

## Prior learning topics

Prior to starting a DP mathematics course students have extensive previous mathematical experiences, but these will vary. It is expected that mathematics students will be familiar with the following topics before they take the examinations because questions assume knowledge of them. Teachers must therefore ensure that any topics listed here that are unknown to their students at the start of the course are included at an early stage. Teachers should also take into account the existing mathematical knowledge of their students to design an appropriate course of study for mathematics. This table lists the knowledge, together with the syllabus content, that is essential for successful completion of the mathematics course.

### Number and algebra

- Number systems: natural numbers  $\mathbb{N}$ ; integers,  $\mathbb{Z}$ ; rationals,  $\mathbb{Q}$ , and irrationals; real numbers,  $\mathbb{R}$
- SI (Système International) units for mass, time, length, area and volume and their derived units, eg. speed
- Rounding, decimal approximations and significant figures, including appreciation of errors
- Definition and elementary treatment of absolute value (modulus),  $|a|$
- Use of addition, subtraction, multiplication and division using integers, decimals and fractions, including order of operations
- Prime numbers, factors (divisors) and multiples
- Greatest common factor (divisor) and least common multiples (HL only)
- Simple applications of ratio, percentage and proportion
- Manipulation of algebraic expressions, including factorization and expansion
- Rearranging formulae
- Calculating the numerical value of expressions by substitution
- Evaluating exponential expressions with simple positive exponents
- Evaluating exponential expressions with rational exponents (HL only)
- Use of inequalities,  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ , intervals on the real number line
- Simplification of simple expressions involving roots (surds or radicals)
- Rationalising the denominator (HL only)
- Expression of numbers in the form  $a \times 10^k$ ,  $1 \leq a < 10$ ,  $k \in \mathbb{Z}$
- Familiarity with commonly accepted world currencies
- Solution of linear equations and inequalities
- Solution of quadratic equations and inequalities with rational coefficients (HL only)
- Solving systems of linear equations in two variables
- Concept and basic notation of sets. Operations on sets: union and intersection
- Addition and subtraction of algebraic fractions (HL only).

### Functions

- Graphing linear and quadratic functions using technology
- Mappings of the elements of one set to another. Illustration by means of sets of ordered pairs, tables, diagrams and graphs.

## Geometry and trigonometry

- Pythagoras' theorem and its converse
- Mid-point of a line segment and the distance between two points in the Cartesian plane
- Geometric concepts: point, line, plane, angle
- Angle measurement in degrees, compass directions
- The triangle sum theorem
- Right-angle trigonometry, including simple applications for solving triangles
- Three-figure bearings
- Simple geometric transformations: translation, reflection, rotation, enlargement
- The circle, its centre and radius, area and circumference. The terms diameter, arc, sector, chord, tangent and segment
- Perimeter and area of plane figures. Properties of triangles and quadrilaterals, including parallelograms, rhombuses, rectangles, squares, kites and trapezoids; compound shapes
- Familiarity with three-dimensional shapes (prisms, pyramids, spheres, cylinders and cones)
- Volumes and surface areas of cuboids, prisms, cylinders, and compound three-dimensional shapes

## Statistics and probability

- The collection of data and its representation in bar charts, pie charts, pictograms, and line graphs
- Obtaining simple statistics from discrete data, including mean, median, mode, range
- Calculating probabilities of simple events
- Venn diagrams for sorting data
- Tree diagrams

## Calculus

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$