town C is 4.5 km due east. Calculate the bearing of A from C.

What is the probability a student chosen at random from the class likes both tea and coffee?

Constructions and Loci

For the rectangle ABCD shown on your worksheet, find the region which is

- less than 3cm from B,
- closer to B than C, and
- closer to AB than to BC.

2D and 3D Representations

1) From the front elevation, side elevations and plan view of the shape, draw a sketch of the 3D shape.

2) From an image of the 3D shape, draw the plans and elevations of the shape.

Assessment topics	Mini assessment for each topic studied	Mini assessments End of term tests	Mini assessment for each topic studied	Mini assessments End of term tests	Mini assessment for each topic studied	Mini assessments End of term tests
Cross curricular links/ Character Education	<p><u>Indices and Standard Form</u></p> <p>In Science, standard form is used when working with particularly large numbers (e.g. for mass and distance in astrophysics) and small numbers (for mass and lengths in biology).</p> <p><u>Algebraic Manipulation</u></p> <p>In Science, algebraic manipulation is used to rearrange key formulae.</p>	<p><u>Algebraic Solutions of Equations</u></p> <p>In Computing, algebra is used to form equations that create graphics.</p> <p><u>Data Collection and Sampling</u></p> <p>Sampling and data collection methods are reviewed regularly in Psychology.</p> <p><u>Compound Units</u></p> <p>Compound units are used frequently in Physics.</p>	<p><u>Pythagoras' Theorem and Trigonometry</u></p> <p>In Design Technology, Pythagoras' theorem and trigonometry are used to calculate distances and angles of elevation/depression.</p>	<p><u>Organising, Presenting and Analysing Data</u></p> <p>The ability to organise, present and analyse data is used in multiple subjects. This includes looking at statistics in Geography, collecting data in Biology and analysing data in Business and Economics.</p> <p><u>Fractions and Decimals</u></p> <p>In Design Technology, fractions are used when working with materials and also when scaling up/down recipes.</p>	<p><u>Percentage Change</u></p> <p>In Geography, percentage calculations are used to make comparisons, for instance when looking at rainfall or comparing changes in population sizes.</p> <p>In Business and Economics, profit, loss, growth and decay are all represented as percentages.</p> <p><u>Bearings and Scale Drawings</u></p> <p>In Design Technology you need to be able to work with scale drawings.</p> <p>In Geography, you need to be able to work with scale on maps.</p>	<p><u>Circles, Spheres and Pyramids</u></p> <p>In Design Technology, working with area and volume will help when designing different objects and products.</p>