Level 10

Mathematics

Mathematics Level Description

In Level 10, students extend their use of mathematical models to a wide range of familiar and unfamiliar contexts, involving the use of all types of real numbers. They recognise the role of logical argument and proof in establishing mathematical propositions. Students apply mental, written or technology-assisted forms of computation as appropriate, and routinely use estimation to validate or provide bounds for their answers. They use exponential functions to model compound interest problems.

Students expand, factorise, simplify and substitute into a wide range of algebraic expressions, including linear, quadratic, and exponential terms and relations, as well as simple algebraic fractions with numerical denominators. They solve related equations, linear inequalities and simultaneous linear equations, with and without the use of digital technology. They explore the connection between tabular, graphical and algebraic representations of non-linear relations, including circles with centres at any location in the Cartesian plane.

Students solve problems involving surface area and volume for a range of objects, and follow proofs of key geometric results involving the application of congruence and similarity. They solve practical problems in two and three dimensions involving right angles triangles, Pythagoras theorem and trigonometry.

Students extend their work in probability to combinations of up to three events, using lists, tables, Venn diagrams, tree diagrams and grids as applicable to determine probabilities. They explore the concepts of conditional probability and independence, and their application to solving problems involving chance events.

Students use quartiles and the interquartile range as a measure of spread, and construct and interpret boxplots to compare data sets. They relate box plots to corresponding dot plots and histograms. Students explore the association between two numerical variables using scatterplots, in particular with time as the independent variable. They discuss claims made using statistics in various media articles and other reports, on issues of interest.

Mathematics Content Descriptions

Number and Algebra

Real numbers

Solve simple problems involving inverse proportion

(VCMNA327)

Money and financial mathematics

Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (VCMNA328)

Patterns and algebra

Measurement and Geometry

Using units of measurement

Solve problems involving

surface area and volume for a range of prisms, cylinders and composite solids (VCMMG343)

Geometric reasoning

Formulate proofs involving congruent triangles and angle properties (VCMMG344)

Apply logical reasoning, including the use of

Statistics and Probability

Chance

Describe the results of two- and three-step chance

experiments, both with and without replacements, assign probabilities to outcomes and determine probabilities of events. Investigate the concept of independence (VCMSP347)

Use the language of ‘if ....then, ‘given’, ‘of’, ‘knowing that’ to investigate conditional statements and identify common mistakes in

Factorise algebraic expressions by taking out a common algebraic factor (VCMNA329)

Simplify algebraic products and quotients using index laws (VCMNA330)

Apply the four operations to simple algebraic fractions with numerical denominators (VCMNA331)

Expand binomial products and factorise monic quadratic expressions using a variety of strategies (VCMNA332)

Substitute values into formulas to determine an unknown and re-arrange formulas to solve for a particular term (VCMNA333)

Implement algorithms using data structures in a general-purpose programming language (VCMNA334)

Linear and non-linear relationships

Solve problems involving

linear equations, including those derived from formulas (VCMNA335)

Solve linear inequalities and graph their solutions on a number line (VCMNA336)

Solve simultaneous linear equations, using algebraic and graphical techniques including using digital technology (VCMNA337)

Solve problems involving gradients of parallel and perpendicular lines (VCMNA338)

Explore the connection between algebraic and graphical representations of relations such as simple quadratic, reciprocal, circle and exponential, using digital technology as appropriate

including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes (VCMMG345)

Pythagoras and trigonometry

Solve right-angled triangle problems including those involving direction and angles of elevation and depression (VCMMG346)

common mistakes in interpreting such language (VCMSP348)

Data representation and interpretation

Determine quartiles and interquartile range and investigate the effect of individual data values, including outliers on the interquartile range (VCMSP349)

Construct and interpret box plots and use them to compare data sets (VCMSP350)

Compare shapes of box plots to corresponding histograms and dot plots and discuss the distribution of data (VCMSP351)

Use scatter plots to investigate and comment on relationships between two numerical variables (VCMSP352)

Investigate and describe bivariate numerical data, including where the

independent variable is time (VCMSP353)

Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (VCMSP354)

(VCMNA339)

Solve linear equations involving simple algebraic fractions (VCMNA340)

Solve simple quadratic equations using a range of strategies (VCMNA341)

Solve equations using systematic guess-check-and-refine with digital technology (VCMNA342)

Mathematics Achievement Standard

Number and Algebra

Students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities, quadratic equations and pairs of simultaneous linear equations and related graphs, with and without the use of digital technology. Students substitute into formulas, find unknown values, manipulate linear algebraic expressions, expand binomial expressions and factorise monic and simple non-monic quadratic expressions, with and without the use of digital technology. They represent linear, quadratic and exponential functions numerically, graphically and algebraically, and use them to model situations and solve practical problems.

Measurement and Geometry

Students solve and explain surface area and volume problems relating to composite solids. They use parallel and perpendicular lines, angle and triangle properties, similarity, trigonometry and congruence to solve practical problems and develop proofs involving lengths, angles and areas in plane shapes. They use digital technology to construct and manipulate geometric shapes and objects, and explore symmetry and pattern in two dimensions.

Statistics and Probability

Students compare univariate data sets by referring to summary statistics and the shape of their displays. They describe bivariate data where the independent variable is time and use scatter-plots generated by digital technology to investigate relationships between two continuous variables. Students evaluate the use of statistics in the media. They list outcomes for multi-step chance experiments involving independent and dependent events, and assign probabilities for these experiments.