### Student Book: *Complete Mathematics for Cambridge Secondary 1: Book 2*

**Curriculum Framework** Cambridge Secondary 1  
**Mathematics: Stage 8**

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<th>COMPLETE MATHEMATICS FOR CAMBRIDGE SECONDARY 1 BOOK 2</th>
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<td>Syllabus overview</td>
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#### Number

**Number: Integers, powers and roots**

Add, subtract, multiply and divide integers.  
Pages 8–11

Identify and use multiples, factors, common factors, highest common factors, lowest common multiples and primes; write a number in terms of its prime factors, e.g. 500 = $2^2 \times 5^3$.  
Pages 16–18

Calculate squares, positive and negative square roots, cubes and cube roots; use the notation $\sqrt{49}$ and $\sqrt[3]{64}$ and index notation for positive integer powers.  
Pages 13–15 and 18–19

**Number: Place value, ordering and rounding**

Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01.  
Pages 74–78

Order decimals, including measurements, making use of the =, ≠, > and < signs.  
Pages 73–74

Round whole numbers to a positive integer power of 10, e.g. 10, 100, 1000 or decimals to the nearest whole number or one or two decimal places.  
Pages 71–73

**Number: Fractions, decimals, percentages, ratio and proportion**

Find equivalent fractions, decimals and percentages by converting between them.  
Pages 203–204

Convert a fraction to a decimal using division; know that a recurring decimal is a fraction.  
Pages 151–154

Order fractions by writing with common denominators or dividing and converting to decimals.  
Pages 151–154

Add and subtract fractions and mixed numbers; calculate fractions of quantities (fraction answers); multiply and divide an integer by a fraction.  
Pages 102–108

Calculate and solve problems involving percentages of quantities and percentage increases or decreases; express one given number as a fraction or percentage of another.  
Pages 203–209

Use equivalent fractions, decimals and percentages to compare different quantities.  
Pages 203–204

Simplify ratios, including those expressed in different units; divide a quantity into more than two parts in a given ratio.  
Pages 253–256

Use the unitary method to solve simple problems involving ratio and direct proportion.  
Pages 256–257

**Number: Calculation**

**Mental strategies**

Use known facts to derive new facts, e.g. given 20 x 38 = 760, work out 21 x 38.  
Page 20

Recall squares to 20 x 20, cubes to 5 x 5 x 5, and corresponding roots.  
Pages 18–20
### Recall simple equivalent fractions, decimals and percentages.

### Use known facts and place value to multiply and divide simple fractions.
- Pages 74–78 and 106–108

### Use known facts and place value to multiply and divide simple decimals, e.g. 0.07 x 9, 2.4 ÷ 3.
- Pages 74–78 and 106–108

### Use known facts and place value to calculate simple fractions and percentages of quantities.
- Pages 203–209

### Recall relationships between units of measurement.
- Page 252

### Solve simple word problems including direct proportion problems.
- Pages 256–257

### Use the laws of arithmetic and inverse operations to simplify calculations with integers and fractions.
- Pages 109–111

### Use the order of operations, including brackets, with more complex calculations.
- Pages 18–20

### Addition and subtraction
- Consolidate adding and subtracting integers and decimals, including numbers with differing numbers of decimal places.
- Pages 146–147

### Multiplication and division
- Divide integers and decimals by a single-digit number, continuing the division to a specified number of decimal places, e.g. 68 ÷ 7.
- Pages 76–78
- Multiply and divide integers and decimals by decimals such as 0.6 or 0.06, understanding where to place the decimal point by considering equivalent calculations, e.g. 4.37 x 0.3 = (4.37 x 3) ÷ 10, 92.4 ÷ 0.06 = (92.4 x 100) ÷ 6.
- Pages 74–76 and 147–151

### Algebra

#### Algebra: Expressions, equations and formulae
- Know that letters play different roles in equations, formulae and functions; know the meanings of formula and function.
- Pages 30–31
- Know that algebraic operations, including brackets, follow the same order as arithmetic operations; use index notation for small positive integer powers.
- Pages 26–30
- Construct linear expressions.
- Pages 31–32
- Simplify or transform linear expressions with integer coefficients; collect like terms; multiply a single term over a bracket.
- Pages 26–30
- Derive and use simple formulae, e.g. to convert degrees Celsius (°C) to degrees Fahrenheit (°F).
- Pages 122–125
- Substitute positive and negative integers into formulae, linear expressions and expressions involving small powers, e.g. 3x² + 4 or 2x³, including examples that lead to an equation to solve.
- Pages 121–122
- Construct and solve linear equations with integer coefficients (unknown on either or both sides, without or with brackets).
- Pages 117–121

#### Algebra: Sequences, functions and graphs
- Generate terms of a linear sequence using term-to-term and position-to-term rules; find term-to-term and position-to-term rules of sequences, including spatial patterns.
- Pages 214–215
- Use a linear expression to describe the nth term of a simple arithmetic sequence, justifying its form by referring to the activity or practical context from which it was generated.
- Pages 216–220
Express simple functions algebraically and represent them in mappings. | Pages 222–228
---|---
Construct tables of values and use all four quadrants to plot the graphs of linear functions, where \( y \) is given explicitly in terms of \( x \); recognise that equations of the form \( y = mx + c \) correspond to straight-line graphs. | Pages 222–228

### Geometry

#### Geometry: Shapes and geometric reasoning

| Know that if two 2D shapes are congruent, corresponding sides and angles are equal. | Pages 58–80
---|---
| Classify quadrilaterals according to their properties, including diagonal properties. | Pages 42–46
| Know that the longest side of a right-angled triangle is called the hypotenuse. | Pages 36–39
| Identify alternate angles and corresponding angles. | Pages 129–132
| Understand a proof that: | Pages 132–136
  - the angle sum of a triangle is 180° and that of a quadrilateral is 360°
  - the exterior angle of a triangle is equal to the sum of the two interior opposite angles.
| Solve geometrical problems using properties of angles, of parallel and intersecting lines, and of triangles and special quadrilaterals, explaining reasoning with diagrams and text. | Pages 137–138
| Draw simple nets of solids, e.g. cuboid, regular tetrahedron, square-based pyramid, triangular prism. | Pages 46–50
| Identify all the symmetries of 2D shapes. | Pages 50–54
| Use a straight edge and compasses to construct: | Pages 40–42
  - the midpoint and perpendicular bisector of a line segment
  - the bisector of an angle.
| Use a ruler and compasses to construct: | Pages 36–39
  - circles and arcs
  - a triangle, given three sides (SSS)
  - a triangle, given a right angle, hypotenuse and one side (RHS).

#### Geometry: Position and movement

| Find the midpoint of the line segment AB, given the coordinates of points A and B. | Pages 137–138
---|---
| Transform 2D shapes by rotation, reflection and translation, and simple combinations of these transformations. | Pages 234–241
| Understand and use the language and notation associated with enlargement; enlarge 2D shapes, given a centre of enlargement and a positive integer scale factor. | Pages 242–244
| Interpret and make simple scale drawings. | Pages 244–246

### Measure

#### Measure: Length, mass and capacity

| Choose suitable units of measurement to estimate, measure, calculate and solve problems in a range of contexts, including units of mass, length, area, volume or capacity. | Pages 61–62
---|---
| Know that distances in the USA, the UK and some other countries are measured in miles, and that one kilometre is about \( \frac{2}{3} \) of a mile. | Pages 66–67

#### Measure: Time and rates of change

| Draw and interpret graphs in real life contexts involving more than one component, e.g. travel graphs with more than one person. | Pages 161–162
### Measure: Area, perimeter and volume

<table>
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<tr>
<th>Topic</th>
<th>Pages</th>
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<tr>
<td>Know the definition of a circle and the names of its parts; know and use formulae for the circumference and area of a circle.</td>
<td>261–264</td>
</tr>
<tr>
<td>Derive and use formulae for the area of a triangle, parallelogram and trapezium; calculate areas of compound 2D shapes, and lengths, surface areas and volumes of cuboids.</td>
<td>264–268 and 270–276</td>
</tr>
<tr>
<td>Use simple nets of solids to work out their surface areas.</td>
<td>278–279</td>
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### Handling data

#### Handling data: Planning and collecting data

<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
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<tr>
<td>Identify and collect data to answer a question; select the method of collection, sample size and degree of accuracy needed for measurements.</td>
<td>82–85</td>
</tr>
<tr>
<td>Know the difference between discrete and continuous data.</td>
<td>82</td>
</tr>
<tr>
<td>Construct and use:</td>
<td>85–87</td>
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<tr>
<td>- frequency tables with given equal class intervals to gather continuous data</td>
<td></td>
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<tr>
<td>- two-way tables to record discrete data.</td>
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#### Handling data: Processing and presenting data

<table>
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<tr>
<td>Calculate statistics for sets of discrete and continuous data; recognise when to use the range, mean, median and mode and, for grouped data, the modal class.</td>
<td>87–91</td>
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<tr>
<td>Draw, and interpret:</td>
<td>170–177 and 180–182</td>
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<tr>
<td>- frequency diagrams for discrete and continuous data</td>
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<td>- pie charts</td>
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<td>- simple line graphs for time series</td>
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<td>- stem-and-leaf diagrams.</td>
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#### Handling data: Interpreting and discussing results

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<tr>
<td>Interpret tables, graphs and diagrams for discrete and continuous data, and draw conclusions, relating statistics and findings to the original question.</td>
<td>182–187</td>
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<td>Compare two distributions, using the range and one or more of the mode, median and mean.</td>
<td>182–187</td>
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<tr>
<td>Compare proportions in two pie charts that represent different totals.</td>
<td>182–187</td>
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#### Handling data: Probability

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<tr>
<td>Know that if the probability of an event occurring is $p$, then the probability of it not occurring is $1 - p$.</td>
<td>289–291</td>
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<tr>
<td>Find probabilities based on equally likely outcomes in practical contexts.</td>
<td>286–293</td>
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<tr>
<td>Find and list systematically all possible mutually exclusive outcomes for single events and for two successive events.</td>
<td>291–293</td>
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<tr>
<td>Compare estimated experimental probabilities with theoretical probabilities, recognising that:</td>
<td>287–291</td>
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<tr>
<td>- when experiments are repeated different outcomes may result</td>
<td></td>
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<tr>
<td>- increasing the number of times an experiment is repeated generally leads to better estimates of probability.</td>
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### Problem solving

**Problem Solving**

All Stage 8 problem solving objectives are covered in this book. Problem solving skills underpin many of the exercises and investigations, providing a structure for the application of mathematical skills. Features such as investigations, puzzles and ‘What’s the point?’ stimulate students’ curiosity and encourage them to apply problem solving skills to each new mathematical concept they encounter. Throughout the book