Year 11 Foundation Tier Scheme of Learning

Autumn Term

We begin the autumn term with the study of the mathematics of right-angled triangles. Pythagoras explores the relationship between the shorter and longer sides of the right-angled triangle, allowing the calculation of distances between two points. Moving on, angles are introduced as another variable and the basis of trigonometry is formed as a means of calculating angles and distances between points. Some of the fundamental angles of 0, 30, 45, 60 and 90 degrees are included here because of the links to construction and graphical properties via exact trigonometric values.

We move on to look at probability, (the study of chance) in a modern world, showing and explaining outcomes and their probability of occurrence is essential. This part of the course deals with listing outcomes exhaustively, simplifying this via the use of sample spaces and the use of tree diagrams, Venn diagrams and frequency trees to order, sort and provide tools to solve problems of chance. The difference between theoretical and experimental probability is also dealt with, including reference to increases in sample size and trial size as a way of improving the odds of reliable results and lower bias.

The next topic is multiplicative reasoning and considers techniques for making these types of calculation efficient. Conversion between units of common metric measure are essential for everyday life, so mass, length and capacity are covered along with compound measures such as speed, rates of pay, prices and science linked topics like density and pressure. Percentage change via multiplicative methods is also taught, allowing compound interest, profit and loss and reverse percentage multiplicative problems to be solved more easily than common additive methods used earlier on in the course.

Constructions, loci and bearings are topics involving geometric skills allowing distances and angles to be fixed according to specific instructions and constraints. These are skills of precision and accuracy and useful in much construction work, architectural and navigational fields. Using the properties of well-known shapes, student can expect to be able to construct bisectors, perpendiculars of lines and to draw shapes without the use of a protractor.

Sticking with geometry, we now take a look at the basic congruence criteria for triangles to identify uniqueness, or not, of a pair of triangles. Exploring the connection between 2D and 3D shapes is covered by sketching 3D solids and the accurate representation of the shapes, without visual distortion using plans and front and side elevations, often used by architects and surveyors in the real world.

We complete the autumn term with a look at quadratic equations. Quadratics can be used to model many 2D problems involving area and flight paths of objects through the air under gravity. Students will understand how to manipulate and solve problems using algebra and graphs. This will include expansion and factorisation of expressions using their knowledge of the rules of algebra developed earlier on in the course via commutative, associative and distributive laws of number. This is also an ideal time to use mathematical software to plot graphs to assist with the understanding of this topic.

Spring Term

We begin the spring term by studying the geometric properties and rules associated with circles; including common language of circumference, radius, diameter, the constant Pi, chords, sectors, segments, tangents and arcs, all of which students are expected to recognise and identify. Problems may also include fractions of a circle via sectors and arcs.

Circles are then extended to include circular prisms, or cylinders, along with cones and their volume and surface area.

The next topic area involves calculations with proper, mixed and improper fractions and conversion to decimals where required. The concept of a "reciprocal" will also be covered as a multiplicative inverse and an alternative to division. The laws of indices deal with repeat multiplication and will cover how they are used to deal with extremely large and small numbers often encountered in science. This in turn will inform the use of standard index form (scientific notation) in order to do this efficiently. All four operations of number will be tested using standard form and the use of scientific calculators will be expected in order to facilitate understanding and efficient working. Rounding to an appropriate degree of accuracy will be necessary in this topic as well.

We move on to recall the use of ratio to compare the lengths, areas and volumes of similar shapes. Basic principles of congruence and similarity will be discussed and modelled using triangles. Transformations of shapes using rotations, reflections, translations and enlargements will be used to construct, identify and describe congruent and similar shapes in 2D space using Cartesian co-ordinates. Column vector notation will also be used to describe movement of congruent/similar shapes via addition, subtraction and multiplication of vectors by a scalar quantity. All of the above can be represented through diagrams to support students' understanding and therefore assist in problem solving.

The final unit of the course looks at the use of algebra to solve problems. Basic algebraic knowledge allows students to manipulate expressions and re-arrange formulae in order to represent problems and prove an argument mathematically. Algebraic problem solving can be supported through the use of algebraic substitution into tables to produce graphical representations of a problem to aid with visual solutions or through the solving of simultaneous linear equations. Students will be expected to be able to read and plot graphs of linear, quadratic, cubic and reciprocal graphs in order to solve problems. The use of inequality notation will also be used to describe problems that have a range of values rather than the unique values encountered when solving linear and quadratic equations and graphs can also help with the understanding of these.

Summer Term

We aim for the Scheme of Learning to be complete by the end of the spring term so our focus can turn to exam preparation and revision of key topics. Topics are identified on a class by class basis and through thorough analysis of previous assessments, (such as mocks) to identify strengths and weaknesses of individuals and also of the class as a whole. Model answers to past exam questions are developed and used to emphasise good exam technique, and opportunities to implement examiner mark schemes are incorporated. Students will be encouraged to work under a degree of time pressure and scrutiny to develop the necessary focus under pressure. Walking/talking mocks will be offered to further hone exam technique. Maths Genie and Hegarty Maths, as well as a variety of free online resources and revision guides are available to facilitate individual revision. Time will be put aside to allow students themselves to suggest topics for further revision based on their self-analysis and individual efforts.