🛡️ Alcester Academy Curriculum Planning: Key Stage 4 (Year 10 2021/2022)

Department: Maths	Year Group: 10 sets 1 to 3			Higher GCSE Edexcel			
Term	Topic/Subject	Assessment Objectives	Knowledge acquisition	Skill Building	Wider reading opportunities to include numeracy and SMSC	Final assessment task and title	SEND & PP
Autumn 1 2 weeks 2 weeks	Unit 5a/5b 5a: Polygons, Angles & Parallel Lines.	Calculate missing angles in any polygon and between parallel lines.	Classify the properties of types of triangles and quadrilaterals. Use regular and irregular shapes in calculations. Know angles facts to include angle sum of triangles and other polygons, Alternate and Corresponding angles, Interior and exterior angles. Solve problems including simple proof of angles in shapes including the use of parallel lines.	Name all quadrilaterals that have a specific property. Use geometric reasoning to answer problems giving detailed reasons. Find the size of missing angles at a point or at a point on a straight line. Geometrical problems involving algebra. Use angle facts to demonstrate how shapes would 'fit together', and work out interior angles of shapes in a pattern. Given the size of its exterior angle, how many sides does the polygon have?	Use of **key words**: Quadrilateral, angle, polygon, interior, exterior, proof, tessellation, rotational symmetry, parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, triangle, perpendicular, isosceles, scalene, clockwise, anticlockwise, hexagons, heptagons, octagons, decagons, obtuse, acute, reflex, quadrilateral, triangle, regular, irregular, two-dimensional, three-dimensional, measure, line, angle, order, intersecting	2 GCSE papers Calculator and Non Calculator at the end of Autumn 1.	Use of mnemonics to remember angles in parallel lines (FUN) Clear structure modelled to answer reasoning questions (table format) Use of non examples. Use physical apparatus and visual representations lead to better conceptual understanding
	5b:	Use Pythagoras and	Use and recall Pythagoras' theorem in 2D, including proving a triangle has a right	Give an answer to the use of Pythagoras' Theorem in surd form. Understand, use and recall the trigonometric ratios sine,	Mathematics applied in different cultures such as Rangoli patterns, symmetry, tessellations and		Formula triangles for SOHCAHTOA Use of mnemonics

| | Pythagoras' Theorem & Trigonometry. | Trigonometry to find missing angles and lengths | angle. Find the length of a line segment between two points. Leave solutions in surd form Use and recall rules of Trigonometry to solve 2D problems involving finding a side or angle. Use angle of elevation or depression. Know exact values without a calculator of some Trigonometric values. Solve multi-step problems involving both Pythagoras and trigonometry | 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 θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45° and 60°. | Islamic geometric patterns. Link to Ben Heine, Kandinsky (artists

Use of **key words:** Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy | | |
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Autumn 2 (1.5 weeks)	Unit 9 9a: Simultaneous Equations	Find exact solutions of two simultaneous equations. Solve quadratics using factorisation, rearrangement, the quadratic formula.	Problems that require setting up and solving a pair of simultaneous equations in a real-life context. Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns including where both need multiplying.	Solve equations Understand how to eliminate an unknown so an equation can be solved. Substitute values to find the second unknown. Form a pair of simultaneous equations to solve a real-life problem. Solve equations involving positive, negatives, integers and decimals.	The concept of the inappropriate solution. Use of **key words**: Quadratic, solution, root, linear, solve, simultaneous, inequality, completing the square, factorise, rearrange, surd, function, solve, circle, sets, union, intersection Know that the quadratic formula can be used to solve quadratic equations, and often provides a more efficient method than factorising or completing the square.	Mini assessments/pl enaries using exam questions. Assessment through a written homework tasks.	Algebra tiles to illustrate elimination method. Role play to introduce simultaneous equations. Dual display scientific calculators
(1.5 weeks)	9a: Solving Quadratic Equations						
(1 week)	9b: Inequalities	Use inequalities on a number line, solve inequalities and represent graphically.	Read inequalities and represent on a number line. State the integer solutions for an inequality. Solve inequalities and be able to state largest/smallest integer value. Find the region from a set on inequalities. State the inequalities shown by a region.	Use inequality symbols to compare numbers. Given a list of numbers, represent them on a number line using the correct notation. Solve equations involving inequalities. Including equations involving fractions and unknowns on both sides. Use the correct notation to show inclusive and exclusive inequalities. Draw linear graphs from their equation. Find the region stated by multiple inequalities on a graph.	Key words: Inequalities, Number line, Region Integer, Solutions Students will continue to develop their problems solving skills, teamwork, creative thinking, discussion, explaining and presenting skills whilst exploring the beauty of mathematics.		

(2 week)	Unit 8a: Transformations	Describe and draw all of the transformations.	Recognise, describe and draw rotations giving centre of rotation, direction and number of degrees. Use reflections of shapes including simple equations of straight lines. Use translations defined by a column vector. Enlarge shapes through a scale factor enlargement and centre of enlargement. Identify a scale factor, and area scale factors. Use congruence of shapes within transformations, and combinations of transformations.	Recognise similar shapes because they have equal corresponding angles and/or sides scaled up in same ratio. Understand that translations are specified by a distance and direction (using a vector). Recognise that enlargements preserve angle but not length. Understand that distances and angles are preserved under rotations, reflections and translations so that any shape is congruent to its image. Understand that similar shapes are enlargements of each other and angles are preserved. 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.	Use of **key words:** Transformation, rotation, reflection, enlargement, translation, single, combination, scale factor, mirror line, centre of rotation, centre of enlargement, column vector, vector, similarity, congruent, angle, direction, coordinate, describe Multi-cultural links to carpet designs using transformations can be made. The use of formal mathematical language is encouraged when describing transformations. Students will continue to develop their problems solving skills, teamwork, creative thinking, discussion, explaining and presenting skills whilst exploring the beauty of mathematics.	Assessment through homework's and exam questions in class	Use of tracing paper
Spring 1 3 weeks 3 Weeks	Revision and mocks Unit 10: Probability	Combine/ Mutually exclusive events. Experimental Probability Independent events and tree diagrams	Use systematic listing strategies, use experimental outcomes to complete tables and frequency trees. Identify expected outcomes through randomness and likelihood. Use probability between 0 and 1. Use exhaustive results of outcomes in mutually	If the probability of outcomes are x, $2x$, $4x$, $3x$, calculate x. Find the probability of successive events, such as several throws of a single dice. List all outcomes for single events, and combined	Through exploring probability students will develop an awareness of fairness both in a mathematical; context and in real-life scenarios.	Formal Mock Assessments Full set of GCSE papers	Exploration of real life context

		Conditional Probability Venn diagrams and set notation	exclusive events. Compare sample size in experiments to theoretical probability. Use sets and combinations of sets to construct tables, grids, Venn diagrams and tree diagrams. Use tree diagrams and other representations for independent and dependent events. Use conditional probability with two way tables, tree diagrams and Venn diagrams.	events, systematically. Use a two-way, a tree diagram or a Venn diagram to calculate conditional probability.	Use of **key words:** Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness, experimental		
Spring 2 0.5 weeks

3 week

2 weeks | Unit 14:

14a: Collecting data.

14b: Cumulative frequency, Box plots, & Histograms. | Sampling

Draw and interpret: Cumulative frequency diagrams, Box plots, Histograms. Compare and describe populations. | Know how to specify a problem and set up a plan including what data to collect, what types of primary and secondary data are needed, sample size and population. Identify bias and write questions that avoid or eliminate it.

Know when and how to construct a cumulative frequency diagram, and how to interpret the data presented. Compare mean, median range and quartiles of distributions including the use of box plots. Use and construct a histogram including uneven width bars and frequency density. Estimate a mean from a histogram, and identify numbers involved. | Explain why a sample may not be representative of a whole population. Understand what is meant by a sample and a population. Understand how different sample sizes may affect the reliability of conclusions drawn.

Interpret two or more data sets from box plots and relate the key measures in the context of the data. Construct cumulative frequency graphs, box plots and histograms from frequency tables. Compare two data sets and justify comparisons based on measures extracted from diagrams. Use and understand frequency density. | Bias and the implications of media bias can be introduced. The UK census allows students to develop an awareness of the wier culture.

Use of key **words**: Sample, population, fraction, decimal, percentage, bias, stratified sample, random, cumulative frequency, box plot, histogram, frequency density, frequency, mean, median, mode, range, lower quartile, upper quartile, interquartile range, spread, comparison, outlier | Mini assessments/plenaries using exam questions. Assessment through a written homework tasks. | Exploration of real-life context

Use of graph paper and other equipment. Enlarged graphs for SEND students who may need it.

Non-examples to concrete knowledge and understanding. |

	Unit 11: Compound Measures and Multiplicative Reasoning	Calculate rates and use relationships between ratio. Solve direct and inverse proportion problems Solve problems involving compound measures	Use inverse operations to allow cancellation within problems. Use fractions or percentages as operators. Use standard units of mass, length, time, money and others using decimals where appropriate. Change freely between standard types of units. Use ratio and fractions for multiplicative relationships. Solve problems involving direct and inverse proportion, including the use of algebra and graphs. Use compound units including speed, pay, pricing, density and pressure. Know that inverse proportion is 1/y. Use graphs representing direct and inverse proportion. Use iterative processes to interpret answers on growth and decay or compound interest.	Set up and use equations to solve word and other problems involving inverse proportion, and relate algebraic solutions to graphical representation of the equations. Change g/cm^3 to kg/m^3, kg/m^2 to g/cm^2, m/s to km/h. Solve word problems involving direct and inverse proportion. Understand direct proportion as: as x increases, y increases. Understand inverse proportion as: as x increases, y decreases.	Use of **key words**: Ratio, proportion, best value, unitary, proportional change, compound measure, density, mass, volume, speed, distance, time, density, mass, volume, pressure, acceleration, velocity, inverse, direct, constant of proportionality Multiplicative reasoning involving real-life scenarios develops an awareness of maths use in a wider context.	Two GCSE papers to be taken in class.	Regular recall strategies every lesson
Summer 1 1.5 weeks	Unit 7c: Accuracy and Bounds	State error intervals. Find upper and lower bounds of a problem.	Find upper and lower bounds and appropriate degrees of accuracy. Use bounds in calculations involving perimeter, area and volume in 2D and 3D shapes. Use inequalities to identify an error interval from rounding and truncation. Solve real life problems involving bounds and compound measures.	Work out the upper and lower bounds of a formula where all terms are given to 1 decimal place. Be able to justify that measurements to the nearest whole unit may be inaccurate by up to one half in either direction. Use inequality notation to specify an error interval due to truncation or rounding. Find a final solution to a bounds problem by rounding to a suitable degree of accuracy.	Use of **key words:** upper and lower bounds, accuracy, truncate, significant figures, rounding. This unit will provide students with the opportunity to develop "counter argument" skills.	Mini assessments/plenaries using exam questions. Assessment through a written homework tasks.	Non-examples to concrete knowledge and understanding. Regular recall strategies every lesson

1.5 weeks (2 weeks)	1d/15 Surds	Understand and simplify numbers in surd form.	Simplify surds and perform all four operations with surds. Leave answers in rational form,	Explain the difference between rational and irrational numbers Simplify surds and add and subtract surds Simplify surd expressions involving squares (e.g. √12 = √(4 × 3) = √4 × √3 = 2√3). Expand and simplify surds Divide surds Rationalise simple cases of surds.	Use of **key words**: Rationalise, denominator, surd, rational, irrational, fraction, equation, rearrange, subject, proof, function notation, inverse, evaluate Links with other areas of Mathematics can be made by using surds in Pythagoras and when using trigonometric ratios.		

| | Unit 17: Complex Algebra Manipulation/ Algebraic Fractions | Expand two or more brackets Perform all four operations with algebraic fractions Solve problems involving functions. Rearrange formula. Functions | Expand two or more brackets to produce polynomials. Change the subject of a formula, including cases where the subject occurs on both sides of the formula, or where a power of the subject appears. Add and Subtract Algebraic Fractions. Simplify algebraic fractions when there is more than one term. Calculate input and output of functions Write expressions for functions Solve composite function problems | Solve equations and understand inverse operations. Change the subject of a formula involving fractions and roots. Rearrange a formula where the unknown appears on both sides. Factorise to isolate an unknown. Know the rules for four operations of fractions. Add and subtract algebraic fractions. Factorise to simplify algebraic fractions. Multiply and divide algebraic fractions. Solve multi-step algebraic fraction problems. Substitute values into functions and solve equations involving functions. Substitute values into composite functions. Form expressions involving composite functions. | Use of **key words**: Fraction, function, composite, inverse, rearrange, subject of the formula, formula, coefficient, factorise, term, expand, simplify. | Mini assessments/plenaries using exam questions. Assessment through a written homework tasks. | Non-examples to concrete knowledge and understanding.

Regular recall strategies every lesson |

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Summer 2 (1.5 weeks)	Unit 12: Similar Shapes	Similar triangles Similarity in volume and area Congruency and proof	Recognise when two shapes are similar. Calculate missing lengths, areas and volumes in similar shapes. Use properties of similar shapes to solve problems. Proves that shapes are congruent.	Recognise similar shapes because they have equal corresponding angles and/or sides scaled up in same ratio. Show that two shapes are congruent by using angles rules and circle theorems. Know the conditions of congruent triangles. Know that shapes are similar if all angles are the same. Find length, area and volume scale factors. Find the ratio of corresponding sides to work out scale factor.	Key words: Scale factor, ratio, similar, congruent, proof, given, alternate, corresponding,.	Formal Assessments Full set of GCSE papers	Revision guides and equipment to all PP students.
(2 weeks)							

	Constructions, Loci & Bearings.	Plans and Elevations Constructions Loci Bearings Scale drawings	Use front, side and plan elevations, draw 3D representations of shapes. Use scales and maps. Use and construct bearings. Use bearings to solve problems. Use a ruler and compasses to construct angle bisector, a perpendicular line from any point, angles of 90 and 45 degrees. Identify regions bounded by a circle and line, a distance from a point, equal distance from two points or lines. Use greater than or less than within drawings. Identify and sketch regions through loci. Know that a perpendicular line is the shortest distance.	Interpret a given plan and side view of a 3D form to be able to produce a sketch of the form. Able to read and construct scale drawings. When given the bearing of a point *A* from point *B*, can work out the bearing of *B* from *A*. Know that scale diagrams, including bearings and maps, are 'similar' to the real-life examples. Able to sketch the locus of point on a vertex of a rotating shape as it moves along a line, of a point on the circumference and at the centre of a wheel.	Use of **key words:** Construct, circle, arc, sector, face, edge, vertex, two-dimensional, three-dimensional, solid, elevations, congruent, angles, regular, irregular, bearing, degree, bisect, perpendicular, loci, map, scale, plan, region		

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