Level 9

Mathematics

Mathematics Level Description

In Level 9, students develop familiarity with a broader range of non-linear and linear functions and relations, and related algebra and graphs.

Students apply index laws with integer indices to a range of numerical expressions and extend this to algebraic expressions involving numbers and pro-numerals. They use indices to express very large and very small numbers in scientific notation, and apply this in measurement contexts. Students solve problems involving direct proportion and rates, and simple interest. They apply coordinate geometry to finding the distance between two points in the Cartesian plane, and the midpoint and gradient of a line segment joining two points. Students graph linear relations and solve linear equations, using tables of values, graphs and algebra. They graph simple non-linear relations such as parabolas, the reciprocal function, and circles at the origin, and solve simple related equations with and without the use of digital technology.

Students find areas of composite shapes and the surface area and volumes of right prisms and cylinders. They solve problems involving very small and very large time scales and intervals, and use scientific notation in this context. Students use similarity, enlargement transformations and apply geometric reasoning to solve problems involving ratio and scale factors. They use Pythagoras theorem and trigonometry ratios to solve problems in the plane involving right angles triangles, and develop an understanding that these involve irrational real numbers, which are generally represented by rational approximations specified to a given accuracy.

Students list outcomes for two-step experiments involving selections with and without replacement, using arrays and tree diagrams, and determine related probabilities. They use Venn diagrams and two-way tables to calculate probabilities and relative frequencies from collected or given data to estimate probabilities. They identify issues and questions involving categorical and numerical data, use back-to-back stem-plots and histograms to describe and compare the distribution of data in terms of location (centre), spread and symmetry or skew.

Mathematics Content Descriptions

Number and Algebra

Real numbers

Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (VCMNA301)

Apply index laws to numerical expressions with integer indices (VCMNA302)

Express numbers in scientific notation (VCMNA303)

Money and financial

Measurement and Geometry

Using units of measurement

Calculate the areas of composite shapes (VCMMG312)

Calculate the surface area and volume of cylinders and solve related problems (VCMMG313)

Solve problems involving the surface area and volume of right prisms (VCMMG314)

Statistics and Probability

Chance

List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (VCMSP321)

Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (VCMSP322)

Money and financial mathematics

Solve problems involving simple interest (VCMNA304)

Patterns and algebra

Extend and apply the index laws to variables, using positive integer indices and the zero index (VCMNA305)

Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (VCMNA306)

Apply set structures to solve real-world problems (VCMNA307)

Linear and non-linear relationships

Find the distance between two points located on a Cartesian plane using a range of strategies, including graphing software (VCMNA308)

Find the midpoint and

gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software (VCMNA309)

Sketch linear graphs using the coordinates of two points and solve linear equations (VCMNA310)

Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (VCMNA311)

Investigate very small and very large time scales and intervals (VCMMG315)

Geometric reasoning

Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (VCMMG316)

Solve problems using ratio and scale factors in similar figures (VCMMG317)

Pythagoras and trigonometry

Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles (VCMMG318)

Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles (VCMMG319)

Apply trigonometry to solve right-angled triangle problems (VCMMG320)

Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (VCMSP323)

Data representation and interpretation

Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly from secondary sources (VCMSP324)

Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (VCMSP325)

Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (VCMSP326)

Mathematics Achievement Standard

Number and Algebra

Students apply the index laws using integer indices to variables and numbers, express numbers in scientific notation, solve problems involving very small and very large numbers, and check the order of magnitude of calculations. They solve problems involving simple interest. Students use the distributive law to expand algebraic expressions, including binomial expressions, and simplify a range of algebraic expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment using a range of strategies including the use of digital technology. Students sketch and draw linear and non-linear relations, solve

simple related equations and explain the relationship between the graphical and symbolic forms, with and without the use of digital technology.

Measurement and Geometry

Students solve measurement problems involving perimeter and area of composite shapes, surface area and volume of rectangular prisms and cylinders, with and without the use of digital technology. They relate three-dimensional objects to two-dimensional representations. Students explain similarity of triangles, interpret ratios and scale factors in similar figures, and apply Pythagoras's theorem and trigonometry to solve problems involving angles and lengths in right-angled triangles.

Statistics and Probability

Students compare techniques for collecting data from primary and secondary sources, and identify questions and issues involving different data types. They construct histograms and back-to-back stem-and-leaf plots with and without the use of digital technology. Students identify mean and median in skewed, symmetric and bi-modal displays and use these to describe and interpret the distribution of the data. They calculate relative frequencies to estimate probabilities. Students list outcomes for two-step experiments and assign probabilities for those outcomes and related events.