

YEAR 9 CORE: ENHANCED MATHEMATICS (EA PROGRAM STUDENTS CORE)

Semester 1

Students will solve problems involving linear equations and inequalities as well as pairs of simultaneous linear equations and related graphs. They will substitute into formulas, find unknown values and manipulate linear algebraic expressions. Whilst investigating these concepts, students will become familiar with the procedures involved, with and without the use of digital technology. They will represent linear graphs numerically, graphically and algebraically, and use them to model situations and solve practical problems. They will use parallel and perpendicular lines, angle properties, similarity and congruence as well as angle and chord properties of circles to solve practical problems and develop proofs involving lengths, angles and areas in plane shapes. Applications of Pythagoras' theorem and trigonometry will be investigated when solving problems involving right-angled triangles in two and three-dimensional space. Students will explore the sine, cosine and area rules for any triangle and apply these rules to solve related problems and questions given in non-routine contexts. Students will investigate rational and irrational numbers and perform operations with surds and indices as well as solve simple exponential equations.

Number and Algebra

Students will learn to:

- Learn how to express the sum and difference of algebraic fractions with a common denominator.
- Apply correct procedures to solve equations and inequations arising from formulas and those derived from worded problems.
- Solve linear simultaneous equations, using algebraic and graphical techniques, including the use of digital and CAS technology. Students also investigate the association of the solution of simultaneous equations with the coordinates of the intersection of their corresponding graphs.
- Learn and apply a range of procedures when solving problems involving parallel and perpendicular lines.
- Solve a wide range of linear equations, including those involving algebraic fractions, and check solutions by substitution.
- Apply knowledge of index laws to algebraic terms and simplify algebraic expressions using both positive and negative integral indices.
- Learn the definition of the rational and irrational number sets and perform operations with surds and fractional indices.
- Investigate exponential equations derived from authentic mathematical models based on population growth.

Measurement and Geometry

Students will learn to:

- Apply an understanding of relationships to deduce properties of geometric figures.
- Apply logical reasoning, including the use of congruence and similarity, to communicate a proof using a sequence of logically connected statements.
- Prove and apply angle and chord properties of circles to perform a sequence of steps to determine an unknown angle or length giving a justification for moving from one step to the next.
- Solve right-angled triangle problems including those involving direction and angles of elevation and depression by applying Pythagoras' theorem and trigonometric ratios.
- Solve simple trigonometric equations using periodicity and symmetry as well as their knowledge of the exact angles.
- Apply their knowledge of sine, cosine and area rules to authentic problems.
- Investigate the unit circle to define the trigonometric ratios, establish the exact angle values and solve simple trigonometric equations using symmetry.

Semester 2

Students will solve problems involving quadratic equations and related graphs, with and without the use of digital technology. They will expand binomial expressions and factorise monic and non-monic quadratic expressions and solve a wide range of quadratic equations derived from a variety of contexts. Quadratic functions will be investigated and represented numerically, graphically and algebraically, and used to model situations and to solve practical problems. They will describe results of two and three-step chance experiments, both with and without replacements, and assign probabilities to outcomes and determine probabilities of events. Students will investigate the concept of independence and conditional statements and identify common errors in interpreting such language in the area of probability.

Number and Algebra

Students will learn to:

- Explore the method of 'completing the square' to factorise quadratic expressions and solve quadratic equations.
- Identify and use common factors, including binomial expressions to factorise algebraic expressions using the technique of 'grouping in pairs'.
- Use the identities for perfect squares and the difference of squares to factorise quadratic expressions.
- Explore the connection between algebraic and graphical representations of quadratic functions.
- Use a variety of techniques to factorise and solve monic and non-monic quadratic equations, including grouping, completing the square, the quadratic formula and choosing two integers with the required product and sum.
- Write quadratic equations that represent practical problems and apply correct procedures for the solution.

Statistics and probability

Students will learn to:

- Describe results of chance experiments, both with and without replacements, as well as assign probabilities to outcomes and determine probabilities of events.
- Investigate the concept of independence and recognise that some events can be dependent on preceding events which will affect the way its probability is calculated.
- Use two-way tables, Venn diagrams and tree diagrams to determine probabilities with and without conditional events.