

## **MATHEMATICS – MANDATORY**

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There are 3 Mathematics courses in Year 9 designed to meet the different needs of students. Mathematics is an important area of study and all students will be afforded the opportunity to achieve at their level in an appropriate course. All courses provide challenges for students and the school will ensure that students are suitably placed in the Level most suited to them.

### **Level 3 (5.3)**

By the end of Stage 5.3, students use deductive reasoning in problem solving and in presenting arguments and formal proofs. They interpret and apply formal definitions and generalisations and connect and apply mathematical ideas within and across sub strands. They demonstrate fluency in selecting, combining and applying relevant knowledge, skills and understanding in the solution of familiar and unfamiliar problems.

Students operate with irrational numbers and extend their knowledge of the number system to include all real numbers. They analyse and describe physical phenomena and rates of change. Algebraic skills are extended to expanding the special binomial products and factorising non-monic quadratic expressions, using a variety of techniques. Students solve complex linear equations, non-monic quadratic equations, simple cubic equations, and simultaneous equations involving one linear and one non-linear equation. They solve practical problems using linear, quadratic and simultaneous equations. They change the subject of literal equations. Students generate, describe and graph straight lines, parabolas, cubics, hyperbolas and circles. They use formulas to calculate midpoint, gradient and distance on the Cartesian plane, and to determine the equations of straight lines.

Students solve problems involving the surface areas and volumes of pyramids, cones and spheres, and related composite solids. They explore similarity relationships for area and volume. They determine exact trigonometric ratios for  $30^\circ$ ,  $45^\circ$  and  $60^\circ$ , extend trigonometric ratios to obtuse angles, and sketch sine and cosine curves for angular values from  $0^\circ$  to  $360^\circ$ . Students apply the sine and cosine rules for finding unknown angles and/or sides in non-right-angled triangles. They use Pythagoras' theorem and trigonometry to solve problems in three dimensions.

Their knowledge of a wide range of geometrical facts and relationships is used to prove general properties in geometry, extending the concepts of similarity and congruence to more generalised applications. Students prove known properties of triangles, quadrilaterals and circles.

Students use standard deviation to analyse data, and interpolate and extrapolate from bivariate data using lines of best fit. They investigate statistical reports and explore how data is used to inform decision-making processes.

### **Level 2 (5.2)**

By the end of Stage 5.2, students use mathematical arguments to reach and justify conclusions. When communicating mathematical ideas, they use appropriate mathematical language and algebraic, statistical and other notations and conventions in written, oral or graphical form. Students use suitable problem-solving strategies, which include selecting and organising key information, and they extend their inquiries by identifying and working on related problems.

Students apply their knowledge of percentages, fractions and decimals to problems involving conversion of rates, direct proportion, and financial contexts related to compound interest and depreciation.

Students apply the index laws with integer indices to simplify expressions. They operate with algebraic fractions, expand binomial products and factorise monic quadratic trinomial expressions. They solve linear equations and use them to solve word problems. They solve linear inequalities and linear simultaneous equations. Students solve simple quadratic equations and solve monic quadratic equations by factorisation. On the Cartesian plane they draw and interpret graphs of straight lines, and

simple parabolas, circles and exponential graphs. Students determine the equations of straight lines and use the properties of parallel and perpendicular lines on the Cartesian plane.

Students extend their skills in measurement to solve problems involving the surface areas and volumes of right prisms, cylinders and related composite solids. They use trigonometric ratios to solve problems in which angles may be measured to the nearest second, and problems involving bearings and angles of elevation and depression. In geometry, they use deductive reasoning in numerical and non-numerical problems, drawing on their knowledge of the properties of congruent triangles, the angle properties of polygons, and the properties of quadrilaterals.

Statistical skills are extended to include the construction of box-and-whisker plots and the calculation of interquartile range to analyse and compare data sets in appropriate data displays. Students investigate bivariate data sets and use scatter plots to describe relationships between variables. They evaluate the sources of data in statistical reports. In their study of probability, students record and determine probabilities of events in multi-step chance experiments and examine conditional language.

### **Level 1 (5.1)**

By the end of Stage 5.1, students explain and verify mathematical relationships, select and use appropriate strategies to solve problems, and link mathematical ideas to existing knowledge and understanding. They use mathematical language and notation to explain mathematical ideas, and interpret tables, diagrams and text in mathematical situations.

Students apply their knowledge of percentages, fractions and decimals to financial problems related to earning and spending money, taxation, and simple and compound interest. They simplify and evaluate numerical expressions using index laws for positive and zero indices, round numbers to a specified number of significant figures, and express numbers in scientific notation. Students apply the index laws to simplify algebraic expressions. They determine the midpoint, gradient and length of intervals on the Cartesian plane and draw graphs of linear and simple non-linear relationships.

Skills in measurement are further developed to include finding the areas of composite shapes and the surface areas of rectangular and triangular prisms. Students describe the limit of accuracy of measurements. They apply right-angled triangle trigonometry to practical situations, including those involving angles of elevation and depression. They apply the properties of similar figures to find side lengths in problems related to similar figures.

Students' statistical skills are extended to include considering shape and skewness of distributions, comparing data and data displays, and evaluating the reliability of statistical claims. They also determine the relative frequencies of events in chance experiments and calculate probabilities from information displayed in Venn diagrams and two-way tables.