Curriculum Area: Year 10 Higher Maths

2017/2018

Topics	Year Curriculum	How you can support learning at home, eg. books, websites, family learning through visits
Calculations, checking and rounding **OBJECTIVES** By the end of the sub-unit, students should be able to: • Add, subtract, multiply and divide decimals, whole numbers including any number between 0 and 1; • Put digits in the correct place in a decimal calculation and use one calculation to find the answer to another; • Use 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); • Round numbers to the nearest 10, 100, 1000, the nearest integer, to a given number of decimal places and to a given number of significant figures; • Estimate answers to one- or two-step calculations, including use of rounding numbers and formal estimation to 1 significant figure: mainly whole numbers and then decimals. **Indices, roots, reciprocals and hierarchy of operations** **OBJECTIVES** By the end of the sub-unit, students should be able to:	AP1	Complete homework tasks on Hegarty Maths. Use the Corbett Maths website for extra practice. Use the Edexcel (9-1) Foundation Revision guide.

- Use index notation for integer powers of 10, including negative powers;
- Recognise powers of 2, 3, 4, 5;
- Use the square, cube and power keys on a calculator and estimate powers and roots of any given positive number, by considering the values it must lie between, e.g. the square root of 42 must be between 6 and 7;
- Find the value of calculations using indices including positive, fractional and negative indices;
- Recall that $n^0 = 1$ and $n^{-1} = \frac{1}{n}$ for positive integers n as well as, $n^{\frac{1}{2}} = \sqrt{n}$ and $n^{\frac{1}{3}} = \sqrt[3]{n}$ for any positive number n;
- Understand that the inverse operation of raising a positive number to a power n is raising the result of this operation to the power $\frac{1}{n}$;
- Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractional and negative powers, and powers of a power;
- Solve problems using index laws;
- Use brackets and the hierarchy of operations up to and including with powers and roots inside the brackets, or raising brackets to powers or taking roots of brackets;
- Use an extended range of calculator functions, including +, –, ×, ÷, x^2, $\sqrt{x}$, memory, x^y, $x^{\frac{1}{y}}$, brackets;

Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations.

Factors, multiples, primes, standard form and surds

OBJECTIVES

By the end of the sub-unit, students should be able to:

- Identify factors, multiples and prime numbers;

• Find the prime factor decomposition of positive integers – write as a product using index notation; • Find common factors and common multiples of two numbers; • Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors – include finding LCM and HCF given the prime factorisation of two numbers; • Solve problems using HCF and LCM, and prime numbers; • Understand that the prime factor decomposition of a positive integer is unique, whichever factor pair you start with, and that every number can be written as a product of prime factors; • Convert large and small numbers into standard form and vice versa; • Add, subtract, multiply and divide numbers in standard form; • Interpret a calculator display using standard form and know how to enter numbers in standard form; • Understand surd notation, e.g. calculator gives answer to sq rt 8 as 4 rt 2; • Simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{(4 \times 3)} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$). **Algebra: the basics, setting up, rearranging and solving equations** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Use algebraic notation and symbols correctly; • Know the difference between a term, expression, equation, formula and an identity; • Write and manipulate an expression by collecting like terms; • Substitute positive and negative numbers into expressions such as $3x + 4$ and $2x^3$ and then into expressions involving brackets and powers; • Substitute numbers into formulae from mathematics and other subject using simple linear formulae, e.g. $l \times w$, $v = u + at$; • Simplify expressions by cancelling, e.g. $\frac{4x}{2} = 2x$;		

• Use instances of index laws for positive integer powers including when multiplying or dividing algebraic terms; • Use instances of index laws, including use of zero, fractional and negative powers; • Multiply a single term over a bracket and recognise factors of algebraic terms involving single brackets and simplify expressions by factorising, including subsequently collecting like terms; • Expand the product of two linear expressions, i.e. double brackets working up to negatives in both brackets and also similar to $(2x + 3y)(3x – y)$; • Know that squaring a linear expression is the same as expanding double brackets; • Factorise quadratic expressions of the form $ax^2 + bx + c$; • Factorise quadratic expressions using the difference of two squares; • Set up simple equations from word problems and derive simple formulae; • Understand the ≠ symbol (not equal), e.g. $6x + 4 \neq 3(x + 2)$, and introduce identity ≡ sign; • Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation; • Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution; • Solve linear equations in one unknown, with integer or fractional coefficients; • Set up and solve linear equations to solve to solve a problem; • Derive a formula and set up simple equations from word problems, then solve these equations, interpreting the solution in the context of the problem; • Substitute positive and negative numbers into a formula, solve the resulting equation including brackets, powers or standard form; • Use and substitute formulae from mathematics and other subjects, including the kinematics formulae $v = u + at$, $v^2 – u^2 = 2as$, and $s = ut + \frac{1}{2} at^2$; • Change the subject of a simple formula, i.e. linear one-step, such as $x = 4y$; • Change the subject of a formula, including cases where the subject is on both sides of the original formula, or involving fractions and small powers of the subject;		

• Simple proofs and use of ≡ in “show that” style questions; know the difference between an equation and an identity; Use iteration to find approximate solutions to equations, for simple equations in the first instance, then quadratic and cubic equations. **Sequences** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Recognise simple sequences including at the most basic level odd, even, triangular, square and cube numbers and Fibonacci-type sequences; • Generate sequences of numbers, squared integers and sequences derived from diagrams; • Describe in words a term-to-term sequence and identify which terms cannot be in a sequence; • Generate specific terms in a sequence using the position-to-term rule and term-to-term rule; • Find and use (to generate terms) the *n*th term of an arithmetic sequence; • Use the *n*th term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the first term above or below a given number; • Identify which terms cannot be in a sequence by finding the *n*th term; • Continue a quadratic sequence and use the *n*th term to generate terms; • Find the *n*th term of quadratic sequences; • Distinguish between arithmetic and geometric sequences; • Use finite/infinite and ascending/descending to describe sequences; • Recognise and use simple geometric progressions (*rn* where *n* is an integer, and *r* is a rational number > 0 or a surd); • Continue geometric progression and find term to term rule, including negative, fraction and decimal terms; • Solve problems involving sequences from real life situations.		

Averages and range
OBJECTIVES
By the end of the sub-unit, students should be able to:
 	
• Design and use two-way tables for discrete and grouped data;
• Use information provided to complete a two-way table;
• Sort, classify and tabulate data and discrete or continuous quantitative data;
• Calculate mean and range, find median and mode from a small data set;
• Use a spreadsheet to calculate mean and range, and find median and mode;
• Recognise the advantages and disadvantages between measures of average;
• Construct and interpret stem and leaf diagrams (including back-to-back diagrams):
  ○ find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem and leaf diagrams (mode, median, range);
• Calculate the mean, mode, median and range from a frequency table (discrete data);
• Construct and interpret grouped frequency tables for continuous data:
  ○ for grouped data, find the interval which contains the median and the modal class;
  ○ estimate the mean with grouped data;
  ○ understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values.
 	
Representing and interpreting data and scatter graphs
OBJECTIVES
By the end of the sub-unit, students should be able to:
 	
• Know which charts to use for different types of data sets;
• Produce and interpret composite bar charts;
• Produce and interpret comparative and dual bar charts;
• Produce and interpret pie charts:
  ○ find the mode and the frequency represented by each sector;
	AP2	Complete homework tasks on Hegarty Maths.
		
		Use the Corbett Maths website for extra practice.
		
		Use the Edexcel (9-1) Foundation revision guide.

○ compare data from pie charts that represent different-sized samples; • Produce and interpret frequency polygons for grouped data: ○ from frequency polygons, read off frequency values, compare distributions, calculate total population, mean, estimate greatest and least possible values (and range); • Produce frequency diagrams for grouped discrete data: ○ read off frequency values, calculate total population, find greatest and least values; • Produce histograms with equal class intervals: ○ estimate the median from a histogram with equal class width or any other information, such as the number of people in a given interval; • Produce line graphs: ○ read off frequency values, calculate total population, find greatest and least values; • Construct and interpret time–series graphs, comment on trends; • Compare the mean and range of two distributions, or median or mode as appropriate; • Recognise simple patterns, characteristics relationships in bar charts, line graphs and frequency polygons; • Draw and interpret scatter graphs in terms of the relationship between two variables; • Draw lines of best fit by eye, understanding what these represent; • Identify outliers and ignore them on scatter graphs; • Use a line of best fit, or otherwise, to predict values of a variable given values of the other variable; • Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem; • Understand that correlation does not imply causality, and appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply 'no relationship' but merely 'no linear correlation'; • Explain an isolated point on a scatter graph; • Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing. **Fractions and percentages**		

OBJECTIVES By the end of the sub-unit, students should be able to: • Express a given number as a fraction of another; • Find equivalent fractions and compare the size of fractions; • Write a fraction in its simplest form, including using it to simplify a calculation, e.g. $50 \div 20 = \frac{50}{20} = \frac{5}{2} = 2.5$; • Find a fraction of a quantity or measurement, including within a context; • Convert a fraction to a decimal to make a calculation easier; • Convert between mixed numbers and improper fractions; • Add and subtract fractions, including mixed numbers; • Multiply and divide fractions, including mixed numbers and whole numbers and vice versa; • Understand and use unit fractions as multiplicative inverses; • By writing the denominator in terms of its prime factors, decide whether fractions can be converted to recurring or terminating decimals; • Convert a fraction to a recurring decimal and vice versa; • Find the reciprocal of an integer, decimal or fraction; • Convert between fractions, decimals and percentages; • Express a given number as a percentage of another number; • Express one quantity as a percentage of another where the percentage is greater than 100% • Find a percentage of a quantity; • Find the new amount after a percentage increase or decrease; • Work out a percentage increase or decrease, including: simple interest, income tax calculations, value of profit or loss, percentage profit or loss; • Compare two quantities using percentages, including a range of calculations and contexts such as those involving time or money;		

• Find a percentage of a quantity using a multiplier and use a multiplier to increase or decrease by a percentage in any scenario where percentages are used; • Find the original amount given the final amount after a percentage increase or decrease (reverse percentages), including VAT; • Use calculators for reverse percentage calculations by doing an appropriate division; • Use percentages in real-life situations, including percentages greater than 100%; • Describe percentage increase/decrease with fractions, e.g. 150% increase means $2\frac{1}{2}$ times as big; • Understand that fractions are more accurate in calculations than rounded percentage or decimal equivalents, and choose fractions, decimals or percentages appropriately for calculations. **Ratio and proportion** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Express the division of a quantity into a number parts as a ratio; • Write ratios in form 1 : *m* or *m* : 1 and to describe a situation; • Write ratios in their simplest form, including three-part ratios; • Divide a given quantity into two or more parts in a given part : part or part : whole ratio; • Use a ratio to find one quantity when the other is known; • Write a ratio as a fraction and as a linear function; • Identify direct proportion from a table of values, by comparing ratios of values; • Use a ratio to compare a scale model to real-life object; • Use a ratio to convert between measures and currencies, e.g. £1.00 = €1.36; • Scale up recipes; • Convert between currencies.		

Polygons, angles and parallel lines **OBJECTIVES** By the end of the sub-unit, students should be able to: • Classify quadrilaterals by their geometric properties and distinguish between scalene, isosceles and equilateral triangles; • Understand 'regular' and 'irregular' as applied to polygons; • Understand the proof that the angle sum of a triangle is 180°, and derive and use the sum of angles in a triangle; • Use symmetry property of an isosceles triangle to show that base angles are equal; • Find missing angles in a triangle using the angle sum in a triangle AND the properties of an isosceles triangle; • Understand a proof of, and use the fact that, the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices; • Explain why the angle sum of a quadrilateral is 360°; use the angle properties of quadrilaterals and the fact that the angle sum of a quadrilateral is 360°; • Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding and alternate angles, giving reasons; • Use the angle sums of irregular polygons; • Calculate and use the sums of the interior angles of polygons, use the sum of angles in a triangle to deduce and use the angle sum in any polygon and to derive the properties of regular polygons; • Use the sum of the exterior angles of any polygon is 360°; • Use the sum of the interior angles of an n-sided polygon; • Use the sum of the interior angle and the exterior angle is 180°; • Find the size of each interior angle, or the size of each exterior angle, or the number of sides of a regular polygon, and use the sum of angles of irregular polygons; • Calculate the angles of regular polygons and use these to solve problems;	AP3	Complete homework tasks on Hegarty Maths. Use the Corbett Maths website for extra practice. Use the Edexcel (9-1) Foundation revision guide.

• Use the side/angle properties of compound shapes made up of triangles, lines and quadrilaterals, including solving angle and symmetry problems for shapes in the first quadrant, more complex problems and using algebra; • Use angle facts to demonstrate how shapes would 'fit together', and work out interior angles of shapes in a pattern. **Pythagoras' Theorem and trigonometry** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Understand, recall and use Pythagoras' Theorem in 2D; • Given three sides of a triangle, justify if it is right-angled or not; • Calculate the length of the hypotenuse in a right-angled triangle (including decimal lengths and a range of units); • Find the length of a shorter side in a right-angled triangle; • Calculate the length of a line segment *AB* given pairs of points; • Give an answer to the use of Pythagoras' Theorem in surd form; • Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures; • Use the trigonometric ratios to solve 2D problems; • Find angles of elevation and depression; • Know the exact values of sin ϑ and cos ϑ for $\vartheta = 0°, 30°, 45°, 60°$ and $90°$; know the exact value of tan ϑ for $\vartheta = 0°, 30°, 45°$ and $60°$. **Graphs: the basics and real-life graphs** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Identify and plot points in all four quadrants; • Draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item;		

• Draw distance–time and velocity–time graphs; • Use graphs to calculate various measures (of individual sections), including: unit price (gradient), average speed, distance, time, acceleration; including using enclosed areas by counting squares or using areas of trapezia, rectangles and triangles; • Find the coordinates of the midpoint of a line segment with a diagram given and coordinates; • Find the coordinates of the midpoint of a line segment from coordinates; • Calculate the length of a line segment given the coordinates of the end points; • Find the coordinates of points identified by geometrical information. • Find the equation of the line through two given points. **Linear graphs and coordinate geometry** **OBJECTIVES** By the end of the unit, students should be able to: • Plot and draw graphs of $y = a$, $x = a$, $y = x$ and $y = –x$, drawing and recognising lines parallel to axes, plus $y = x$ and $y = –x$; • Identify and interpret the gradient of a line segment; • Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane; • Identify and interpret the gradient and y-intercept of a linear graph given by equations of the form $y = mx + c$; • Find the equation of a straight line from a graph in the form $y = mx + c$; • Plot and draw graphs of straight lines of the form $y = mx + c$ with and without a table of values; • Sketch a graph of a linear function, using the gradient and y-intercept (i.e. without a table of values); • Find the equation of the line through one point with a given gradient; • Identify and interpret gradient from an equation $ax + by = c$; • Find the equation of a straight line from a graph in the form $ax + by = c$; • Plot and draw graphs of straight lines in the form $ax + by = c$;		

• Interpret and analyse information presented in a range of linear graphs:
  ○ use gradients to interpret how one variable changes in relation to another;
  ○ find approximate solutions to a linear equation from a graph;
  ○ identify direct proportion from a graph;
  ○ find the equation of a line of best fit (scatter graphs) to model the relationship between quantities;
• Explore the gradients of parallel lines and lines perpendicular to each other;
• Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line;
Select and use the fact that when $y = mx + c$ is the equation of a straight line, then the gradient of a line parallel to it will have a gradient of m and a line perpendicular to this line will have a gradient of $-\frac{1}{m}$.
 	
Quadratic, cubic and other graphs
OBJECTIVES
By the end of the sub-unit, students should be able to:
• Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape;
• Generate points and plot graphs of simple quadratic functions, then more general quadratic functions;
• Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function;
• Interpret graphs of quadratic functions from real-life problems;
• Draw graphs of simple cubic functions using tables of values;
• Interpret graphs of simple cubic functions, including finding solutions to cubic equations;
• Draw graphs of the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$ using tables of values;
Draw circles, centre the origin, equation $x^2 + y^2 = r^2$.		

Perimeter, area and circles **OBJECTIVES** By the end of the unit, students should be able to: • Recall and use the formulae for the area of a triangle, rectangle, trapezium and parallelogram using a variety of metric measures; • Calculate the area of compound shapes made from triangles, rectangles, trapezia and parallelograms using a variety of metric measures; • Find the perimeter of a rectangle, trapezium and parallelogram using a variety of metric measures; • Calculate the perimeter of compound shapes made from triangles and rectangles; • Estimate area and perimeter by rounding measurements to 1 significant figure to check reasonableness of answers; • Recall the definition of a circle and name and draw parts of a circle; • Recall and use formulae for the circumference of a circle and the area enclosed by a circle (using circumference = $2\pi r = \pi d$ and area of a circle = πr^2) using a variety of metric measures; • Use $\pi \approx 3.142$ or use the π button on a calculator; • Calculate perimeters and areas of composite shapes made from circles and parts of circles (including semicircles, quarter-circles, combinations of these and also incorporating other polygons); • Calculate arc lengths, angles and areas of sectors of circles; • Find radius or diameter, given area or circumference of circles in a variety of metric measures; • Give answers in terms of π; Form equations involving more complex shapes and solve these equations. **3D forms and volume, cylinders, cones and spheres** **OBJECTIVES** By the end of the sub-unit, students should be able to:	AP4	Complete homework tasks on Hegarty Maths. Use the Corbett Maths website for extra practice. Use the Edexcel (9-1) Foundation revision guide.

• Find the surface area of prisms using the formulae for triangles and rectangles, and other (simple) shapes with and without a diagram; • Draw sketches of 3D solid and identify planes of symmetry of 3D solids, and sketch planes of symmetry; • Recall and use the formula for the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures; • Convert between metric measures of volume and capacity, e.g. 1 ml = 1 cm^3; • Use volume to solve problems; • Estimating surface area, perimeter and volume by rounding measurements to 1 significant figure to check reasonableness of answers; • Use $\pi \approx 3.142$ or use the π button on a calculator; • Find the volume and surface area of a cylinder; • Recall and use the formula for volume of pyramid; • Find the surface area of a pyramid; • Use the formulae for volume and surface area of spheres and cones; • Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones; • Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders; • Give answers in terms of π; • Form equations involving more complex shapes and solve these equations. **Accuracy and bounds** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Calculate the upper and lowers bounds of numbers given to varying degrees of accuracy; • Calculate the upper and lower bounds of an expression involving the four operations;		

• Find the upper and lower bounds in real-life situations using measurements given to appropriate degrees of accuracy; • Find the upper and lower bounds of calculations involving perimeters, areas and volumes of 2D and 3D shapes; • Calculate the upper and lower bounds of calculations, particularly when working with measurements; Use inequality notation to specify an error bound. **Transformations** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Distinguish properties that are preserved under particular transformations; • Recognise and describe rotations – know that that they are specified by a centre and an angle; • Rotate 2D shapes using the origin or any other point (not necessarily on a coordinate grid); • Identify the equation of a line of symmetry; • Recognise and describe reflections on a coordinate grid – know to include the mirror line as a simple algebraic equation, $x = a$, $y = a$, $y = x$, $y = -x$ and lines not parallel to the axes; • Reflect 2D shapes using specified mirror lines including lines parallel to the axes and also $y = x$ and $y = -x$; • Recognise and describe single translations using column vectors on a coordinate grid; • Translate a given shape by a vector; • Understand the effect of one translation followed by another, in terms of column vectors (to introduce vectors in a concrete way); • Enlarge a shape on a grid without a centre specified; • Describe and transform 2D shapes using enlargements by a positive integer, positive fractional, and negative scale factor; • Know that an enlargement on a grid is specified by a centre and a scale factor; • Identify the scale factor of an enlargement of a shape;		

• Enlarge a given shape using a given centre as the centre of enlargement by counting distances from centre, and find the centre of enlargement by drawing; • Find areas after enlargement and compare with before enlargement, to deduce multiplicative relationship (area scale factor); given the areas of two shapes, one an enlargement of the other, find the scale factor of the enlargement (whole number values only); • Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations; • Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements; • Describe the changes and invariance achieved by combinations of rotations, reflections and translations. **Constructions, loci and bearings** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Draw 3D shapes using isometric grids; • Understand and draw front and side elevations and plans of shapes made from simple solids; • Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid; • Use and interpret maps and scale drawings, using a variety of scales and units; • Read and construct scale drawings, drawing lines and shapes to scale; • Estimate lengths using a scale diagram; • Understand, draw and measure bearings; • Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings • Use the standard ruler and compass constructions: ○ bisect a given angle; ○ construct a perpendicular to a given line from/at a given point; ○ construct angles of 90°, 45°;		

○ perpendicular bisector of a line segment; • Construct: ○ a region bounded by a circle and an intersecting line; ○ a given distance from a point and a given distance from a line; ○ equal distances from two points or two line segments; ○ regions which may be defined by 'nearer to' or 'greater than'; • Find and describe regions satisfying a combination of loci, including in 3D; • Use constructions to solve loci problems including with bearings; • Know that the perpendicular distance from a point to a line is the shortest distance to the line. **Solving quadratics and simultaneous equations** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Factorise quadratic expressions in the form $ax^2 + bx + c$; • Set up and solve quadratic equations; • Solve quadratic equations by factorisation and completing the square; • Solve quadratic equations that need rearranging; • Solve quadratic equations by using the quadratic formula; • Find the exact solutions of two simultaneous equations in two unknowns; • Use elimination or substitution to solve simultaneous equations; • Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns: ○ linear / linear, including where both need multiplying; ○ linear / quadratic; ○ linear / $x^2 + y^2 = r^2$; • Set up and solve a pair of simultaneous equations in two variables for each of the above scenarios, including to represent a situation; • Interpret the solution in the context of the problem;		

Inequalities **OBJECTIVES** By the end of the sub-unit, students should be able to: • Show inequalities on number lines; • Write down whole number values that satisfy an inequality; • Solve simple linear inequalities in one variable, and represent the solution set on a number line; • Solve two linear inequalities in *x*, find the solution sets and compare them to see which value of *x* satisfies both solve linear inequalities in two variables algebraically; • Use the correct notation to show inclusive and exclusive inequalities.		
AP5 **Probability** **OBJECTIVES** By the end of the unit, students should be able to: • Write probabilities using fractions, percentages or decimals; • Understand and use experimental and theoretical measures of probability, including relative frequency to include outcomes using dice, spinners, coins, etc; • Estimate the number of times an event will occur, given the probability and the number of trials; • Find the probability of successive events, such as several throws of a single dice; • List all outcomes for single events, and combined events, systematically; • Draw sample space diagrams and use them for adding simple probabilities; • Know that the sum of the probabilities of all outcomes is 1; • Use 1 – *p* as the probability of an event not occurring where *p* is the probability of the event occurring; • Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values;		Complete homework tasks on Hegarty Maths. Use the Corbett Maths website for extra practice. Use the Edexcel (9-1) Foundation revision guide.

• Use union and intersection notation;
• Find a missing probability from a list or two-way table, including algebraic terms;
• Understand conditional probabilities and decide if two events are independent;
• Draw a probability tree diagram based on given information, and use this to find probability and expected number of outcome;
• Understand selection with or without replacement;
• Calculate the probability of independent and dependent combined events;
• Use a two-way table to calculate conditional probability;
• Use a tree diagram to calculate conditional probability;
• Use a Venn diagram to calculate conditional probability;
• Compare experimental data and theoretical probabilities;
• Compare relative frequencies from samples of different sizes.
 	
Multiplicative reasoning: direct and inverse proportion, relating to graph form for direct, compound measures, repeated proportional change
OBJECTIVES
By the end of the unit, students should be able to:
 	
• Express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when A:B are in the ratio 3:5, A is $\frac{3}{5}B$. When $4a = 7b$, then $a = \frac{7b}{4}$ or a:b is 7:4;
• Solve proportion problems using the unitary method;
• Work out which product offers best value and consider rates of pay;
• Work out the multiplier for repeated proportional change as a single decimal number;
• Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation;
• Understand and use compound measures and:
  ○ convert between metric speed measures;
  ○ convert between density measures;		

○ convert between pressure measures; • Use kinematics formulae from the formulae sheet to calculate speed, acceleration, etc (with variables defined in the question); • Calculate an unknown quantity from quantities that vary in direct or inverse proportion; **Similarity and congruence in 2D and 3D** **OBJECTIVES** By the end of the unit, students should be able to: • Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and pair of compasses constructions; • Solve angle problems by first proving congruence; • Understand similarity of triangles and of other plane shapes, and use this to make geometric inferences; • Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor; • Use formal geometric proof for the similarity of two given triangles; • Understand the effect of enlargement on angles, perimeter, area and volume of shapes and solids; • Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of two corresponding sides, using integer or fraction scale factors; • Write the lengths, areas and volumes of two shapes as ratios in their simplest form; • Find missing lengths, areas and volumes in similar 3D solids; • Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids; • Use the relationship between enlargement and areas and volumes of simple shapes and solids; • Solve problems involving frustums of cones where you have to find missing lengths first using similar triangles.		

AP6 **Graphs of trigonometric functions** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Recognise, sketch and interpret graphs of the trigonometric functions (in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size. • Know the exact values of $\sin \vartheta$ and $\cos \vartheta$ for $\vartheta = 0°, 30°, 45°, 60°$ and $90°$ and exact value of $\tan \vartheta$ for $\vartheta = 0°, 30°, 45°$ and $60°$ and find them from graphs. • Apply to the graph of $y = f(x)$ the transformations $y = -f(x)$, $y = f(-x)$ for sine, cosine and tan functions $f(x)$. • Apply to the graph of $y = f(x)$ the transformations $y = f(x) + a$, $y = f(x + a)$ for sine, cosine and tan functions $f(x)$. **Further trigonometry** **OBJECTIVES** By the end of the sub-unit, students should be able to: • Know and apply Area = $\frac{1}{2}ab \sin C$ to calculate the area, sides or angles of any triangle. • Know the sine and cosine rules, and use to solve 2D problems (including involving bearings). • Use the sine and cosine rules to solve 3D problems. • Understand the language of planes, and recognise the diagonals of a cuboid. • Solve geometrical problems on coordinate axes. • Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations. • Calculate the length of a diagonal of a cuboid. • Find the angle between a line and a plane.		Complete homework tasks on Hegarty Maths. Use the Corbett Maths website for extra practice. Use the Edexcel (9-1) Foundation revision guide.

Collecting data
OBJECTIVES
By the end of the sub-unit, students should be able to:
• Specify the problem and plan:
  ○ decide what data to collect and what analysis is needed;
  ○ understand primary and secondary data sources;
  ○ consider fairness;
• Understand what is meant by a sample and a population;
• Understand how different sample sizes may affect the reliability of conclusions drawn;
• Identify possible sources of bias and plan to minimise it;
• Write questions to eliminate bias, and understand how the timing and location of a survey can ensure a sample is representative (see note);
 	
Cumulative frequency, box plots and histograms
OBJECTIVES
By the end of the sub-unit, students should be able to:
• Use statistics found in all graphs/charts in this unit to describe a population;
• Know the appropriate uses of cumulative frequency diagrams;
• Construct and interpret cumulative frequency tables, cumulative frequency graphs/diagrams and from the graph:
  ○ estimate frequency greater/less than a given value;
  ○ find the median and quartile values and interquartile range;
• Compare the mean and range of two distributions, or median and interquartile range, as appropriate;
• Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions;
• Produce box plots from raw data and when given quartiles, median and identify any outliers;
• Know the appropriate uses of histograms;		

• Construct and interpret histograms from class intervals with unequal width;
• Use and understand frequency density;
• From histograms:
  ○ complete a grouped frequency table;
  ○ understand and define frequency density;
• Estimate the mean and median from a histogram with unequal class widths or any other information from a histogram, such as the number of people in a given interval.
 	
Quadratics, expanding more than two brackets, sketching graphs, graphs of circles, cubes and quadratics
OBJECTIVES
By the end of the unit, students should be able to:
• Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots and *y*-intercept, turning point;
• Be able to identify from a graph if a quadratic equation has any real roots;
• Find approximate solutions to quadratic equations using a graph;
• Expand the product of more than two linear expressions;
• Sketch a graph of a quadratic function and a linear function, identifying intersection points;
• Sketch graphs of simple cubic functions, given as three linear expressions;
• Solve simultaneous equations graphically:
  ○ find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach;
  ○ find graphically the intersection points of a given straight line with a circle;
  ○ solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem;
• Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values;		

• Represent the solution set for inequalities using set notation, i.e. curly brackets and 'is an element of' notation; ○ for problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets, i.e. solution of $x^2 - 3x - 10 < 0$ as $\{x: -3 < x < 5\}$; • Solve linear inequalities in two variables graphically; • Show the solution set of several inequalities in two variables on a graph; • Use iteration with simple converging sequences.		