



# Belfairs Academy

## Mathematics Fundamentals Year 9

**H – denotes studied by Higher Tier Students only**

General Skills
<b>Cognitive skills</b> <ul style="list-style-type: none"><li>• Non-routine problem solving – expert thinking, metacognition, creativity.</li><li>• Systems thinking – decision making and reasoning.</li><li>• Critical thinking – definitions of critical thinking are broad and usually involve general cognitive skills such as analysing, synthesising and reasoning skills.</li><li>• ICT literacy - access, manage, integrate, evaluate, construct and communicate.</li></ul>
<b>Interpersonal skills</b> <ul style="list-style-type: none"><li>• Communication – active listening, oral communication, written communication, assertive communication and non-verbal communication.</li><li>• Relationship-building skills – teamwork, trust, intercultural sensitivity, service orientation, self-presentation, social influence, conflict resolution and negotiation.</li><li>• Collaborative problem solving – establishing and maintaining shared understanding, taking appropriate action, establishing and maintaining team organisation</li></ul>
<b>Intrapersonal skills</b> <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li></ul>
Knowledge
<b>Straight line graphs</b> <ul style="list-style-type: none"><li>• Interpret straight line graphs</li><li>• Find and use the equation of a straight line</li><li>• Reduce equations to the form <math>y = mx + c</math></li><li>• Compare to linear sequences and finding the rule for the <math>n</math>th term</li><li>• <b>Explore the gradients of parallel and perpendicular lines (H)</b></li></ul>
<b>Forming and solving equations and inequalities</b> <ul style="list-style-type: none"><li>• Revisit and extend to equations and inequalities with unknowns on both sides using all previous contexts: angles, probability, area etc.</li><li>• Change the subject of a formula</li><li>• <b>Change the subject of a complex formula (H)</b></li><li>• <b>Solve a pair of simultaneous equations using graphical methods (H)</b></li></ul>
<b>Quadratics</b> <ul style="list-style-type: none"><li>• Understand graphs of quadratics</li><li>• Plot quadratic graphs by completing a table</li><li>• <b>Expand and factorise quadratic equations (coefficient of <math>x^2 = 1</math>)</b></li><li>• <b>Sketch graphs of quadratics from roots and factorised form</b></li></ul>
<b>Three dimensional shapes</b> <ul style="list-style-type: none"><li>• Understand the language of faces, edges and vertices</li><li>• Know the names of common prisms and non-prisms</li><li>• Identify 2-D shapes within 3-D shapes</li><li>• Work out the volume and surface area of cuboids and cylinders</li><li>• Work out the volume of any prism</li><li>• Work out missing lengths given area and/or volume</li><li>• <b>Explore volumes of cones, spheres and complex shapes (H)</b></li><li>• <b>Work out the surface area of any prism (H)</b></li></ul>
<b>Constructions and congruency</b> <ul style="list-style-type: none"><li>• Construct 3-D shapes from nets, and construct the net of a 3-D shape</li><li>• Construct and use scale drawings</li><li>• Construct perpendiculars and bisectors</li><li>• Understand congruency</li><li>• Explore congruency via construction</li><li>• <b>Explore the locus of a path (H)</b></li></ul>
<b>Numbers</b> <ul style="list-style-type: none"><li>• Revisit types of number – extend to include rational and real numbers</li></ul>



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- Revisit fraction arithmetic
- Extend knowledge of HCF and LCM
- Revisit standard form

### Using percentages

- Revisit percentage increase and decrease
- Use percentages over 100%
- Find percentage changes
- Use multipliers in a variety of contexts
- Solve "reverse percentage" problems
- **Work with repeated percentage change**

### Mathematics and money

- Explore financial mathematics including: Bills and bank statements; Interest; Unit pricing (best buys)

### Angles

- Revisit angles rules, including within special quadrilaterals
- Find angles using algebraic methods
- Use chains of reasoning to evaluate angles
- **Develop more complex geometrical proofs (H)**

### Transformations

- Identify the order of rotational symmetry of a shape
- Find the result of rotating shapes
- Translate points and shapes by a given vector
- Understand variance and invariance in the context of transformations
- **Find the result of a series of transformations (H)**
- Enlarge shapes by a positive scale factor, including from a given point
- Calculate the lengths of missing sides in similar shapes
- **Enlarge shapes by a negative scale factor (H)**
- **Similar triangles – exploring ratios in right-angled triangles (H)**

### Pythagoras' Theorem and Trigonometry

- Identify the hypotenuse of a right-angled triangle
- Determine whether a triangle is right-angled
- Calculate missing sides in right-angled triangles
- **Explore proofs of Pythagoras' Theorem (H)**
- **Use Pythagoras' Theorem in 3-D shapes (H)**
- Introduction to Trigonometry – finding sides and angles

### Solving ratio and proportion problems

- Direct proportion problems and graphs
- Conversion graphs
- Solve ratio problems given the whole or the part
- Simple inverse proportion
- Unit pricing problems ("best buys")
- **Inverse proportion graphs (H)**

### Compound Measures

- Work with speed, distance, time
- Solve problems involving density
- Solve problems involving pressure, force, area
- Work with compound units
- **Converting compound measures (H)**

### Diagrams and charts

- Revisit data measures, charts and graphs including bivariate data; criticise misleading graphs
- Revisit frequency trees and other representations e.g. tables
- Understand Venn diagrams and Set notations

### Probability

- Compare theoretical and experimental probabilities, probability of two or more events
- **Tree diagrams (H)**