



MATHSPACE

mapping document

This document outlines the mapping of Hong Kong Curriculum outcomes to particular topics and subtopics within Mathspace.

[S1-S3](#)

[S4-S5](#)

NF – Non foundation, ** - exemplars of enrichment topics

coming soon

S1-S3 Syllabus

Number	Directed Numbers	Approximation and Errors
Using a Calculator for Whole Number Mental Calculations Using a Calculator for Fractions Use a Calculator for Decimals Roman Numerals Egyptian Numbers Binary Number System Numbers with Different Bases	Representation of Directed Numbers Integer Number Line Comparing Sizes of Integers Negative Number Placement and Opposites Comparisons of Directed Number Statements Addition of Integers Subtraction of Integers Addition and Subtraction of Integers Adjacent Signs Multiplication of Integers Division of Integers Negative Squares and Cubes Order of Operations Order of operations with directed rational numbers Mixed Problems with Directed Numbers Using a Calculator for Directed Numbers	Significant Figures Introducing Scientific Notation Scientific Notation I Using a Calculator for Scientific Notation Scientific Notation II Error in Measurement Estimation and Rounding Estimation with Decimals (Investigation) Estimating Percentages Checking Reasonableness and Calculations
Percentages	Interest and borrowing	Ratios and rates
Percentage of a Quantity Percentage Composition Percentage Change Unitary Method Best Buys and Discounts I Best Buys and Discounts II Business Applications of Percentages Profit and Loss Overtime and Extra Income Commission and Other Income Wages and Salaries Wage Deductions and Net Income Repeated Percentage Change Deferred Payment Plans Payment Methods Using a Calculator with Percentages	Simple Interest Compound Interest Introduction Compound Interest - Compound Variations Compound Interest - Finding Other Values Applications of Compound Interest - Depreciation Applications of Compound Interest - Growth and Decay Effective Interest Rates Loans Credit Cards	Introduction to Ratios Simplifying Ratios Problems Using Equivalent Ratios Ratio Tables Dividing a Quantity into a Given Ratio Simplifying Ratios with Numeric Terms Simplifying Ratios with Algebraic Terms Ratios with Fractions and Percents Decimal Ratios Applications of Ratios Ratios and Proportion Dividing a Quantity into a Given Ratio Scales, Maps and Ratios I Scales, Maps and Ratios II Rates I Rates II
Number Patterns	Algebra I	Algebra II
Pictorial Representations of Algebra Describing Number Patterns Algebraic Expressions Components in an expression Laws of Arithmetic with Algebraic Terms Substitution into Expressions Algebraic Equations Algebraic Conventions Equivalent Expressions Modelling Algebraic Expressions Rules for Describing Sequences Relationships between two Quantities Table of values	Substitution into Algebraic Expressions I Worded Problems Addition and subtraction of Like Terms Directed Numbers in Algebra I Equations Directed Numbers in Algebra II Substitution into Algebraic Expressions II Substitution to Complete Table of Values Substitution into common formulas Formulas arising from Substitution Addition and subtraction of Algebraic Terms Multiplication of Algebraic Terms Division of Algebraic Terms Algebraic Fractions I Distributive Law Factorizing the HCF Rewriting Expressions Equivalent Expressions Multi-step word problems (arithmetic operations) Multi-step word problems (averages and percentages) Algebra in Measurement	Simplifying expressions with grouping symbols Algebraic Fractions II Algebraic Multiplication and Division Using the Index Laws Order of Operations I Factorising Algebraic Factors Problem Solving Binomial Products Order of Operations II Factorising the HCF Addition and Subtraction of Algebraic Fractions Multiplication and Division of Algebraic Fractions Mixed Operations with Algebraic Fractions Expanding Perfect Squares Expanding Difference of two Squares Miscellaneous Expansions

Indices	Surds	Equations
Index Notation The Zero Index Multiplication Law I Multiplication Law II Division Law I Division Law II Power of a Power Further Application of Index Laws Negative Indices I Numerical Bases with Negative Indices Numerical Bases with Negative Indices (mult and division) Numerical Bases with Negative Indices (power of power) Numerical Bases with Negative Indices (mixed) Mixed Index Laws Negative Indices II Multiplication Law with Negative Indices Division Law with Negative Indices Power of Power with Negative Indices Products and Quotients with Negative Indices	Rationals and Irrationals Approximating Irrational Numbers Answers that result in irrational numbers Rational and Irrational Operations Exact answers VS decimal evaluations Simplifying Surds Addition and Subtraction of Surds Multiplication and Division of Surds Rationalising the Denominator Using a Calculator for Surds	Number Sentences Introduction to Equations Values that Satisfy Equations Balancing Equations Backtracking Building Expressions Using Backtracking One Step Equations Two Step Equations Number Problems Problem Solving with Equations Identifying Patterns Simple Number Problems Keeping Equations Balanced Simple Equations Three Step Equations Variables on both sides I Variables on both sides II Problem solving with Equations Solutions to Linear Equations Comparing Linear Equations Solve Equations with rational expressions Equations involving Fractions Formulae and Substitution Changing the subject of a formula Measurement Equations Creating Equations with 1 Variable Identities and Equations
Inequalities	Systems of Equations	Sequences
Introduction to Inequalities One Step Inequalities Two Step Inequalities Problem Solving with Inequalities Identifying Solutions to Inequalities in Two Variables Three Step Inequalities Compound Inequalities#	Introduction to Simultaneous Equations The Graphical Method The Substitution Method The Elimination Method Problems with Simultaneous Equations Mixed Problems on Systems of Equations Creating Inequalities with 2 Variables	Introduction to Sequences Introduction to Arithmetic Progressions Introduction to Geometric Progressions Fibonacci Sequence First Order Linear Recurrences Introduction
Linear Equations I	Linear Equations II	Factorization
The Number Plane Interpreting Graphs Horizontal and Vertical Lines Identifying key features of Linear functions Points on a Line Intercepts Graphing Straight Lines from Intercepts Input and Output tables from Graphs Finding the Rule Identifying Linear Equations - Graphs Graphing Linear Equations from Ordered Pairs Solving Equations with Straight Lines Practical Linear Relationships	Unit Rates and Graphs Comparing unit rates Simple Proportional Relationships Intercepts and The Intersection of Lines Gradient of Horizontal and Vertical Lines Gradient of a Line Gradient from Two points The Gradient Formula Identifying Slope from Equation Distances on the Plane (using Pythag) The Distance Formula The Midpoint of an Interval Linear Relationships - graphs Sketching Linear Graphs Modelling Linear Relationships - graphs Calculating Gradients Parallel Lines I Parallel Lines II Perpendicular Lines Intersections of Lines Finding Linear Equations in Context Geometrical Problems with Coordinates	Highest Common Factor Difference of Two Squares Perfect Squares Grouping in Pairs Monic Quadratic Trinomials Miscellaneous Factorisations Simplifying Algebraic Fractions Factorising Algebraic Fractions (mult/div) Factorising Algebraic Fractions (add/sub) Complete the Square Further Factorisations Non-Monic Quadratic Trinomials Factoring Sum and Difference of Cubes

Functions	Measuring, Estimating and Units	
Describing functions Defining Functions and Relations Evaluating Functions Polynomial curve sketching	Units to measure capacity, mass and length Appropriate Units Units of capacity I Units of Capacity II Appropriate Volume and Capacity Units Units of Mass I Units of Mass II Units of Mass III Appropriate Units of Mass Units of Length Units of Measurement Units of Area Conversions Measure and estimate length of objects Estimate Lengths Measure and estimate mass of objects Measure and estimate capacity of objects	Measure, estimate, order and compare objects Measure, estimate, order and compare temperature Estimate Area Estimate Volume Mixed Unit Conversions Units resulting from a formula or graph Quantities, Units and Modelling Reasonable Units Converting Units Very large and small Accuracy in Measurement (upper and lower bounds) Accuracy and Precision Error in Measurement Dimensional analysis (construction of units)
Polynomials		
Polynomials and Notation Addition and Subtraction of Polynomials Multiplication of Polynomials		
Measurement	Trigonometry	Geometry
Perimeter I Perimeter II Introduction to Area Area of Rectangles and Squares Area of Triangles Area of Parallelograms Area of Composite Shapes I Area of Composite Shapes II Exploring the area of special quadrilaterals Area of Special Quadrilaterals Connecting Perimeters and Areas Area of Non Right Angle Triangles Parts of a Circle Circumference Area of a Circle Area and Perimeter of Sectors Volume of Rectangular Prisms Volume Volume of Prisms I Volume of Prisms II Volume of Cylinders I Volume of Cylinders II Volume of Right Pyramids Volume of Right Cones Volume of Spheres Volume of Composite Solids I Volume of Composite Solids II Applications of Volume Surface Area of Prisms I Surface Area of Prisms II Surface Area of Cylinders I Surface Area of Cylinders II Surface Area of Right Pyramids and Cones Surface Area of a Sphere Surface Area of Simple Composite Solids Surface Area of Composite Solids Surface Area of Complex Composite Solids	PYTHAG - The Right-Angled Triangle PYTHAG - Pythagorean Triads PYTHAG - Calculating Side Lengths Using Pythagoras PYTHAG - Applications using Pythagoras PYTHAG - Review (calculations and applications) Sides of a Right-Angled Triangle Ratio of Sides in Right-Angled Triangles Trigonometric Ratios I Trigonometric Ratios II Trigonometric Ratios with Exact Values Calculating Trigonometric Expressions Finding Unknown Side Lengths Using Trig Ratios Finding Unknown Angles Triangle Problems Applications to Geometry Angles of Elevation and Depression Problems with Two Right-Angled Triangles Applications to Real Life I Applications to Real Life II Trigonometry in 3D Pythagoras in 3D [#] Applications Including Bearings Exact Trigonometric Values Trigonometric Equations - with Exact Values Trigonometric Equations - Complimentary Results and Ratios	Polygons Classification of Solids Faces, Edges and Vertices in Polyhedra Nets of solids Naming Angles Measuring, Estimating and Drawing Angles Angles at a Point & vertically Opposite Angles Types of Triangles Types of Quadrilaterals Symmetry Lengths in Polygons on the Plane Constructing 3D Shapes (Investigation) Visualising Solids Cross Sections of Prisms Lines, Intervals and Rays Angles on a straight line Complementary and Supplementary Angles Angles in Triangles Interior and Exterior Angles of Polygons Exterior Angle Sum and other Calculations Cointerior Angles Alternate Angles Corresponding Angles Angles and Parallel Lines Identifying Parallel Lines Constructions with a compass Angles in Quadrilaterals Lengths in Quadrilaterals Properties of Quadrilaterals Identifying Polygons from angle conditions Drawing and Recognising Shapes with Properties (Investigation) Triangle problems Angles in Triangles Revision Angles and Lengths in Quadrilaterals Revision Shapes in Fractal Geometry Symmetries in 3-D Shapes Soma Cubes Angles on Parallel Lines Revision Harder Angles on Parallel Lines Centres of Triangles [#] Geometrical Calculations Deductive Proofs Proofs with Triangles Proofs with Quadrilaterals

Congruence and Similarity	Probability	Data Analysis
Translations on the Cartesian Plane Reflections on the Cartesian Plane Rotations on the Cartesian Plane Combined Transformations on the Cartesian Plane Tessellations Line and Rotational Symmetries Introduction to Congruence Transformations and Congruence Congruence in Triangles Congruence in Quadrilaterals Simple Proofs for Congruence in Triangles Find sides and angles with congruent relationships Methods for Enlargements Enlargements, Ratio and Scale Factors Introduction to Similarity Transformations and Similarity Similarity in Triangles Using similarity proportion to solve problems Trigonometry and Similarity Conditions of Similarity Area and Volumes of Similar Figures	Range of Probabilities Describing Chance Sample Spaces Probabilities as Rational Number Conducting Experiments (Investigation) Experimental Probability Theoretical Probability Expected Outcomes Generating data for probability analysis (Investigation) Venn Diagrams and Two Way Tables Complementary Events Describing and/or events Relative frequencies of And/Or events tree diagrams Replacement and non-replacement probabilities Using Frequency tables and graphs to estimate probabilities Expectation and Fair Value Mixed Questions on Probability Probabilities of Games Traffic Light Problems Decision Making using Probability (Investigation) Comparisons from Experiments (Investigation)	Types of Data I Practicalities of Obtaining Data Statistical Questions Frequency Tables Grouped Data Number of Observations Statistical Attributes Line, Conversion and Step Graphs Stem and Leaf Plots Dot Plots Create and interpret column or bar graphs Create and Interpret Histograms Travel Graphs Sector Graphs Divided Bar Graphs Area Charts and Radar Graphs Back to back stem and leaf plots Histograms and Polygons The Mean The Median Mode Range Mean, Median, Mode and Range Centre or Spread ? How the shape affects choice of centre and spread Weighted Means Cumulative Frequency Frequency Distribution for Grouped Data Measures of Spread - Quartiles Comparisons and Predictions Comparing Sets of Data I Comparing Sets of Data II Real Life Data I Real Life Data II Statistics in the Media I Statistics in the Media II Scatter Plots Describing Statistical Relationships Step graphs Statistical Investigations

Number and Number Systems		
Directed Numbers and the Number Line		
understand and accept intuitively the concept and uses of negative numbers	<i>Directed Numbers</i>	Representation of Directed Numbers Comparisons of Directed Number Statements
have simple ideas of ordering on the number line	<i>Directed Numbers</i>	Integer Number Line Comparing Sizes of Integers Negative Number Placement and Opposites [#] Comparisons of Directed Number Statements
explore and discuss the manipulation of directed numbers	<i>Directed Numbers</i>	Negative Number Placement and Opposites [#] Comparisons of Directed Number Statements Addition of Integers Subtraction of Integers Addition and Subtraction of Integers Adjacent Signs Multiplication of Integers Division of Integers Mixed Problems with Directed Numbers
manipulate directed numbers	<i>Directed Numbers</i>	Addition of Integers Subtraction of Integers Addition and Subtraction of Integers Adjacent Signs Multiplication of Integers Division of Integers Negative Squares and Cubes Order of Operations Order of operations with directed rational numbers Mixed Problems with Directed Numbers
Numerical Estimation		
be aware of the need to use estimation strategies in real-life situations and appreciate the past attempts to approximate values such as π	<i>Approximation and Errors</i>	Estimation (Investigation) [#]
determine whether to estimate values or to compute the exact values	<i>Surds</i>	Approximating Irrational Numbers Exact Answers vs Decimal Evaluations
select and use estimation strategies to estimate values and to judge the reasonableness of results	<i>Approximation and Errors</i>	Estimation and Rounding Checking Reasonableness and Calculations Estimation with Decimals (Investigation) Estimating Percentages
choose appropriate means for calculation such as mental computation, calculators or paper and pencil etc.	<i>Number</i> <i>Directed Number</i>	Mental Calculations Using a Calculator for Whole Number Using a Calculator for Fractions Using a Calculator for Decimals Using a Calculator for Directed Numbers

Approximation and Errors		
acquire further concepts and skills of rounding off numbers to a required number of significant figures	<i>Approximation and Errors</i>	Significant Figures
understand the meaning of scientific notation	<i>Approximation and Errors</i>	Introducing Scientific Notation
use scientific notation in practical problems	<i>Approximation and Errors</i>	Scientific Notation I Scientific Notation II Using a Calculator for Scientific Notation
be aware of the size of errors during estimation and approximation	<i>Approximation and Errors</i>	Errors in Measurement
understand and calculate different types of errors such as absolute errors, relative errors and percentage errors	<i>Approximation and Errors</i>	Errors in Measurement
Rational and Irrational Numbers		
be aware of the existence of irrational numbers and surds	<i>Surds</i>	Rationals and Irrationals Answers that result in irrational numbers Rational and Irrational Operations Exact Answers VS Decimal Evaluations
explore the representations of irrational numbers in the number line	<i>Surds</i>	Approximating Irrational Numbers
(NF) manipulate commonly encountered surds including the rationalization of the denominator in the form of $\frac{a}{\sqrt{b}}$	<i>Surds</i>	Addition and subtraction of Surds Multiplication and Division of Surds Rationalising the Denominator
(NF) appreciate the expressions of surds could be expressed in a more concise form	<i>Surds</i>	Simplifying Surds Addition and subtraction of Surds Multiplication and Division of Surds
Comparing Quantities		
Using Percentages		
understand the meaning of percentages and percentage changes	<i>Percentages</i>	Percentage of a Quantity Percentage Composition Percentage Change
apply percentage changes to solve simple selling problems	<i>Percentages</i> <i>Interest and Borrowing</i>	Unitary Method Business Applications of Percentages Best Buys and Discounts I & II Deferred Payment Plans Payment Methods Simple Interest
apply percentages to solve problems involving simple and compound interests, growth and depreciation	<i>Interest and Borrowing</i>	Compound Interest Introduction Compound Interest - Compound Variations Compound Interest - Finding Other Values Applications of Compound Interest - Depreciation Applications of Compound Interest - Growth and Decay
More About Percentages		
apply percentages to solve further practical problems involving successive and component changes	<i>Percentages</i>	Repeated Percentage Change
apply percentages to solve simple real-life problems involving taxation and rates	<i>Percentages</i> <i>Interest and Borrowing</i>	Wages and Salaries Commission and Other Income Profit and Loss Overtime and Extra Income Wage Deductions and Net Income Effective Interest Rates Loans Credit Cards

Rate and Ratio		
understand the meaning of rate and ratio	<i>Ratios and Rates</i>	Introduction to Ratios and Rates Ratio Tables Rates I & II
recognize the notation of $a : b$, $a : b : c$	<i>Ratios and Rates</i>	Introduction to Ratios and Rates Ratio Tables Simplifying Ratios Simplifying Ratios with Numeric Terms Simplifying Ratios with Algebraic Terms Dividing a Quantity into a Given Ratio Ratios with Fractions and Percents Decimal Ratios
apply the ability in using rate, ratio to solve real-life problems including mensuration problems	<i>Ratios and Rates</i> <i>Linear equations II</i>	Problems using Equivalent Ratios Applications of Ratios Ratio and Proportion Scales, Maps and Ratios I & II Unit rates and graphs Comparing Unit Rates Simple Proportional Relationships
Observing Patterns and Expressing Generality		
Formulating Problems with Algebraic Language		
appreciate the use of letters to represent numbers	<i>Number Patterns</i>	Pictorial Representations of Algebra Describing Number Patterns Algebraic Expressions Components in an expression Laws of Arithmetic with Algebraic Terms Algebraic Conventions
understand the language of algebra including translating word phrases into algebraic expressions or write descriptive statement for algebraic expressions	<i>Number Patterns</i> <i>Algebra I</i>	Modelling Algebraic Expressions Rules for Describing Sequences Equivalent Expressions Worded Problems Rewriting Expressions Equivalent Expressions
note the differences between the language of arithmetic and the language of algebra	<i>Number Patterns</i> <i>Algebra I</i> <i>Algebra II</i>	Laws of Arithmetic with Algebraic Terms Addition and Subtraction of Like Terms Directed numbers in Algebra I & II Addition and Subtraction of Algebraic Terms Multiplication of Algebraic Terms Division of Algebraic Terms Simplifying Expressions with Grouping Symbols Order of Operations I & II
recognize some common and simple formulas which can be expressed as algebraic forms and be able to substitute values	<i>Number Patterns</i> <i>Algebra I</i>	Substitution into Expressions Table of values Substitution into Algebraic Expressions I & II Substitution in to complete a table of values Substitution into common formulas Formulas arising from Substitution Algebra in Measurement

formulate simple algebraic equations/inequalities to solve problems	<i>Number Patterns</i> <i>Algebra I</i> <i>Algebra II</i> <i>Equations</i> <i>Inequalities</i>	Algebraic Equations Equations Multi-step word problems (arithmetic operations) Multi-step word problems (averages and percentages) Problem Solving Number Sentences Introduction to Equations Values that Satisfy Equations Balancing Equations Backtracking Building Expressions Using Backtracking One Step Equations Two Step Equations Number Problems Problem Solving with Equations Introduction to Inequalities One Step Inequalities Two Step Inequalities Creating Inequalities with 2 Variables
investigate, appreciate and observe the patterns of various number sequences such as polygonal numbers, arithmetic and geometric sequences, Fibonacci sequence etc.	<i>Sequences</i>	Introduction to Sequences Introduction to Arithmetic Progressions Introduction to Geometric Progressions Fibonacci Sequence Introduction to Sequences First Order Linear Recurrences Introduction
use algebraic symbols to represent the number patterns	<i>Number Patterns</i> <i>Algebra I</i>	Modelling Algebraic Expressions Rules for Describing Sequences Table of Values Worded Problems
obtain a preliminary idea of function such as input-processing-output concept	<i>Number Patterns</i> <i>Linear Equations I</i> <i>Functions</i>	Relationships between Two Quantities Input and Output tables from graphs Finding the ruel Evaluating functions
Manipulations of Simple Polynomials		
recognize polynomial as a special example of algebraic expressions	<i>Polynomials</i>	Polynomials and Notation
recognize the meaning of the terminology involved	<i>Functions</i> <i>Polynomials</i>	Describing Functions Defining Functions and Relations Evaluating functions Polynomials and Notation
add, subtract, multiply polynomials involving more than one variable	<i>Polynomials</i>	Addition and Subtraction of Polynomials Multiplication of Polynomials
Laws of Integral Indices		
extend and explore the meaning of the index notation of numbers with negative exponents	<i>Indices</i>	Negative Indices I & II Numerical Bases with Negative Indices Numerical Bases with Negative Indices (mult and division) Numerical Bases with Negative Indices (power of power) Numerical Bases with Negative Indices (mixed) Mixed Index Laws Negative Indices Multiplciation Law with Negative Indices Division Law with Negative Indices Power of Power with Negative Indices Products and Quotients with Negative Indices
explore, understand and use the laws of integral indices to simplify simple algebraic expressions (up to 2 variables only)	<i>Algebra II</i>	Algebraic Multiplication and Division Using the Index Laws

(NF) understand and compare numbers expressed in various bases in real-life situations	<i>Number</i>	Numbers with Different Bases
(NF) foster a sense of place values in different numeral systems	<i>Number</i>	Roman Numerals Egyptian Numbers Binary Number System
(NF) inter-convert between simple binary/hexadecimal numbers to decimal numbers	<i>Number</i>	Numbers with Different Bases
Factorization of Simple Polynomials		
understand factorization as a reverse process of expansion	<i>Algebra I</i> <i>Algebra II</i> <i>Factorization</i>	Distributive Law Factorising the HCF Simplifying Expressions with Grouping Symbols Binomial Products Difference of Two Squares Perfect Squares
factorize polynomials by using common factors and grouping of terms	<i>Algebra I</i> <i>Algebra II</i> <i>Factorization</i>	Factorising the HCF Factorising the HCF Factorising Algebraic Factors Highest Common Factor Grouping in Pairs
factorize polynomials by using identifies including difference of two squares; perfect square expressions; difference and sum of two cubes (NF – difference and sum of two cubes)	<i>Factorization</i>	Difference of Two Squares Perfect Squares Monic Quadratic Trinomials Miscellaneous Factorisations Further Factorisations Complete the Square Factoring sum and difference of cubes
factorize polynomials by cross-method	<i>Factorization</i>	Monic Quadratic Trinomials Non-Monic Quadratic Trinomials
Algebraic Relations and Functions		
Linear Equations in One Unknown		
formulate and solve linear equations in one unknown	<i>Equations</i>	One Step Equations Two Step Equations Number Problems Problem Solving with Equations Identifying Patterns Simple Number Problems Keeping Equations Balanced Simple Equations Three Step Equations Grouping with Pronumerals I & II Problem solving with Equations Solutions to Linear Equations Comparing Linear Equations Solve Equations (add/sub) with rational expressions Solve Equations (mult) with rational expressions Solve Equations (div) with rational expressions Equations involving Fractions Formulae and Substitution Measurement Equations Creating Equations with 1 Variable
**solve literal equations	<i>Equations</i>	Changing the subject of a formula

Linear Equations in Two Unknowns		
plot and explore the graphs of linear equations in 2 unknowns	<i>Linear Equations I</i> <i>Linear Equations II</i>	Interpreting Graphs Horizontal and Vertical Lines Points on a Line Intercepts Identifying Linear Equations - Graphs Solving Equations with Straight Lines Practical Linear Relationships Identifying key features of Linear functions Graphing Straight Lines from Intercepts Graphing Linear Equations from Ordered Pairs Linear Relationships - graphs Sketching Linear Graphs Modelling Linear Relationships - graphs
formulate and solve simultaneous equations by algebraic and graphical methods	<i>Systems of Equations</i> <i>Linear Equations II</i>	Introduction to Simultaneous Equations The Graphical Method The Substitution Method The Elimination Method Problems with Simultaneous Equations Mixed Problems on Systems of Equations Intercepts and the Intersection of Lines Intersections of Lines
be aware of the approximate nature of the graphical method	<i>Systems of Equations</i>	The Graphical Method
**explore simultaneous equations that are inconsistent or that have no unique solution	<i>Systems of Equations</i>	The Substitution Method The Elimination Method Problems with Simultaneous Equations
Identities		
explore the meaning of identities and distinguish between equations and identities	<i>Equations</i>	Identities and Equations [#]
discover and use the identities : difference of two squares; the perfect square expression; difference and sum of two cubes (NF – difference and sum of two cubes)	<i>Algebra II</i>	Expanding Difference of two Squares Expanding Perfect Squares Miscellaneous Expansion
Formulas		
manipulate algebraic fractions with linear factors as denominators	<i>Algebra I</i> <i>Algebra II</i> <i>Factorisation</i>	Algebraic Fractions I Algebraic Fractions II Addition and Subtraction of Algebraic Fractions Multiplication and Division of Algebraic Fractions Mixed Operations with Algebraic Fractions Simplifying Algebraic Fractions Factorising Algebraic Fractions (mult/div) Factorising Algebraic Fractions (add/sub)
develop an intuitive idea of factorization of polynomials	<i>Functions</i>	Polynomial Curve Sketching
explore familiar formulas and substitute values of formulas	<i>Algebra I</i> <i>Equations</i>	Substitution into common formulas Formulas arising from Substitution Algebra in Measurement Formulae and Substitution Changing the subject of a formula
perform change of subject in simple formulas but not including radical sign	<i>Equations</i>	Formulae and Substitution Changing the subject of a formula
Linear Inequalities in one unknown		
understand the meaning of inequality signs \geq , $>$, \leq and $<$	<i>Inequalities</i>	Introduction to Inequalities One Step Inequalities
explore the fundamental properties and some laws of inequalities	<i>Inequalities</i>	Introduction to Inequalities

solve simple linear inequalities in one unknown and represent the solution on the number line	<i>Inequalities</i>	One Step Inequalities Two Step inequalities Problem Solving with Inequalities Identifying Solutions to Inequalities Three step Inequalities Compound Inequalities #
Included as background and supporting work		
Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding.	<i>Indices</i>	Index Notation The Zero Index Multiplication Law I Multiplication Law II Division Law I Division Law II Power of a Power Further Application of Index Laws

Measures in 2-D and 3-D Figures		
Estimation in Measurement		
recognize the approximate nature of measurement and choose an appropriate measuring tool and technique for a particular purpose	<i>Measuring, Estimating and Units</i>	Accuracy and Precision
choose an appropriate unit and the degree of accuracy for a particular purpose	<i>Measuring, Estimating and Units</i>	Units to measure capacity, mass and length Appropriate Units Units of capacity I & II Appropriate Volume and Capacity Units Units of Mass I, II and III Appropriate Units of Mass Units of Length Units of Measurement Units of Area Conversions Mixed Unit Conversions Units resulting from a formula or graph Quantities, Units and Modelling Reasonable Units Converting Units Very large and small
develop estimation strategies in measurement	<i>Measuring, Estimating and Units</i>	Measure and Estimate Length of Objects Estimate Lengths Measure and Estimate Mass of Objects Measure and Estimate capacity of objects Measure, estimate, order and compare objects Measure, estimate, order and compare temperature Estimate Area Estimate Volume
handle and reduce errors in measurement	<i>Measuring, Estimating and Units</i>	Accuracy in Measurement (upper and lower bounds) Accuracy and Precision Error in Measurement
estimate, measure and calculate lengths, areas, capacities, volumes, weights, rates, etc.	<i>Measuring, Estimating and Units</i> <i>Measurement</i>	Measure and Estimate Length of Objects Estimate Lengths Measure and Estimate Mass of Objects Measure and Estimate capacity of objects Measure, estimate, order and compare objects Measure, estimate, order and compare temperature Estimate Area Estimate Volume Perimeter I & II Area of Rectangles and Squares Area of a Triangles Area of Parallelograms Area of Composite Shapes I Area of Composite Shapes II Area of Special Quadrilaterals

Simple Ideas of Areas and Volumes		
find areas of simple polygons	<i>Measurement</i>	Introduction to Area Area of Rectangles and Squares Area of a Triangles Area of Parallelograms Area of Composite Shapes I Area of Composite Shapes II Exploring the area of special quadrilaterals Area of Special Quadrilaterals
explore the formula for the area of a circle	<i>Measurement</i>	Area of a Circle
calculate circumferences and areas of circles	<i>Measurement</i>	Circumference Area of a Circle
understand and use the formulas for surface areas and volumes of cubes, cuboids, prisms and cylinders	<i>Measurement:</i>	Volume of Rectangular Prisms Volume Volume of Prisms I Volume of Prisms II Volume of Cylinders I Volume of Cylinders II Volume of Composite Solids I Volume of Composite Solids II Applications of Volume Surface Area of Prisms I Surface Area of Prisms II Surface Area of Cylinders I Surface Area of Cylinders II Surface Area of Simple Composite Solids Surface Area of Composite Solids
appreciate the application of formulas, besides measurement, in finding measures and be aware of the accumulated errors arisen	<i>Measurement</i>	Error in Measurement
**explore the maximum area of figures for a given perimeter	<i>Measurement</i>	Area of Rectangles and Squares Connecting Perimeters and Areas
**design a container by cutting squares from the 4 corners of a sheet of A4 paper to maximize the capacity of the container	<i>Measurement</i>	Volume of Prisms II
More About Areas and Volumes		
calculate arc lengths and areas of sectors	<i>Measurement</i>	Area and Perimeter of Sectors
understand and use the formulas for volumes of pyramids, circular cones and spheres	<i>Measurement</i>	Volume of Right Pyramids Volume of Right Cones Volume of Spheres Volume of Composite Solids I Volume of Composite Solids II Applications of Volume
understand and use the formulas for surface areas of right circular cones and spheres	<i>Measurement</i>	Surface Area of Right Pryamids and Cones Surface Area of a Sphere Surface Area of Complex Composite Solids
understand and use the relationships between sides, surface areas and volumes of similar figures	<i>Congruence and Similarity</i>	Areas and Volumes of Similar Figures
distinguish between formulas for length, area, volume by considering dimensions	<i>Measurement</i>	Dimensional analysis (construction of units)

Learning Geometry Through an Intuitive Approach

Introduction to Geometry		
recognize the common terms and notations in geometry such as line segments, angles, regular polygons, cubes and regular polyhedra (Platonic solids) etc.	<i>Geometry</i>	Polygons Lines, Intervals and Rays
identify types of angles and polygons	<i>Geometry</i>	Polygons Classification of Solids Faces, Edges and Vertices in Polyhedra Nets of solids Naming Angles Measuring, Estimating and Drawing Angles Complementary and Supplementary Angles
construct 3-D solids and explore their properties, such as Euler's formula	<i>Geometry</i>	Faces, Edges and Vertices in Polyhedra
sketch the 2-D representation of simple solids	<i>Geometry</i>	Nets of solids Constructing 3D Shapes# Drawing and Recognising Shapes with Properties
sketch the cross-sections of the solids	<i>Geometry</i>	Visualising Prisms Cross Sections of Prisms
overview tools of geometry and explore ways of using them to construct polygons, circles, parallel and perpendicular lines	<i>Geometry</i>	Constructions with a Compass
**recognize some semi-regular polyhedra (Archimedean Solids)	<i>Geometry</i>	Classification of Solids
Transformation and Similarity		
recognize reflectional and rotational symmetries in 2-dimensional (2-D) shapes	<i>Geometry</i> <i>Congruence and Similarity</i>	Symmetry Line and Rotational Symmetries
recognize the effect on 2-D shapes after the transformation including reflection, rotation, translation, dilation/contraction etc.	<i>Congruence and Similarity</i>	Translations on the Cartesian Plane Reflections on the Cartesian Plane Rotations on the Cartesian Plane Combined Transformations on the Cartesian Plane
appreciate the symmetrical shapes around and transformations on shapes used in daily-life	<i>Geometry</i>	Symmetry
**construct and design tile patterns	<i>Congruence and Similarity</i>	Tesselations
Congruence and Similarity		
recognize the properties for congruent and similar triangles	<i>Congruence and Similarity</i>	Congruence in Triangles Similarity in Triangles Using similarity proportion to solve problems Trigonometry and Similarity Conditions of Similarity
extend the ideas of transformation and symmetry to explore the conditions for congruent and similar triangles	<i>Congruence and Similarity</i>	Transformations and Congruence Transformations and Similarity
recognize the minimal conditions in fixing a triangle	<i>Congruence and Similarity</i>	Similarity in Triangles
identify whether 2 triangles are congruent/similar with simple reasons	<i>Congruence and Similarity</i>	Simple Proofs for Congruence in Triangles Congruence in Triangles Similarity in Triangles Using similarity proportion to solve problems Trigonometry and Similarity Conditions of Similarity
(NF) explore and justify the methods to construct angle bisectors, perpendicular	<i>Geometry</i>	Constructions with a Compass

bisectors and special angles by compasses and straight edges		
(NF) appreciate the construction of lines and angles with minimal tools at hand	<i>Geometry</i>	Constructions with a compass Measuring, Estimating and Drawing Angles
** discuss the possibility of trisecting an angle by compasses and straight edges	<i>Geometry</i>	Constructions with a Compass
**explore some shapes in fractal geometry	<i>Geometry</i>	Introduction to Fractal Geometry
Angles related with Lines and Rectilinear Figures		
recognize different types of angles	<i>Geometry</i>	Naming Angles
explore and use the angle properties associated with intersecting lines and parallel lines	<i>Geometry</i>	Angles at a Point & vertically Opposite Angles Angles on a Straight Line [#] Cointerior Angles Alternate Angles Corresponding Angles Angles and Parallel Lines Identifying Parallel Lines Angles on Parallel Lines Revision Harder Angles on Parallel Lines
explore and use the properties of lines and angles of triangles	<i>Geometry</i>	Types of Triangles Angles in Triangles Triangle problems Angles in Triangles Revision
explore and use the formulas for the angle sum of the interior angles and exterior angles of polygons	<i>Geometry</i>	Interior and Exterior Angles of Polygons Exterior Angle Sum and other Calculations
explore regular polygons that tessellate	<i>Geometry</i>	Polygons
(NF) appreciate the past attempts in constructing some special regular polygons with minimal tools at hand	<i>Geometry</i>	Constructions with a compass
(NF) construct some special regular polygons using straight edges and compasses	<i>Geometry</i>	Constructions with a compass Drawing and Recognising Shapes with Properties
**discuss past attempts in constructing some special regular polygons such as 17-sided regular polygons		Investigation coming
More about 3-D Figures		
extend the idea of symmetry in 2-D figures to recognize and appreciate the reflectional and rotational symmetries in cubes and tetrahedron	<i>Geometry</i>	Symmetries in 3-D Shapes (investigation)
explore and identify the net of a given solid	<i>Geometry:</i>	Nets of solids
imagine and sketch the 3-D objects from given 2-D representations from various views	<i>Geometry:</i>	Visualising Prisms
recognize the limitation of 2-D representations in identifying the solid	<i>Geometry</i>	Constructing 3D Shapes (Investigation) [#]
explore the properties of simple 3-D object, such as identifying; \sphericalangle the projection of an edge on one plane, \sphericalangle the angle between a line and a plane, \sphericalangle the angle between 2 planes	<i>Trigonometry</i>	Pythagoras in 3D [#] Trigonometry in 3D
**investigate the reflectional and rotational symmetries in other regular polyhedra	<i>Geometry</i>	Symmetries in 3-D Shapes
**assemble a set of Soma Cube into a larger cube	<i>Geometry</i>	Soma Cubes Investigation [#]
**explore the number of regular polyhedra	<i>Geometry</i>	Polygons

Learning Geometry through a Deductive Approach

Simple Introduction to Deductive Geometry

develop a deductive approach to study geometric properties through studying the story of Euclid and his book - Elements		Investigation coming
develop an intuitive idea of deductive reasoning by presenting proofs of geometric problems relating with angles and lines	<i>Geometry</i>	Geometrical Calculations Deductive Proofs Proofs with Triangles Proofs with Quadrilaterals
understand and use the conditions for congruent and similar triangles to perform simple proofs	<i>Congruence and Similarity</i>	Simple Proofs for Congruence in Triangles Find sides and angles with congruent relationships Congruence in Triangles
identify lines in a triangle such as medians, perpendicular bisectors etc.	<i>Geometry</i>	Centres of Triangles [#]
(NF) explore and recognize the relations between the lines of triangles such as the triangle inequality, concurrence of intersecting points of medians etc.	<i>Geometry</i>	Centres of Triangles [#]
(NF) explore and justify the methods of constructing centres of a triangle such as in-centre, circumcentre, orthocentre, centroids etc.	<i>Geometry</i>	Centres of Triangles [#]
**prove some properties of the centres of the triangle	<i>Geometry</i>	Centres of Triangles [#]

Pythagoras' Theorem

recognize and appreciate different proofs of Pythagoras' Theorem including those in Ancient China		Investigation coming
recognize the existence of irrational numbers and surds	<i>Surds</i>	Rationals and Irrationals Answers that result in irrational numbers
use Pythagoras' Theorem and its converse to solve problems	<i>Trigonometry</i>	PYTHAG - The Right-Angled Triangle PYTHAG - Pythagorean Triads PYTHAG - Calculating Side Lengths Using Pythagoras Pythagoras in 3D [#] PYTHAG - Applications Using Pythagoras PYTHAG - Review
(NF) appreciate the dynamic element of mathematics knowledge through studying the story of the first crisis of mathematics		Investigation coming
**investigate and compare the approaches behind in proving Pythagoras' Theorem in different cultures		Investigation coming
**explore various methods in finding square root		Investigation coming

Quadrilaterals

extend the idea of deductive reasoning in handling geometric problems involving quadrilaterals	<i>Geometry</i>	Angles in Quadrilaterals Lengths in Quadrilaterals Properties of Quadrilaterals Proofs with Quadrilaterals
deduce the properties of various types of quadrilaterals but with focus on parallelograms and special quadrilaterals	<i>Geometry</i>	Types of Quadrilaterals Lengths in Polygons on the Plane # Identifying Polygons from angle conditions# Angles and Lengths in Quadrilaterals Revision
(NF) perform simple proofs related with parallelograms	<i>Geometry Congruence and Similarity</i>	Proofs with Quadrilaterals Congruence in Quadrilaterals # Using similarity proportion to solve problems #

(NF) understand and use the mid-point and intercept theorems to find unknowns		Investigation coming
Learning Geometry through an Analytic Approach		
Introduction to Coordinates		
understand and use the rectangular and polar coordinate systems to describe positions of points in a plane	<i>Linear Equations I</i>	The Number Plane
able to locate a point in a plane by means of an ordered pair in the rectangular coordinate system	<i>Linear Equations I</i>	The Number Plane Graphing straight lines from ordered pairs
describe intuitively the effects of transformation such as translation, reflection with respect to lines parallel to x-axis, y-axis and rotation about the origin through multiples of 90° on points in coordinate planes	<i>Congruence and Similarity</i>	Translations on the Cartesian Plane Reflections on the Cartesian Plane Rotations on the Cartesian Plane Combined Transformations on the Cartesian Plane
calculate areas of figures that can be cut into or formed by common 2-D rectilinear figures	<i>Measurement</i>	Area of Composite Shapes I & II
Coordinate Geometry of Straight Lines		
understand and use formulas of distance and slope	<i>Linear Equations II</i>	Gradient of Horizontal and Vertical Lines Gradient of a Line Gradient from Two Points The Gradient Formula Identifying Slope from Equation Distances on the plane (using pythag0 The Distance Formula The Midpoint of an Interval Calculating Gradients Finding Linear Equations in Context Geometrical Problems with Coordinates
(NF) use ratio to find the coordinates of the internal point of division and mid-point	<i>Linear Equations II</i>	The Midpoint of an Interval
understand the conditions for parallel lines and perpendicular lines	<i>Linear Equations II</i>	Parallel Lines II Parallel Lines II Perpendicular Lines
(NF) appreciate the analytic approach to prove results relating to rectilinear figures besides deductive approach		Investigation coming
(NF) choose and use appropriate methods to prove results relating to rectilinear figures		Investigation coming
**explore the formula for external point of division		Investigation coming
Trigonometry		
Trigonometric Ratios and Using Trigonometry		
understand the sine, cosine and tangent ratios for angles between 0° to 90°	<i>Trigonometry</i>	Sides of a Right-Angled Triangle Ratio of Sides in Right-Angled Triangles Trigonometric Ratios I Trigonometric Ratios II Trigonometric Ratios with Exact Values Calculating Trigonometric Expressions Finding Unknown Side Lengths Using Trig Ratios Finding Unknown Angles Triangle Problems Applications to Geometry Applications to Real Life I Applications to Real Life II

explore the properties and relations of trigonometric ratios	<i>Trigonometry</i>	Sides of a Right-Angled Triangle Ratio of Sides in Right-Angled Triangles Trigonometric Ratios I Trigonometric Ratios II Trigonometric Ratios with Exact Values Calculating Trigonometric Expressions Finding Unknown Side Lengths Using Trig Ratios Finding Unknown Angles Triangle Problems Applications to Geometry Applications to Real Life I Applications to Real Life II
explore the exact value of trigonometric ratios on special angles 30°, 45°, 60°	<i>Trigonometry</i>	Exact Trigonometric Values Trigonometric Equations - with Exact Values Trigonometric Equations - Complimentary Results and Ratios
(NF) rationalize the denominators such as $\sqrt{2}$	<i>Surds</i>	Rationalising the Denominator
apply trigonometric ratios to find measures of 2-D figures	<i>Trigonometry</i>	Finding Unknown Side Lengths Using Trig Ratios Finding Unknown Angles Triangle Problems Applications to Geometry Applications to Real Life I Applications to Real Life II
introduce the ideas of bearing, gradient, angle of elevation, angle of depression and solve related 2-dimensional problems	<i>Linear Equations II</i> <i>Trigonometry</i>	Gradient of a Line Applications to Geometry Angles of Elevation and Depression Problems with Two Right-Angled Triangles Applications to Real Life I Applications to Real Life II Applications Including Bearings
Included as background and supporting work		
Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding.	<i>Measurement</i> <i>Congruence and Similarity:</i>	Area of Non Right Angle Triangles Parts of a Circle Introduction to Congruence Methods for Enlargements Reproducing Images to Scale Enlargements, Ratio and Scale Factors Introduction to Similarity

Organization and Representation of Data

Introduction to Various Stages of Statistics

recognize various stages involved in statistics	<i>Data Analysis</i>	Statistical Investigations
use simple methods to collect data so as to analyze posed problems	<i>Data Analysis</i>	Practicalities of Obtaining Data Statistical Questions Number of Observations Statistical Attributes
be aware of the existence of different types of data (discrete and continuous)	<i>Data Analysis</i>	Types of Data I Types of Data II
understand the criteria of organizing data and discuss different ways of organizing the same set of data	<i>Data Analysis</i>	Frequency Tables Grouped Data Describing Statistical Relationships

Construction and Interpretation of Simple Diagrams and Graphs

construct and interpret simple diagrams including stem-and-leaf diagrams, pie charts, histograms, scatter diagrams, broken line graphs	<i>Data Analysis</i>	Line, Conversion and Step Graphs Stem and Leaf Plots Dot Plots Column, Bar Graphs and Histograms Travel Graphs Sector Graphs Back to back stem and leaf plots Histograms and Polygons Scatter Plots Step Graphs
construct and interpret simple frequency polygons and curves, cumulative frequency polygons and curves	<i>Data Analysis</i>	Histograms and Polygons
be able to differentiate between histograms and bar charts	<i>Data Analysis</i>	Column, Bar Graphs and Histograms
explore the construction of diagrams and graphs with various tools besides paper and pencil	<i>Data Analysis</i>	Line, Conversion and Step Graphs Stem and Leaf Plots Dot Plots Column, Bar Graphs and Histograms Travel Graphs Sector Graphs Back to back stem and leaf plots Scatter Plots Step Graphs
compare the presentations of the same set of data by using various graphs or the same type of graphs but with different scales	<i>Data Analysis</i>	Comparisons and Predictions Comparing Sets of Data I Comparing Sets of Data II Real Life Data I Real Life Data II
choose appropriate diagrams/graphs to present a given set of data	<i>Data Analysis</i>	Comparisons and Predictions Comparing Sets of Data I Comparing Sets of Data II Real Life Data I Real Life Data II
read data from given frequencies in graphs (including percentiles, quartiles, median)	<i>Data Analysis</i>	The Median Cumulative Frequency Frequency Distribution for Grouped Data Measures of Spread - Quartiles
read frequencies from given data in diagrams and graphs	<i>Data Analysis</i>	Frequency Tables Cumulative Frequency Frequency Distribution for Grouped Data

use some common wordings such as ‘most popular’, ‘most likely’, ‘equally likely’ to describe trends from line graphs		Investigation coming
discuss the impressions from graphs presented in various sources	<i>Data Analysis</i>	Statistics in the Media I Statistics in the Media II
identify sources of deception in misleading graphs and their accompanying statements	<i>Data Analysis</i>	Comparisons and Predictions Comparing Sets of Data I Comparing Sets of Data II Real Life Data I Real Life Data II Statistics in the Media I Statistics in the Media II
recognize the dangers of misinterpreting statistical data	<i>Data Analysis</i>	Real Life Data I Real Life Data II Statistics in the Media I Statistics in the Media II
Analysis and Interpretation of Data		
Measures of Central Tendency		
find mean, median and mode from a given set of ungrouped data	<i>Data Analysis</i>	The Mean The Median Range and Mode Mean, Median, Mode and Range
find mean, median and modal class from a given set of grouped data	<i>Data Analysis</i>	Mean, Median, Mode and Range Frequency distribution for Grouped Data
be aware that the mean found for grouped data is an estimation	<i>Data Analysis</i>	Frequency distribution for Grouped Data
compare 2 data sets with given mean, median and mode	<i>Data Analysis</i>	Comparing Sets of Data I Comparing Sets of Data II
construct data sets with a given mean, median and mode	<i>Data Analysis</i>	Mean, Median, Mode and Range
discuss the relative merits of different measures of central tendency for a given situation	<i>Data Analysis</i>	Centre or Spread? How the shape effects choice of centre and spread
(NF) explore and make conjectures on the effect of the central tendency of the data such as: (i) removal of a certain item from the data; (ii) adding a common constant to the whole set of data; (iii) multiplying the whole set of data by a common constant (iv) insertion of zero in the data set	<i>Data Analysis</i>	How the shape effects choice of centre and spread
understand weighted mean and be aware of its use in various real-life situations such as Hang Seng Index, calculation of marks in a report etc.	<i>Data Analysis</i>	Weighted Means#
discuss the misuse of averages in various daily life situations	<i>Data Analysis</i>	The Mean
recognize the dangers of misusing averages	<i>Data Analysis</i>	The Mean

Probability

Simple Idea of Probability

explore the meaning of probability through various activities	<i>Probability</i>	Describing Chance Experimental Probability Generating data for probability analysis Venn diagrams and two way tables Describing and/or events Tree diagrams
have an intuitive idea about the relation between probability and the relative frequency as found in statistics or simulation activities	<i>Probability</i>	Probabilities as rational number Theoretical Probability Generating data for probability analysis Complementary Events Relative frequencies of And/Or events Expectation and Fair Value
investigate probability in real-life activities, including geometric probability	<i>Probability</i>	Conducting Experiments (investigation) Probabilities of Games Traffic Light Problems Decision Making using Probability (Investigation) Comparisons from Experiments (Investigation)
compare the empirical and theoretical probabilities	<i>Probability</i>	Theoretical Probability Expected Outcomes
calculate the theoretical probability by listing the sample space and counting	<i>Probability</i>	Sample Spaces Theoretical Probability Replacement and non-replacement probabilities Using Frequency tables and graphs to estimate probabilities Mixed Questions on Probability
recognize the meaning of expectation	<i>Probability</i>	Expected Outcomes

Included as Background and Supporting Work

Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding	<i>Data Analysis</i>	Divided Bar Graphs Area Charts and Radar Graphs
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S4-S5 Syllabus

Number and Algebra Review	Proportions	Indices
Whole Number Review Fraction Review Decimal Review Recurring Decimals as/from Fractions Converting Recurring Decimals to Fractions Percentage Review Ratios and Rates Review Algebra Review Probability Review	Proportional Relationships Constant of Proportionality Proportional Relationships as Equations Interpreting Proportional Relationships Graphs and Direct Proportions Direct Proportion	Numerical Bases with Fractional Indices Fractional Bases with Fractional Indices Fractional Indices with Algebraic Terms
Equations	Inequalities	Linear Equations I
Mixed Equations I Mixed Equations II Problem Solving with Linear and Non-Linear Equations Simple Exponential Equations Solving Cubic Equations Identify Solutions to Linear Equations Solving Equations through Trial and Improvement Solve Radical Equations Solve Equations with Rational Expressions Solve Equations with Negative Exponents# Solve Equations with Nested Radicals#	Introduction to Inequalities One Step Inequalities Two Step inequalities Problem Solving with Inequalities Identifying Solutions to Inequalities in Two Variables Three step Inequalities Compound Inequalities# Solve Linear Inequalities from a Graph# Solve polynomial inequalities# Graphing Linear and Non-Linear Inequalities Constructing Inequalities or Systems of Inequalities Systems of Inequalities in Two Variables Creating Inequalities with 2 Variables Problems with Systems of Inequalities in 2 Variables	Identifying key features of Linear functions Identifying Slope from Equation Gradient-Intercept Form Equation of a Line: General Form The Point Slope Formula The Two Point Formula Equations of Lines (Mixed Set) Finding the Rule Linear Relationships - graphs Sketching Linear Graphs Linear functions, summary of features Modelling Linear Relationships - graphs Direct Proportion Inverse Proportion Finding the Equation of Line Graphs of Physical Phenomena
Linear Equations II	Quadratic Equations	
Linear modelling Linear modelling- Simultaneous Equations Linear Modelling - Break Even Analysis Linear Programming - Graphical Method# Linear Programming - Objective Function# Linear Programming - Feasible Regions# Linear Programming - Applications# Writing Intervals # Division of an interval in a given ratio Perpendicular distance# Angle between two lines# Proportion and Variation	Quadratic relationship Transformations and Quadratic Equations Transformation and Quadratic Graphs Identifying Key Features of Quadratics Solving basic quadratic equations Solve by Factorisation I Graphing Quadratic Functions in Factorised Form Solving by factorisation II Solving by completing the square I Graphing Quadratic Functions in Turning Point Form Using Vertex Formula Solving using the quadratic formula Application Problems Miscellaneous Equations Solving by completing the square II NonMonic Quadratic Equations	Graphing Quadratic Functions in General Form Variable substitution Method The Number and Nature of Solutions Simultaneous, linear and quadratic equations Applications of Quadratic Functions using graphs Further Applications Solve fractional equations that result in quadratics Quadratic Graphing Review Sum and product of roots Quadratic Identities# Maximum and Minimum Values of Quadratic Equations Applications of Maximisation and Minimisation Solve Quadratic Inequalities#
Factorisation		
Highest Common Factor Difference of Two Squares Perfect Squares Grouping in Pairs Monic Quadratic Trinomials Miscellaneous Factorisations Factorising Algebraic Fractions (mult/div) Factorising Algebraic Fractions (add/sub) Complete the Square Non-Monic Quadratic Trinomials Factoring Sum and Difference of Cubes		
Power Functions	Cubic Functions	Functions (Theory of)
Power Functions Solving for Constant of Proportionality in Power Functions	Graphing Cubic Functions Factoring Cubics with an identifiable factor Solve applications involving cubic functions Solve Inequalities involving Cubics Evaluating Cubic and Other Power Functions	Describing functions Defining Functions and Relations Identifying One-to-One Functions Evaluating Functions Odd and Even Functions Algebra of Functions

Simple Rational Functions	Hyperbolic Functions	Parabolic Functions
Identify Characteristics of Simple Rational Functions Transformations of Simple Rational Functions Graphing Simple Rational Functions	Identify Characteristics of Hyperbolic Functions# Graphing Hyperbolic Functions# Solutions to Hyperbolic Functions (incl Applications)# Solve Inequalities involving Hyperbolic Functions#	Identify Characteristics of Parabolas Relation $y^2 = x$ Graphing Parabolas (based on vertex and transformations) Solve Applications Involving Parabolic Functions General Locus Problems#
Absolute Value Functions	Logarithms	Exponentials
Graphing Absolute Value Functions	Revision of Index Laws Logs and Exponential Forms Logarithm Laws and Logarithm Properties Change of Base Evaluating Logarithmic Expressions Identify Characteristics of Logarithmic Functions Transformations of Logarithmic graphs Logarithm Graph Find the Equation of a Logarithm Function# Evaluate Logarithmic Functions Solving logarithmic equations Applications of Logarithmic Functions Logarithmic Scales Solve Inequalities Involving Logarithmic Functions# Natural Logarithms Solving Log and Exponential Equations with Technology#	Identify Characteristics of Exponential Functions Transformations of Exponential graphs Exponential Graph Simplifying Exponential Expressions Transforming Exponential Expressions Finding Exponential Equations in Context Finding Exponential Equations from Graphs or Data Growth and Decay Applications of Exponential Functions Comparing Exponential Models Exponentials VS Linear or Quadratic Functions Evaluating Exponential Functions Solve Exponential Equations Exponential Functions $y=a^x$ Mixed Questions Solve Inequalities Involving Exponential Functions# Further Exponentials
Inverse Functions		
Inverse functions Graphs of Inverse Functions		
Circles		
Circles at Origin Circles with translations Circles (Mixed and Semi-Circles)		
Combined Conic Sections		
Determine Type of Conic Section Identify and Graph Conic Sections# Find Eccentricity of Conic Section#		
Trig Functions and Graphs	Functions (Graphs and Behaviour)	Polynomials
Exact Trigonometric Values Symmetrical and Period Nature of Trig Functions Unit Circle and Trig Functions# Key Features of Sine and Cosine Curves Transformations of Sine and Cosine Curves and Equations Graphing Sine Curves Graphing Cosine Curves Graphical solution of trig equations# Applications of Sine and Cosine Functions	Polynomial curve sketching Transformations of Functions Dilation and Symmetry Mixed Graphs I (linear, quad, exp, circles) Mixed graphs II (linear, quad, cubic, $1/x$) Mixed Graphs III (quad, exp, cubic, $1/x$) Comparing Functions (quad, cubic, exp, linear)# Non-Linear Graphs and Tables of Values Applications of Polynomials Choosing the correct function model Direct and Inverse Variation Using technology to solve problems with graphs I Using technology to solve problems with graphs II Intersections of Graphs by other methods I Intersections of graphs by other methods II	Polynomials and Notation Addition and Subtraction of Polynomials Multiplication of Polynomials Polynomial Division Remainder and Factor Theorem Further applications of remainder and factor theorem Polynomial Division Using Synthetic Division Numerical Approximations of Roots Solving for Zeroes and Coefficients Intermediate Value Theorem#

Sequences and Series	Trigonometry	Circle Geometry
Introduction to Sequences Introduction to Arithmetic Progressions Recurrence relationships for AP's Terms in Arithmetic Progressions Graphs and Tables - AP's Notation for a Series# Arithmetic Series (defined limits) Applications of Arithmetic Progressions Introduction to Geometric Progressions Recurrence relationships for GP's Finding the Common Ratio Terms in Geometric Progressions Graphs and Tables - GP's Geometric Series Infinite sum for GP's Applications of Geometric Progressions Applications of Geometric Series# First Order Linear Recurrences Introduction Graphs and Tables - Recurrence Relations Solutions to Recurrence Relations Applications of Recurrence Relations	The Trigonometric Ratios Triangle Problems Pythagoras in 3D# Trigonometry in 3D Applications to Real Life Sine Rule Sine Rule (Ambiguous Case)# Cosine Rule Applications of the Sine Rule Applications of the Cosine Rule Sine and Cosine Rule Area of Non-Right Angled Triangles	Finding angles in Circles Lengths in Circles Parts of Circles Chords of a Circle Arcs, Sectors and Segments of a Circle Cyclic Quadrilaterals Tangents to Circles# Centres of triangles# Alternate Segments and Intersecting Chords and Secants# Proofs using cyclic quadrilaterals#
Probability	Language and Use of Statistics	Univariate Data
Experimental Probability Theoretical Probability Relative frequencies of And/Or events Replacement and non-replacement probabilities Identifying Independent and Dependent Events Independent Events Dependent Events Probability of Equally Likely Outcome Mutually Exclusive and Non-Mutually Exclusive Events Conditional Probability - Sample Spaces	Sampling Techniques I Sampling Techniques II Questionnaire design (investigation) Pros and Cons of Samples (Investigation) Conducting a Census (Investigation) Pros and Cons of a Census (Investigation) Statistics in the Media - Misleading (Investigation) Real Life statistics - Society Statistical Investigations (Investigation) Planning a Statistical Investigation II (Investigation) Sources of Bias Sources of Errors# Misrepresentation of Results#	Statistical Displays - A review Create and interpret histograms and polygons Create and interpret cumulative frequency tables Create and interpret box and whisker Connecting box and whisker plots and histograms# Recognising the spread of data Recognising the shape of data Mean Median Mode Range Mean, median mode and range (calculation from graphs and charts) Mean, median mode and range (find missing data) Mean, median mode and range (comparing data sets) Comparisons and Predictions Mean, median, mode and range (combined set) Centre or Spread ? How the shape effects choice of centre and spread Quartiles and Inter-quartile range Quartiles, Deciles and Percentiles 5 Number Summary Using a fence to find Outliers# Effects of Outliers Variance# Standard Deviation Applications of Standard Deviation
Bivariate Data		
Create and Interpret Parallel Box Plots# Create and Interpret Scatter Plots Describing Statistical Relationships Comparing Sets of Data Comparing Sets of Data II (includes box and whisker) Shape and Correlation of Bivariate Data		

Observing Patterns and Expressing Generally

More About Polynomials

manipulate polynomials further including long division up to simple quadratic divisor	<i>Polynomials</i>	Polynomial Division Polynomial Division Using Synthetic Division
(NF) recognize the concept of division algorithm	<i>Polynomials</i>	Polynomial Division
(NF) understand and use remainder and factor theorems to factorize polynomials up to degree 3	<i>Polynomials</i>	Remainder and Factor Theorem Further applications of remainder and factor theorem
(NF) appreciate the power of factor theorem and also be aware of the limitation of the theorem	<i>Polynomials</i>	Remainder and Factor Theorem Further applications of remainder and factor theorem

Arithmetic and Geometric Sequences and their Summation

(NF) explore further the properties of arithmetic and geometric sequences	<i>Sequences and Series</i>	Introduction to Arithmetic Progressions Introduction to Geometric Progressions Introduction to Sequences
(NF) develop and use the general terms of the sequences	<i>Sequences and Series</i>	Terms in Arithmetic Progressions Graphs and Tables - AP's Finding the Common Ratio Terms in Geometric Progressions Graphs and Tables - GP's
(NF) investigate and use the general formulas of the sum to n terms of arithmetic and geometric sequences	<i>Sequences and Series</i>	Notation for a Series [#] Arithmetic Series Geometric Series Applications of Geometric Series [#]
(NF) develop an intuitive idea on limit and deduce the formula for sum to infinity for certain geometric series	<i>Sequences and Series</i>	Infinite sum for GP's
(NF) solve real-life problems such as interest, growth and depreciation, geometric problems etc.	<i>Sequences and Series</i>	Applications of Arithmetic Progressions Applications of Geometric Progressions
**explore recurrence in some sequences	<i>Sequences and Series</i>	Recurrence relationships for AP's Recurrence relationships for GP's First Order Linear Recurrences Introduction Graphs and Tables - Recurrence Relations Solutions to Recurrence Relations Applications of Recurrence Relations

Algebraic Relations and Functions

Quadratic Equations in One Unknown

formulate and solve quadratic equations by factor method and formula	<i>Quadratic Equations</i>	Identifying Key Features of Quadratics Quadratic relationships Solving basic quadratic equations Solve by Factorisation I & II Graphing Quadratic Functions in Factorised Form Solving by completing the square I & II Graphing Quadratic Functions in Turning Point form Using Vertex Formula Solving using the quadratic formula Application Problems with Quadratics Miscellaneous Quadratic Equations NonMonic Quadratic Equations Graphing Quadratic Functions in General Form
solve the equation $ax^2 + bx + c = 0$ by plotting the graph $y = ax^2 + bx + c$ and reading the x-intercepts	<i>Quadratic Equations</i>	Graphing Quadratic Functions in General Form
be aware of the approximate nature of the graphical method	<i>Quadratic Equations</i>	Identifying Key Features of Quadratics Quadratic Graphing Review
choose the most appropriate strategy to solve quadratic equations	<i>Quadratic Equations</i>	Application Problems with Quadratics Miscellaneous Quadratic Equations Applications of Quadratic Functions using graphs Further Applications
recognize the conditions for the nature of roots	<i>Quadratic Equations</i>	The Number and Nature of Solutions Sum and product of roots
understand the hierarchy of real-number system and be aware of the characteristics of rational numbers when expressed in decimals	<i>Number and Algebra Review</i>	Recurring Decimals as/from Fractions Converting Recurring Decimals to Fractions
More About Equations		
(NF) formulate and solve equations which can be transformed into quadratic equations	<i>Quadratic Equations</i>	Variable substitution Method Solve fractional equations that result in quadratics
(NF) formulate and solve one linear and one quadratic simultaneous equations by algebraic method	<i>Quadratic Equations</i>	Simultaneous, linear and quadratic equations
solve equations by reading intersecting points of given graphs	<i>Functions (Graphs and Behaviour)</i>	Using technology to solve problems with graphs I & II Intersections of graphs by other methods I & II
appreciate the power and understand the limitation of graphical method in solving equations	<i>Functions (Graphs and Behaviour)</i> <i>Linear Equations II</i>	Using technology to solve problems with graphs I & II Intersections of graphs by other methods I & II Linear modelling Linear modelling- Simultaneous Equations Linear Modelling - Break Even Analysis

choose the most appropriate strategy to solve equations	<p><i>Equations</i></p> <p><i>Quadratic Equations</i></p> <p><i>Cubic Functions</i></p> <p><i>Polynomials</i></p> <p><i>Linear Equations II</i></p> <p><i>Power Functions</i></p> <p><i>Hyperbolic Functions</i></p> <p><i>Parabolic Functions</i></p>	<p>Mixed Equations I</p> <p>Mixed Equations II</p> <p>Problem Solving with Linear and Non-Linear Equations</p> <p>Identify Solutions to Linear Equations</p> <p>Solving Cubic Equations</p> <p>Solving Equations through Trial and Improvement</p> <p>Solve Radical Equations</p> <p>Solve Equations with Rational Expressions</p> <p>Solve Equations with Negative Exponents[#]</p> <p>Solve Equations with Nested Radicals[#]</p> <p>Application Problems</p> <p>Miscellaneous Equations</p> <p>Further Applications</p> <p>Solve applications involving cubic functions</p> <p>Solving for Zeroes and Coefficients</p> <p>Linear modelling</p> <p>Linear modelling- Simultaneous Equations</p> <p>Linear Modelling - Break Even Analysis</p> <p>Solving for Constant of Proportionality in Power Functions</p> <p>Solutions to Hyperbolic Functions (incl Applications)[#]</p> <p>Solve Applications Involving Parabolic Functions</p> <p>General Locus Problems[#]</p>
**explore the algebraic method to solve cubic or higher degree equations	<p><i>Equations</i></p> <p><i>Cubic Functions</i></p> <p><i>Functions (Graphs and Behaviour)</i></p> <p><i>Power Functions</i></p>	<p>Solving Cubic Equations</p> <p>Solve applications involving cubic functions</p> <p>Graphing Cubic Functions</p> <p>Factoring Cubics with an identifiable factor</p> <p>Polynomial curve sketching</p> <p>Intersections of graphs by other methods I & II</p> <p>Power Functions</p>
Variations		
discuss the relations between 2 changing quantities	<p><i>Linear Equations I</i></p> <p><i>Linear Equations II</i></p> <p><i>Functions (Graphs and Behaviour)</i></p> <p><i>Proportions</i></p> <p><i>Inverse Functions</i></p>	<p>Direct Proportion</p> <p>Inverse Proportion</p> <p>Proportion and Variation</p> <p>Direct and Inverse Variation</p> <p>Proportional Relationships</p> <p>Constant of Proportionality</p> <p>Proportional Relationships as Equations</p> <p>Interpreting Proportional Relationships</p> <p>Graphs and Direct Proportions</p> <p>Direct Proportion</p> <p>Inverse Functions</p>
sketch the graphs of direct and inverse variations and recognize the algebraic representations between the quantities	<p><i>Functions (Graphs and Behaviour)</i></p> <p><i>Proportions</i></p> <p><i>Inverse Functions</i></p>	<p>Direct and Inverse Variation</p> <p>Proportional Relationships</p> <p>Constant of Proportionality</p> <p>Proportional Relationships as Equations</p> <p>Interpreting Proportional Relationships</p> <p>Graphs and Direct Proportions</p> <p>Direct Proportion</p> <p>Inverse Functions</p> <p>Graphs of Inverse Functions</p>

recognize and appreciate the algebraic representations of various variations such as those in the forms of $V=\pi r^2 h$ or $y = k_1+k_2 x$ etc.	<i>Proportions</i>	Proportional Relationships Constant of Proportionality Proportional Relationships as Equations Interpreting Proportional Relationships Graphs and Direct Proportions Direct Proportion
apply the relations to solve real-life problems	<i>Proportions</i>	Proportional Relationships Constant of Proportionality Proportional Relationships as Equations Interpreting Proportional Relationships Graphs and Direct Proportions Direct Proportion
Linear Inequalities in Two Unknowns		
(NF) represent the linear inequalities in 2 unknowns on a plane	<i>Inequalities</i>	Identifying Solutions to Inequalities in Two Variables Problems with Systems of Inequalities in 2 Variables Solve Linear Inequalities from a Graph# Graphing Linear and Non-Linear Inequalities Constructing Inequalities or Systems of Inequalities
(NF) discuss the solution of compound linear inequalities connected by 'and'	<i>Inequalities</i>	Compound Inequalities#
(NF) solve systems of linear inequalities in two unknowns	<i>Inequalities</i>	Introduction to Inequalities One Step Inequalities Two Step inequalities Problem Solving with Inequalities Identifying Solutions to Inequalities Three step Inequalities Compound Inequalities# Solve Linear Inequalities from a Graph# Solve polynomial inequalities# Creating Inequalities with 2 Variables Systems of Inequalities in Two Variables Creating Inequalities with 2 Variables Problems with Systems of Inequalities in 2 Variables
(NF) solve linear programming problems	<i>Linear Equations II</i>	Linear Programming - Graphical Method# Linear Programming - Objective Function# Linear Programming - Feasible Regions# Linear Programming - Applications#
Exponentials and Logarithmic Functions		
(NF) understand and use the laws of rational indices	<i>Indices</i> <i>Logarithms</i>	Numerical Bases with Fractional Indices Fractional Bases with Fractional Indices Fractional Indices with Algebraic Terms Revision of Index Laws
(NF) understand the definition of logarithmic functions and recognize the common logarithm is not the only type of the function	<i>Logarithms</i>	Logs and Exponential Forms Logarithm Laws and Logarithm Properties Change of Base
(NF) examine the properties of the graphs of exponential and logarithmic functions	<i>Logarithms</i> <i>Exponentials</i>	Identify Characteristics of Logarithmic Functions Transformations of Logarithmic graphs Logarithm Graph Identify Characteristics of Exponential Functions Transformations of Exponential graphs Exponential Graph

(NF) explore and study the relations between the properties of logarithmic function and that of exponential function	<i>Logarithms</i> <i>Exponentials</i> <i>Equations</i>	Logs and Exponential Forms Evaluating Logarithmic Expressions Evaluate Logarithmic Functions Solving logarithmic equations Solving Log and Exponential Equations with Technology# Simplifying Exponential Expressions Evaluating Exponential Functions Solve Exponential Equations Transforming Exponential Expressions Simple exponential equations Exponential Functions $y=a^x$ (Mixed Questions) Simple Exponential Equations
(NF) appreciate the application of logarithm in various real-life problems	<i>Logarithms</i> <i>Exponentials</i>	Find the Equation of a Logarithm Function# Applications of Logarithmic Functions Logarithmic Scales Natural Logarithms Finding Exponential Equations in Context Finding Exponential Equations from Graphs or Data Growth and Decay Applications of Exponential Functions Comparing Exponential Models Further Exponentials
Functions and Graphs		
relate the idea of input-processing-output to the meaning of dependent and independent variables		Investigation coming soon
understand the basic idea of a function from the tabular, symbolic and graphical representations of a function and the dummy nature of x	Functions (Theory of)	Identifying One-to-One Functions
use the notation for a function	<i>Functions (Theory of)</i> <i>Polynomials</i> <i>Cubic Functions</i> <i>Logarithms</i> <i>Exponentials</i>	Describing functions Defining Functions and Relations Identifying One-to-One Functions Evaluating Functions Odd and Even Functions Algebra of Functions Polynomials and Notation Addition and Subtraction of Polynomials Multiplication of Polynomials Evaluating Cubic and Other Power Functions Evaluating Logarithmic Expressions Evaluate Logarithmic Functions Evaluating Exponential Functions
explore various properties of quadratic functions such as vertex, axis of symmetry, the optimum value(s) from their graphs	<i>Quadratic Equations</i>	Transformations and Quadratic Equations Transformations and Quadratic Graphs Using Vertex Formula Maximum and Minimum Values of Quadratics Maximisation and Minimisation Sum and product of roots Quadratic Identities#
(NF) appreciate the contribution of Arabians on the method of completing the square and use it to find the properties of quadratic functions	<i>Quadratic Equations</i>	Solving by completing the square I & II

(NF) appreciate the power of the method in generating a perfect square expression	<i>Factorisation</i> <i>Quadratic Equations</i>	Complete the Square Perfect Squares Solving by completing the square I & II Graphing Quadratic Functions in Turning Point form
sketch and compare graphs of various types of functions	<i>Functions (Graphs and Behaviour)</i> <i>Quadratics</i> <i>Cubics</i> <i>Power Functions</i> <i>Rational Functions</i> <i>Hyperbolic Functions</i> <i>Parabolic Functions</i> <i>Absolute Value Functions</i> <i>Logarithms</i> <i>Exponentials</i> <i>Inverse Functions</i>	Mixed Graphs I (linear, quad, exp, circles) Mixed graphs II (linear, quad, cubic, 1/x) Mixed Graphs III (quad, exp, cubic, 1/x) Comparing Functions (quad, cubic, exp, linear) [#] Non-Linear Graphs and Tables of Values Graphing Quadratic Functions in Factorised Form Graphing Quadratic Functions in Turning Point Form Graphing Quadratic Functions in General Form Quadratic Graphing Review Graphing Cubic Functions Power Functions Identify Characteristics of Simple Rational Functions Graphing Simple Rational Functions Identify Characteristics of Hyperbolic Functions [#] Graphing Hyperbolic Functions [#] Identify Characteristics of Parabolas Relation $y^2 = x$ Graphing Absolute Value Functions Logarithm Graph Exponential Graph Exponentials VS Linear or Quadratic Functions Graphs of Inverse Functions
solve $f(x) > k$, $f(x) < k$, $f(x) \geq k$, $f(x) \leq k$ by reading graphs of $f(x)$	<i>Inequalities</i> <i>Quadratic Equations</i> <i>Cubic Functions</i> <i>Hyperbolic Functions</i> <i>Logarithms</i> <i>Exponentials</i>	Solve Linear Inequalities from a Graph [#] Graphing Linear and Non-Linear Inequalities Solve Quadratic Inequalities [#] Solve Inequalities involving Cubics Solve Inequalities involving Hyperbolic Functions [#] Solve Inequalities Involving Logarithmic Functions [#] Solve Inequalities Involving Exponential Functions [#]
(NF) explore the effects of transformation on the functions from tabular, symbolic and graphical perspectives	<i>Functions (Graphs and Behaviour)</i> <i>Quadratic Equations</i> <i>Logarithms</i> <i>Exponentials</i> <i>Simple Rational Functions</i> <i>Parabolic Functions</i> <i>Trig Graphs</i>	Dilation and Symmetry Transformations of Functions Transformations and Quadratic Equations Transformation and Quadratic Graphs Transformations of Logarithmic graphs Transformations of Exponential graphs Transformations of Hyperbolas Graphing Parabolas (based on vertex and transformations) Transformations of Sine and Cosine Curves and Equations

<p>(NF) visualize the effect of transformation on the graphs of functions when giving symbolic relations</p>	<p><i>Functions (Graphs and Behaviour)</i> <i>Quadratic Equations</i></p> <p><i>Logarithms</i> <i>Exponentials</i> <i>Simple Rational Functions</i> <i>Parabolic Functions</i></p> <p><i>Trig Graphs</i></p>	<p>Dilation and Symmetry Transformations of Functions</p> <p>Transformations and Quadratic Equations</p> <p>Transformation and Quadratic Graphs</p> <p>Transformations of Logarithmic graphs</p> <p>Transformations of Exponential graphs</p> <p>Transformations of Hyperbolas</p> <p>Graphing Parabolas (based on vertex and transformations)</p> <p>Transformations of Sine and Cosine Curves and Equations</p>
<p>Included as background and supporting work</p>		
<p>Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding.</p>	<p><i>Number and Algebra Review</i></p> <p><i>Factorisation</i></p> <p><i>Functions (Graphs and Behaviour)</i> <i>Polynomials</i></p>	<p>Whole Number Review</p> <p>Fraction Review</p> <p>Decimal Review</p> <p>Percentage Review</p> <p>Ratios and Rates Review</p> <p>Algebra Review</p> <p>Probability Review</p> <p>Highest Common Factor</p> <p>Difference of Two Squares</p> <p>Grouping in Pairs</p> <p>Monic Quadratic Trinomials</p> <p>Miscellaneous Factorisations</p> <p>Factorising Algebraic Fractions (mult/div)</p> <p>Factorising Algebraic Fractions (add/sub)</p> <p>Non-Monic Quadratic Trinomials</p> <p>Factoring Sum and Difference of Cubes</p> <p>Applications of Polynomials</p> <p>Choosing the correct function model</p> <p>Numerical Approximations of Roots</p> <p>Intermediate Value Theorem[#]</p>

Learning Geometry Through an Intuitive Approach

Qualitative Treatment of Locus

describe verbally or sketch the locus of points moving under a condition or conditions	<p><i>Combined Conic Sections</i></p> <p><i>Hyperbolic Functions</i></p> <p><i>Parabolic Functions</i></p>	<p>Determine Type of Conic Section</p> <p>Identify and Graph Conic Sections[#]</p> <p>Find Eccentricity of Conic Section[#]</p> <p>Identify Characteristics of Hyperbolic Functions[#]</p> <p>Graphing Hyperbolic Functions[#]</p> <p>Identify Characteristics of Parabolas</p> <p>Relation $y^2 = x$</p> <p>Graphing Parabolas (based on vertex and transformations)</p>
appreciate different conditions which can give rise to the same type of locus	<p><i>Combined Conic Sections</i></p> <p><i>Hyperbolic Functions</i></p> <p><i>Parabolic Functions</i></p>	<p>Determine Type of Conic Section</p> <p>Identify and Graph Conic Sections[#]</p> <p>Find Eccentricity of Conic Section[#]</p> <p>Identify Characteristics of Hyperbolic Functions[#]</p> <p>Graphing Hyperbolic Functions[#]</p> <p>Identify Characteristics of Parabolas</p> <p>Relation $y^2 = x$</p> <p>Graphing Parabolas (based on vertex and transformations)</p>

Learning Geometry through a Deductive Approach

Basic Properties of Circles

(NF) understand and use the basic properties of chords and arcs of a circle	<i>Circle Geometry</i>	<p>Lengths in Circles</p> <p>Parts of Circles</p> <p>Chords of a Circle</p> <p>Arcs, Sectors and Segments of a Circle</p> <p>Alternate Segments and Intersecting Chords and Secants[#]</p> <p>Centres of triangles[#]</p>
(NF) understand and use the angle properties of a circle	<i>Circle Geometry</i>	<p>Parts of Circles</p> <p>Finding angles in Circles</p>
(NF) understand and use the basic properties of cyclic quadrilateral and tangent to a circle	<i>Circle Geometry</i>	<p>Cyclic Quadrilaterals</p> <p>Tangents to Circles[#]</p> <p>Proofs using cyclic quadrilaterals[#]</p>
(NF) appreciate the intuitive and inductive ways of recognizing the properties of circles and see the importance of deductive approach	<i>Circle Geometry</i>	<p>Alternate Segments and Intersecting Chords and Secants[#]</p> <p>Proofs using cyclic quadrilaterals[#]</p> <p>Centres of triangles[#]</p>
(NF) perform geometric proofs related with circles	<i>Circle Geometry</i>	<p>Alternate Segments and Intersecting Chords and Secants[#]</p> <p>Proofs using cyclic quadrilaterals[#]</p> <p>Centres of triangles[#]</p>
(NF) appreciate the structure of Euclidean Geometry such as definitions, axioms and postulates etc. and its deductive approach in handling geometric problems	<i>Circle Geometry</i>	<p>Alternate Segments and Intersecting Chords and Secants[#]</p> <p>Proofs using cyclic quadrilaterals[#]</p> <p>Centres of triangles[#]</p>

Learning Geometry through an Analytic Approach

Coordinate Treatment of Simple Locus Problems

explore and visualize straight line as loci of moving points and describe the loci with equations	<i>Linear Equations I</i>	Identifying key features of Linear functions
recognize the characteristics of equation form that represents a straight line	<i>Linear Equations I</i>	Identifying Slope from Equation Gradient Intercept Form Equation of a Line: General Form The Point Gradient Formula The Two Point Formula Finding the Rule
understand and apply the point-slope form to find the equations of straight lines from various given conditions	<i>Linear Equations I</i>	The Point Gradient Formula Finding the Rule
describe the properties of the line from a given linear equation	<i>Linear Equations I</i>	Identifying Slope from Equation Sketching Linear Graphs Modelling Linear Relationships - graphs
(NF) explore and visualize circles as loci of moving points	<i>Circles</i>	Circles at Origin Circles with translations Circles (Mixed and Semi-Circles)
(NF) find the equation of circles from given conditions	<i>Circles</i>	Circles at Origin Circles with translations Circles (Mixed and Semi-Circles)
**explore other forms of equations for straight lines	<i>Linear Equations I</i>	Equation of a Line: General Form The Two Point Formula Equations of Lines (Mixed Set) Linear Relationships – graphs Linear functions, summary of features Finding the Equation of Line Graphs of Physical Phenomena

Trigonometry

More about Trigonometry

(NF) understand the sine, cosine and tangent functions, their graphs	<i>Trig Functions and Graphs</i>	Unit Circle and Trig Functions# Exact Trigonometric Values Symmetrical and Periodic Nature of Trig Functions Key Features of Sine and Cosine Curves Graphing Sine Curves Graphing Cosine Curves Graphical solution of trig equations#
(NF) use graphs to explore properties of trigonometric functions including periodicity etc.	<i>Trig Functions and Graphs</i>	Symmetrical and Periodic Nature of Trig Functions
(NF) use graphs of the functions to find roots of an equation such as $\sin \theta = \text{constant}$, where $0^\circ \leq \theta \leq 360^\circ$	<i>Trig Functions and Graphs</i>	Graphical solution of trig equations#
(NF) recognize the limitation of Pythagoras' Theorem in solving triangles	<i>Trigonometry</i>	Pythagoras in 3D# Trigonometry in 3D Applications to Real Life
(NF) understand and use sine and cosine formulas to solve triangles	<i>Trigonometry</i>	Sine Rule Sine Rule (Ambiguous Case)# Cosine Rule Applications of the Sine Rule Applications of the Cosine Rule Sine and Cosine Rule

(NF) understand and use the formula $\frac{1}{2}ab\sin C$ and Heron's formula for areas of triangles	<i>Trigonometry</i>	Area of Non-Right Angled Triangles
(NF) investigate and find the angle between 2 intersecting lines, between a line and a plane, between 2 intersecting planes	<i>Linear Equations II</i>	Angle between two lines [#]
(NF) apply trigonometric knowledge in solving 2-dimensional and 3-dimensional problems	<i>Trig Functions and Graphs</i> <i>Trigonometry</i> <i>Linear Equations II</i>	Applications of Sine and Cosine Functions The Trigonometric Ratios Triangle Problems Trigonometry in 3D Applications of the Sine Rule Applications of the Cosine Rule Sine and Cosine Rule Perpendicular Distance [#]
Included as background and supporting work		
Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding.	<i>Linear Equations II</i>	Writing Intervals [#] Division of an interval in a given ratio

Analysis and Interpretation of Data

Measures of Dispersion

recognize range, inter-quartile range and standard deviation as measures of dispersion for a set of data	<i>Univariate Data</i>	Recognising the spread of data Recognising the shape of data Range Centre or Spread ? How the shape effects choice of centre and spread Quartiles and Inter-quartile range Quartiles, Deciles and Percentiles Standard Deviation
find range from a given set of data	<i>Univariate Data</i>	Range
find inter-quartile range from the cumulative frequency polygon	<i>Univariate Data</i>	Create and interpret histograms and polygons Create and interpret cumulative frequency tables Quartiles and Inter-quartile range
construct box-and-whisker diagrams and use them to compare the distributions of different sets of data	<i>Univariate Data</i> <i>Bivariate Data</i>	Create and interpret box and whisker Connecting box and whisker plots and histograms# 5 Number Summary Create and Interpret Parallel Box Plots#
interpret the basic formula of standard deviation and be able to find the standard deviation for both grouped and ungrouped data set	<i>Univariate Data</i>	Standard Deviation Applications of Standard Deviation
compare the dispersions of different sets of data using appropriate measures	<i>Univariate Data</i> <i>Bivariate Data</i>	Mean, median mode and range (calculation from graphs and charts) Mean, median mode and range (find missing data) Mean, median mode and range (comparing data sets) Comparisons and Predictions Mean, median, mode and range (combined set) Centre or Spread ? How the shape effects choice of centre and spread Quartiles and Inter-quartile range Create and Interpret Scatter Plots Describing Statistical Relationships Comparing Sets of Data Comparing Sets of Data II (includes box and whisker) Shape and Correlation of Bivariate Data
(NF) explore and make conjecture on the effect of the dispersion of the data such as: i. removal of a certain item from the data; ii. adding a common constant to the whole set of data; iii. multiplying the whole set of data by a constant; iv. insertion of zero in the data set.		Investigation coming soon

Simple Statistical Surveys

Uses and Abuses of Statistics

(NF) recognize different techniques in choosing samples and the criteria in choosing data collection method	<i>Language and Use of Statistics</i>	Sampling Techniques I & II Conducting a Census (Investigation) Pros and Cons of a Census (Investigation) Sources of Bias Sources of Errors# Misrepresentation of Results#
(NF) investigate methods in which statistical surveys are used and misused in various daily-life activities	<i>Language and Use of Statistics</i>	Sources of Bias Sources of Errors# Misrepresentation of Results#
(NF) discuss the strengths and weaknesses of statistical investigations presented in different sources such as news media, advertisements, etc including methods of collecting, presenting and analysing data etc.	<i>Language and Use of Statistics</i>	Statistics in the Media - Misleading (Investigation) Real Life statistics - Society
(NF) recognize the complexity in conducting surveys	<i>Language and Use of Statistics</i>	Questionnaire design (investigation) Pros and Cons of Samples (Investigation)

Conducting Surveys

**conduct statistical investigations including i. formulating key questions to investigate problems relating to their experience; ii. deciding appropriate data collection method which may involve designing simple questionnaire; iii. applying sampling techniques in collecting data; iv. conducting the investigations; v. making interpretation on the data collected and analyzing their findings; vi. presenting the investigations to other	<i>Language and Use of Statistics</i>	Statistical Investigations (Investigation) Planning a Statistical Investigation II (Investigation)
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Probability

More about Probability

(NF) recognize the basic laws in probability	<i>Probability</i>	Experimental Probability Theoretical Probability Relative frequencies of And/Or events Replacement and non-replacement probabilities Identifying Independent and Dependent Events Independent Events Dependent Events Probability of Equally Likely Outcome Mutually Exclusive and Non-Mutually Exclusive Events Conditional Probability
(NF) apply the addition or multiplication laws in a wide variety of activities including real-life problems	<i>Probability</i>	Relative frequencies of And/Or events Identifying Independent and Dependent Events Independent Events Dependent Events Conditional Probability
(NF) recognize the notion of conditional probability and the notation of $P(A B)$	<i>Probability</i>	Conditional Probability

Included as Background and Supporting Work

Whilst not explicitly required as part of the curriculum, these subtopics are included for background and supporting work for the benefit it can add to student learning and understanding

Univariate Data

Statistical Displays - A review
Mean
Median
Mode
Using a fence to find Outliers#
Effects of Outliers
Variance#