

## Level description: Year 9

In Year 9, learning in Mathematics builds on each student's prior learning and experiences. Students engage in a range of approaches to learning and doing mathematics that develop their understanding of and fluency with concepts, procedures and processes by making connections, reasoning, problem-solving and practice. Proficiency in mathematics enables students to respond to familiar and unfamiliar situations by employing mathematical strategies to make informed decisions and solve problems efficiently. Students further develop proficiency and positive dispositions towards mathematics and its use as they:

- **apply scientific notation in measurement contexts , routinely consider accuracy in measurement and work with absolute, relative and percentage errors in a range of different measurement contexts**
- **work with the real number line as a geometric model for real numbers that provides a continuous measurement scale ; locate different fractions exactly on the common scale of the real number line using scale and similarity , and locate some irrational square roots of natural numbers using Pythagoras' theorem**
- **use linear and quadratic functions to model a broad range of phenomena and contexts , make predictions, and represent these using tables, graphs and algebra , including with the use of digital tools**
- **manipulate algebraic expressions involving variables , exponents , and the expansion and factorisation of simple quadratic expressions using a variety of techniques including tables, diagrams, algorithms and digital tools**
- **formulate and solve related linear and non-linear equations exactly or approximately using numerical, graphical and algebraic approaches**
- **solve measurement problems about the surface area and volume of objects and apply formulas to solve problems, calculating these and related dimensions of objects as required**
- **use similarity , scale , trigonometry, enlargement transformations , the triangle inequality and Pythagoras' theorem to solve practical problems using given sets of information**
- **investigate probabilities of compound events from two-step experiments and solve related problems; use a variety of representations such as Venn diagrams , tree diagrams , two-way tables and grids to assist in determining the probabilities for these events ; design experiments to gather empirical data about relative frequencies and use these to check their reasoning**
- **compare multiple numerical data subsets in context and analyse their distributions with consideration of symmetry and skew; justify their choice of data representation with respect to data types and context , and critically review the statistical presentation of data and related arguments of others.**

## Achievement standard: Year 9

By the end of Year 9, students recognise and use rational and irrational numbers to solve problems. They extend and apply the exponent laws with positive integers to variables. Students expand binomial products, and factorise monic quadratic expressions. They find the distance between 2 points on the Cartesian plane, and the gradient and midpoint of a line segment. Students use mathematical modelling to solve problems involving change in financial and other applied contexts, choosing to use linear and quadratic functions. They graph quadratic functions and solve monic quadratic equations with integer roots algebraically. Students describe the effects of variation of parameters on functions and relations, using digital tools, and make connections between their graphical and algebraic representations.

They apply formulas to solve problems involving the surface area and volume of right prisms and cylinders. Students solve problems involving ratio, similarity and scale in two-dimensional situations. They determine percentage errors in measurements. Students apply Pythagoras' theorem and use trigonometric ratios to solve problems involving right-

angled triangles. They use mathematical modelling to solve practical problems involving direct proportion, ratio and scale, evaluating the model and communicating their methods and findings. Students express small and large numbers in scientific notation. They apply the enlargement transformation to images of shapes and objects, and interpret results. Students design, use and test algorithms based on geometric constructions or theorems. They compare and analyse the distributions of multiple numerical data sets, choose representations, describe features of these data sets using summary statistics and the shape of distributions, and consider the effect of outliers. Students explain how sampling techniques and representation can be used to support or question conclusions or to promote a point of view. They determine sets of outcomes for compound events and represent these in various ways. Students assign probabilities to the outcomes of compound events. They design and conduct experiments or simulations for combined events using digital tools.