Belfairs Academy
Mathematics Fundamentals Year 11

H – denotes studied by Higher Tier Students only

General Skills
Cognitive skills ● Non-routine problem solving – expert thinking, metacognition, creativity. ● Systems thinking – decision making and reasoning. ● Critical thinking – definitions of critical thinking are broad and usually involve general cognitive skills such as analysing, synthesising and reasoning skills. ● ICT literacy - access, manage, integrate, evaluate, construct and communicate.
Interpersonal skills ● Communication – active listening, oral communication, written communication, assertive communication and non-verbal communication. ● Relationship-building skills – teamwork, trust, intercultural sensitivity, service orientation, self-presentation, social influence, conflict resolution and negotiation. ● Collaborative problem solving – establishing and maintaining shared understanding, taking appropriate action, establishing and maintaining team organisation
Intrapersonal skills ● Adaptability – ability and willingness to cope with the uncertain, handling work stress, adapting to different personalities, communication styles and cultures, and physical adaptability to various indoor and outdoor work environments. ● Self-management and self-development – ability to work remotely in virtual teams, work autonomously, be self-motivating and self-monitoring, willing and able to acquire new information and skills related to work.

Knowledge
Graphical functions • Writing formulae • Substitution • Rearranging formulae • Kinematic formulae
Linear and non-linear graphs • Find and use equations of straight lines • **Understand and use equations of perpendicular lines (H)** • Plot and read from quadratic curves • Understand and find roots • Plot cubic and reciprocal graphs • find approximate solutions using a graph • **Find the equation of a tangent to a curve (H)**
Indices and standard form (F) • Use the concepts and vocabulary of a highest common factor, lowest common multiple, and prime factorisation, including using product notation and the unique factorisation theorem • calculate with roots, and with integer indices • calculate with and interpret standard form A x 10n, where 1 â‰¤ A < 10 and n is an integer. • simplify and manipulate algebraic expressions • simplifying expressions involving sums, products and powers, including the laws of indices
Algebraic Fractions (H) • Simplify and manipulate algebraic fractions by: • collecting like terms • multiplying a single term over a bracket • taking out common factors • expanding products of two or more binomials • simplifying expressions involving sums, products and powers, including the laws of indices • Know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs • solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula

Using graphs
- Reflect shapes in a given line
- Construct and interpret speed, distance and time graphs
- Construct and interpret real-life graphs
- **Understand and use exponential graphs (H)**
- **Estimate the area under a curve (H)**
- **Transformation of functions (H)**

Expanding and factorising
- Expand a single bracket and binomial
- Factorise into a single bracket
- Factorise quadratics of the form $x^2 + bx + c$ (e.g. a = 1)
- Solve quadratic equations
- Simplify complex algebraic expressions including algebraic fractions
- **Solve quadratic equations by completing the square and the quadratic formula (H)**

Functions
- Find inputs and outputs
- Show algebraic expressions re equivalent
- Solve problems using the kinematics formulae
- **Work with composite and inverse functions (H)**

Multiplicative reasoning
- Review scale and enlargement
- Work with direct and inverse proportion
- Calculate with pressure and density
- Determine whether a problem requires additive or multiplicative reasoning
- **Solve problems involving variation with powers (H)**

Geometric reasoning
- Review angle facts, focusing on the language of reasons and the chains of reasoning
- Review Pythagoras' Theorem and using trigonometric ratios
- **Construct formal geometric proofs, including the remaining circle theorems (H)**
- **Construct formal algebraic proofs (H)**

Algebraic reasoning
- Work with complex indices
- Review simplification of complex expressions and finding the nth term rule
- Justify e.g. why a number is/isn't in a given sequence
- **Recurring decimals to fraction proofs (H)**

Transforming and constructing
- Revisit transformations of shapes, linking to types of symmetry
- Perform standard constructions using ruler and protractor or ruler and compasses
- Solve loci problems
- **Understand and use trigonometrical graphs (H)**
- **Sketch translations and reflections of the graph of a given function (H)**

Listing and describing
- Work with organised lists
- Sample spaces and probability
- Complete and use Venn diagrams
- Work with plans and elevations
- Use data to compare distributions
- **Product rule for counting (H)**

Show that …
- Illustrate equivalence, numerically and algebraically
- Justify answers
- Use the language of angle rules
- Use the conditions for congruent triangles
- **Formal proof with congruent triangles (H)**