

Secondary Mathematics

Learning Progression Framework

Level 5 to Level 8

Number and Algebra Dimension:

Level 5 Students recognise directed numbers. They estimate values and use basic algebra to solve problems. They manipulate the addition, subtraction and multiplication of polynomials.

Code	Learning Outcomes	Pointers	
NA 5.1	Recognise directed numbers	NA 5.1.1	Use directed numbers to represent values
		NA 5.1.2	Locate directed numbers on the number line
		NA 5.1.3	Order a given set of directed numbers
NA 5.2	Perform operations on directed numbers	NA 5.2.1	Perform addition and subtraction of directed numbers
		NA 5.2.2	Perform multiplication and division of directed numbers
		NA 5.2.3	Perform mixed operations on directed numbers
		NA 5.2.4	Solve numerical problems involving directed numbers
NA 5.3	Use algebraic language to formulate problems	NA 5.3.1	Use variables and appropriate operations to write an expression, an equation or an inequality to represent a situation
		NA 5.3.2	Extend a simple number pattern
		NA 5.3.3	Substitute values into an algebraic expression
		NA 5.3.4	Write the n^{th} term of a simple sequence by inspection
		NA 5.3.5	Find the terms of the sequence from a given n^{th} term
NA 5.4	Recognise percentage changes and their applications	NA 5.4.1	Demonstrate recognition of the meaning of percentage changes
		NA 5.4.2	Solve simple real-life problems related to percentage changes

Code	Learning Outcomes	Pointers	
NA 5.5	Use numerical estimations in different contexts	NA 5.5.1	Determine when to estimate or to compute the exact values in real-life situations
		NA 5.5.2	Select and use estimation strategies to estimate values
		NA 5.5.3	Judge the reasonableness of answers from estimations
		NA 5.5.4	Judge the reasonableness of the estimation strategies used
NA 5.6	Find the approximate values of numbers	NA 5.6.1	Round off numbers to a required number of significant figures
NA 5.7	Recognise polynomials	NA 5.7.1	Identify polynomials from algebraic expressions
		NA 5.7.2	Recognise mathematical terms related to polynomials
NA 5.8	Perform addition, subtraction and multiplication of polynomials	NA 5.8.1	Perform addition, subtraction and multiplication of polynomials involving more than one variable
NA 5.9	Use linear equations in one unknown to solve problems	NA 5.9.1	Solve linear equations in one unknown
		NA 5.9.2	Solve problems involving linear equations in one unknown
NA 5.10	Recognise the use of laws of indices involving non-negative integral indices	NA 5.10.1	Use laws of indices to simplify expressions involving non-negative integral indices
		NA 5.10.2	Use scientific notation to represent large numbers

Level 6 Students recognise and apply rate, ratio and percentage to solve problems. They recognise errors in approximations. They recognise the real number system. They factorise polynomials. They use linear equations in two unknowns and linear inequalities in one unknown to solve problems.

Code	Learning Outcomes	Pointers	
NA 6.1	Recognise rate and ratio and their applications	NA 6.1.1	Use rate and ratio to compare quantities
		NA 6.1.2	Find a 3-term ratio from two 2-term ratios
		NA 6.1.3	Apply rate and ratio to solve real-life problems including mensuration problems
NA 6.2	Recognise errors in approximations	NA 6.2.1	Give the size of errors in estimation and approximation
		NA 6.2.2	Calculate the accumulated error for applying formulas
		NA 6.2.3	Solve problems involving absolute errors, relative errors and percentage errors
NA 6.3	Recognise rational and irrational numbers	NA 6.3.1	Identify irrational numbers
		NA 6.3.2	Simplify expressions involving surds to their simplest forms
		NA 6.3.3	Rationalise the denominator in the form of \sqrt{a}
		NA 6.3.4	Perform operations on surds
NA 6.4	Use percentages to solve real-life problems	NA 6.4.1	Apply percentages to solve problems including the applications of successive and component changes
		NA 6.4.2	Apply percentages to solve problems involving simple and compound interests, growth, depreciation, taxation and rates
NA 6.5	Use linear equations in two unknowns to solve problems	NA 6.5.1	Formulate simultaneous linear equations in two unknowns
		NA 6.5.2	Solve simultaneous linear equations in two unknowns by algebraic method
		NA 6.5.3	Plot graphs representing linear equations in two unknowns
		NA 6.5.4	Solve simultaneous linear equations in two unknowns by graphical method
NA 6.6	Factorise polynomials	NA 6.6.1	Recognise factorisation is the reverse operation of expansion

Code	Learning Outcomes	Pointers	
		NA 6.6.2	Factorise polynomials by taking out common factors
		NA 6.6.3	Factorise polynomials by grouping terms
		NA 6.6.4	Factorise polynomials by the cross-method
NA 6.7	Use simple formulas	NA 6.7.1	Manipulate algebraic fractions with linear denominators
		NA 6.7.2	Change the subject of a formula
NA 6.8	Recognise identities and their uses	NA 6.8.1	Distinguish between equations and identities
		NA 6.8.2	Use the identities “difference of two squares” and “perfect square expression” to expand and factorise algebraic expressions
		NA 6.8.3	Use the identities “sum and difference of two cubes” to expand and factorise algebraic expressions
NA 6.9	Use linear inequalities in one unknown to solve problems	NA 6.9.1	Represent solutions of inequalities on the number line
		NA 6.9.2	Solve linear inequalities in one unknown
		NA 6.9.3	Solve problems involving linear inequalities in one unknown
NA 6.10	Recognise the use of laws of indices involving negative integral indices	NA 6.10.1	Simplify expressions involving positive and negative integral indices
		NA 6.10.2	Use scientific notation to represent small numbers
NA 6.11	Recognise numeral systems	NA 6.11.1	Give examples on the use of different numeral systems
		NA 6.11.2	Write numbers of different numeral systems in expanded forms
		NA 6.11.3	Convert between binary and decimal numbers, hexadecimal and decimal numbers

Level 7 Students recognise the methods of solving quadratic equations, quadratic inequalities and compound linear inequalities in one unknown. They also recognise division of polynomials, various functions including quadratic functions and their graphs. They use the remainder theorem, the factor theorem and the concepts of variations to solve problems.

Code	Learning Outcomes	Pointers	
NA 7.1	Recognise the methods to solve quadratic equations in one unknown	NA 7.1.1	Identify quadratic equations
		NA 7.1.2	Solve quadratic equations by the factor method
		NA 7.1.3	Form quadratic equations from given roots
		NA 7.1.4	Plot the graph of $y = ax^2 + bx + c$
		NA 7.1.5	Solve a quadratic equation $ax^2 + bx + c = 0$ graphically by reading the x -intercepts from the graph of $y = ax^2 + bx + c$
		NA 7.1.6	Solve quadratic equations by the quadratic formula
		NA 7.1.7	Recognise the relations between the discriminant of a quadratic equation and the nature of its roots
		NA 7.1.8	Solve problems involving quadratic equations
NA 7.2	Recognise division of polynomials, the remainder theorem and the factor theorem	NA 7.2.1	Describe the relation among the dividend, divisor, quotient and remainder
		NA 7.2.2	Perform division of polynomials
		NA 7.2.3	Use the remainder theorem to solve problems
		NA 7.2.4	Use the factor theorem to solve problems

Code	Learning Outcomes	Pointers	
NA 7.3	Recognise the concepts of functions and their graphs	NA 7.3.1	Recognise the intuitive concepts of functions, domains, co-domains, independent and dependent variables
		NA 7.3.2	Recognise the notation of functions
		NA 7.3.3	Use suitable methods to represent functions including tabular, algebraic and graphical methods
		NA 7.3.4	Describe the features of the graphs of quadratic functions
		NA 7.3.5	Compare graphs of functions including constant, linear, quadratic and trigonometric functions
		NA 7.3.6	Solve the equation $f(x) = k$ using the graph of $y = f(x)$
		NA 7.3.7	Solve the inequalities $f(x) > k$, $f(x) < k$, $f(x) \geq k$ and $f(x) \leq k$ using the graph of $y = f(x)$
NA 7.4	Recognise and use variations to solve problems	NA 7.4.1	Sketch the graphs of direct and inverse variations
		NA 7.4.2	Represent direct, inverse, joint and partial variations algebraically
		NA 7.4.3	Apply the concepts of direct and inverse variations to solve problems
		NA 7.4.4	Apply the concepts of joint and partial variations to solve problems
NA 7.5	Recognise the methods of solving compound linear inequalities and quadratic inequalities	NA 7.5.1	Solve compound linear inequalities in one unknown
		NA 7.5.2	Solve quadratic inequalities in one unknown by the graphical method

Level 8 Students perform fundamental operations on complex numbers. They grasp the knowledge of quadratic, exponential, logarithmic and rational functions. They recognise arithmetic and geometric sequences, quadratic and related simultaneous equations, quadratic inequalities and systems of linear inequalities. They use them to solve problems.

Code	Learning Outcomes	Pointers	
NA 8.1	Perform the four fundamental operations of complex numbers	NA 8.1.1	Perform addition, subtraction, multiplication and division of complex numbers
NA 8.2	Recognise the relations between the roots and coefficients of quadratic equations	NA 8.2.1	State the relations between the roots and coefficients of a quadratic equation
		NA 8.2.2	Use the relations between the roots and coefficients of a quadratic equation to manipulate algebraic expressions
		NA 8.2.3	Form quadratic equations using the relations between the roots and coefficients
NA 8.3	Recognise the methods of solving simultaneous equations in two unknowns	NA 8.3.1	Solve simultaneous equations in two unknowns, one linear and one quadratic in the form $y = ax^2 + bx + c$ by the graphical method
		NA 8.3.2	Solve simultaneous equations in two unknowns, one linear and one quadratic by the algebraic method
NA 8.4	Solve problems involving equations which can be transformed into quadratic equations	NA 8.4.1	Solve equations which can be transformed into quadratic equations
		NA 8.4.2	Solve daily-life problems involving equations which can be transformed into quadratic equations
NA 8.5	Use the remainder theorem to simplify expressions	NA 8.5.1	Recognise the concepts of the greatest common divisor and the least common multiple of polynomials
		NA 8.5.2	Perform addition, subtraction, multiplication and division of rational functions
NA 8.6	Find extrema of quadratic functions	NA 8.6.1	Calculate the maximum and minimum values of quadratic functions by the algebraic method
NA 8.7	Recognise the transformations of functions	NA 8.7.1	Describe the transformations of the function $f(x)$ including $f(x) + k$,

Code	Learning Outcomes	Pointers	
			$f(x+k)$, $kf(x)$ and $f(kx)$ from tabular, symbolic and graphical perspectives
NA 8.8	Recognise exponential and logarithmic functions and their applications	NA 8.8.1	Recognise the definitions of rational indices
		NA 8.8.2	Use the laws of rational indices to simplify expressions
		NA 8.8.3	Recognise the definition of logarithms
		NA 8.8.4	Use the properties of logarithm to simplify expressions
		NA 8.8.5	Recognise the properties of exponential and logarithmic functions
		NA 8.8.6	Sketch the graphs of exponential and logarithmic functions and identify their features
		NA 8.8.7	Compare graphs of functions including exponential and logarithmic functions
		NA 8.8.8	Solve exponential and logarithmic equations
		NA 8.8.9	Apply logarithms to solve problems in real-life situations
NA 8.9	Recognise arithmetic sequences and their applications	NA 8.9.1	Recognise the concept of arithmetic sequences
		NA.8.9.2	Recognise the properties of arithmetic sequences
		NA 8.9.3	Use the general term of an arithmetic sequence to solve problems
		NA 8.9.4	Use the general formula of the sum to a finite number of terms of an arithmetic sequence to solve problems

Code	Learning Outcomes	Pointers	
NA 8.10	Recognise geometric sequences and their applications	NA 8.10.1	Recognise the concept of geometric sequences
		NA 8.10.2	Recognise the properties of geometric sequences
		NA 8.10.3	Use the general term of a geometric sequence to solve problems
		NA 8.10.4	Use the general formula of the sum to a finite number of terms of a geometric sequence to solve problems
		NA 8.10.5	Use the general formula of the sum to infinity for geometric sequences to solve problems
NA 8.11	Solve quadratic inequalities	NA 8.11.1	Solve quadratic inequalities in one unknown by the algebraic method
NA 8.12	Solve problems involving systems of linear inequalities	NA 8.12.1	Represent linear inequalities in two unknowns graphically
		NA 8.12.2	Solve systems of linear inequalities in two unknowns
		NA 8.12.3	Solve linear programming problems

Measures, Shape and Space Dimension:

Level 5 Students sketch simple solids. They apply transformations on 2-D shapes. They draw and construct geometric figures. They recognise the approximate nature of measurements and develop estimation strategies in measurements. They solve mensuration problems. They apply simple geometric facts and properties to solve problems.

Code	Learning Outcomes	Pointers	
MSS 5.1	Recognise the nature of measurements and apply different techniques and tools in doing measurement	MSS 5.1.1	Recognise the approximate nature of measurement and choose an appropriate measuring tool and unit for a particular purpose to a specified degree of accuracy
		MSS 5.1.2	Work out suitable estimation strategies to reduce errors in measurement
MSS 5.2	Apply formulas for measurement and solving mensuration problems	MSS 5.2.1	Apply the formulas for circumferences and areas of circles
		MSS 5.2.2	Find surface areas and volumes of prisms and cylinders
		MSS 5.2.3	Calculate arc lengths and areas of sectors
MSS 5.3	Visualise 2-dimensional (2-D) figures and 3-dimensional (3-D) objects	MSS 5.3.1	Recognise common terms and notations in geometry
		MSS 5.3.2	Identify different types of angles and polygons
		MSS 5.3.3	Draw and make 3-D objects
		MSS 5.3.4	Demonstrate recognition of points, edges and faces of 3-D objects
		MSS 5.3.5	Sketch 2-D representation of simple solids and the cross-sections of solids
		MSS 5.3.6	Attempt different ways in drawing geometrical figures

Code	Learning Outcomes	Pointers	
MSS 5.4	Recognise transformation and symmetry	MSS 5.4.1	Recognise reflectional and rotational symmetries in 2-D shapes
		MSS 5.4.2	Recognise the effect of reflection, rotation or translation on 2-D shapes in terms of sizes, shapes and positions
		MSS 5.4.3	Point out symmetrical figures commonly found and be able to apply transformation in daily life
MSS 5.5	Recognise coordinates	MSS 5.5.1	Use the rectangular and polar coordinate systems to describe positions of points in a plane
		MSS 5.5.2	Locate a point in the rectangular coordinate plane by means of an ordered pair
		MSS 5.5.3	Describe and predict the effects of transformations such as translation, reflection with respect to lines parallel to the x-axis, y-axis and rotation about the origin through multiples of 90° , on points in coordinate planes
MSS 5.6	Explore the properties of lines and angles on rectilinear figures	MSS 5.6.1	Differentiate different types of angles on rectilinear figures
		MSS 5.6.2	Use angle properties associates with intersecting lines and parallel lines to solve problems
		MSS 5.6.3	Use the properties of lines and angles of triangles to solve problems
		MSS 5.6.4	Find the sums of the interior and exterior angles of a convex polygon
		MSS 5.6.5	Identify regular polygons that tessellate
		MSS 5.6.6	Construct special regular polygons using straight edges and compasses
MSS 5.7	Recognise the properties of congruent and similar triangles	MSS 5.7.1	State the properties of congruent and similar triangles
		MSS 5.7.2	State and analyse the minimal conditions in fixing a triangle
		MSS 5.7.3	State the conditions of congruency and similarity
		MSS 5.7.4	Identity the congruency and similarity of triangles
MSS	Recognise the Pythagoras' Theorem and use it to	MSS 5.8.1	Demonstrate how to prove Pythagoras' Theorem

Code	Learning Outcomes	Pointers	
5.8	solve problems	MSS 5.8.2	Demonstrate recognition of the existence of irrational numbers and surds
		MSS 5.8.3	Use Pythagoras' Theorem and its converse to solve problems

Level 6 Students identify properties of 3-D figures from 2-D representations. They verify geometric properties of rectilinear figures analytically. They solve problems involving right-angled triangles and similar figures. They perform simple deductive proofs involving rectilinear figures.

Code	Learning Outcomes	Pointers	
MSS 6.1	Explore and visualise geometric properties of 3-D objects from various views	MSS 6.1.1	Apply the idea of symmetry in 2-D figures to study the reflectional and rotational symmetries in cubes and tetrahedron
		MSS 6.1.2	Identify the net of a given solid
		MSS 6.1.3	Draw 3-D objects from given 2-D representations
		MSS 6.1.4	Identify the projection of an edge on a plane, the angle between a line and a plane, and the angle between 2 planes
MSS 6.2	Recognise and apply formulas to more complicated mensuration problems	MSS 6.2.1	Demonstrate recognition of the use of formulas for volumes of pyramids, circular cones and spheres and for surface areas of right circular cones and spheres
MSS 6.3	Use inductive reasoning, deductive reasoning to explore the properties of 2-D rectilinear figures	MSS 6.3.1	Identify lines in a triangle such as medians and perpendicular bisectors
		MSS 6.3.2	Recognise the concurrence of lines in a triangle such as medians and angle bisectors
		MSS 6.3.3	Justify the methods to construct angle bisectors, perpendicular bisectors and special angles by compasses and straight edges
MSS 6.4	Write simple geometric proofs involving 2-D rectilinear figures	MSS 6.4.1	Apply deductive reasoning by presenting simple proofs of geometric problems relating to angles and lines
		MSS 6.4.2	Use conditions for congruent and similar triangles to perform deductive proofs
		MSS 6.4.3	Justify the methods of constructing centres of a triangle such as in-centre, circumcentre, orthocentre and centroids
MSS 6.5	Recognise the properties of quadrilaterals	MSS 6.5.1	Use the properties of parallelograms and special quadrilaterals to solve problems
		MSS 6.5.2	Perform simple proofs related to parallelograms
		MSS 6.5.3	Use the mid-point theorem and the intercept theorem to solve problems

Code	Learning Outcomes	Pointers	
MSS 6.6	Apply the sine, cosine and tangent ratios to solve 2-D problems	MSS 6.6.1	Demonstrate recognition of the sine, cosine and tangent ratios for angles between 0° to 90°
		MSS 6.6.2	Demonstrate recognition of the properties and relations of the sine, cosine and tangent ratios
		MSS 6.6.3	Give the exact values of the sine, cosine and tangent ratios on special angles 30° , 45° and 60°
		MSS 6.6.4	Apply the sine, cosine and tangent ratios to solve 2-D problems
		MSS 6.6.5	Use bearing, gradient, angle of elevation, and angle of depression to solve related 2-D problems
MSS 6.7	Use the analytic approach to explore the properties of 2-D rectilinear figures	MSS 6.7.1	Calculate areas of figures that can be cut into or formed by 2-D rectilinear figures
		MSS 6.7.2	Demonstrate recognition of the use of formulas of distance and slope
		MSS 6.7.3	Find the coordinates of internal point of division and mid-point
		MSS 6.7.4	Demonstrate recognition of the conditions for parallel lines and perpendicular lines
		MSS 6.7.5	Use coordinate geometry to prove facts relating to rectilinear figures
		MSS 6.7.6	Choose and use appropriate methods to prove facts relating to rectilinear figures
MSS 6.8	Use inductive reasoning to explore the properties of 3-D objects	MSS 6.8.1	Recognise the relationships between sides, surface areas and volumes of similar solids and use them to solve problems
		MSS 6.8.2	Distinguish between formulas for length, area and volume by considering dimensions

Level 7 Students apply properties of circles to solve problems. They describe and sketch loci. They find equations of straight lines and circles. They sketch graphs of trigonometric functions and solve simple trigonometric equations.

Code	Learning Outcomes	Pointers	
MSS 7.1	Use the basic properties of circles to solve problems	MSS 7.1.1	Recognise the properties of chords and arcs of a circle and use them to solve problems
		MSS 7.1.2	Recognise the angle properties of a circle and use them to solve problems
		MSS 7.1.3	Recognise the properties of a cyclic quadrilateral and use them to solve problems
MSS 7.2	Describe 2-D geometric relations and represent them in the rectangular coordinate plane	MSS 7.2.1	Describe and sketch the locus of points satisfying given condition(s)
		MSS 7.2.2	Describe the locus of points with algebraic equation(s)
		MSS 7.2.3	Find the equations of straight lines from various conditions and describe the features of a straight line from its equation
		MSS 7.2.4	Recognise the possible intersection of two straight lines
		MSS 7.2.5	Find the equations of circles from various conditions and describe the features of a circle from its equation
MSS 7.3	Recognise the trigonometric functions	MSS 7.3.1	Recognise the definitions of the functions sine, cosine and tangent
		MSS 7.3.2	Recognise the graphs and properties of the functions sine, cosine and tangent
MSS 7.4	Solve simple trigonometric equations	MSS 7.4.1	Solve the trigonometric equations $a \sin \theta = b$, $a \cos \theta = b$, $a \tan \theta = b$ (solution in the interval from 0° to 360°)

Level 8 Students apply properties of circles to geometric proofs. They find the intersection of a straight line and a circle. They use trigonometric knowledge to solve 2-D and 3-D problems.

Code	Learning Outcomes	Pointers	
MSS 8.1	Use the properties of circles to solve problems and perform geometric proofs	MSS 8.1.1	Perform the tests for concyclic points and cyclic quadrilaterals
		MSS 8.1.2	Recognise the properties of tangents to a circle and angles in the alternate segments and use them to solve problems
		MSS 8.1.3	Use the properties of circles to perform geometric proofs
MSS 8.2	Recognise the intersection of a straight line and a circle	MSS 8.2.1	Find the coordinates of the intersections of a straight line and a circle and recognise the possible intersection of a straight line and a circle
MSS 8.3	Solve 2-D and 3-D problems by applying trigonometric knowledge	MSS 8.3.1	Solve trigonometric equations other than $a \sin \theta = b$, $a \cos \theta = b$, $a \tan \theta = b$ (solution in the interval from 0° to 360°)
		MSS 8.3.2	Use the formula $\frac{1}{2}ab \sin C$ for areas of triangles
		MSS 8.3.3	Use the sine and cosine formulae to solve triangles
		MSS 8.3.4	Use Heron's formula for areas of triangles
		MSS 8.3.5	Apply trigonometric knowledge to solve 2-D and 3-D problems

Data Handling Dimension:

Level 5 Students collect and organise discrete and continuous data. They construct and interpret statistical charts. They find the measures of the central tendency for a set of data.

Code	Learning Outcomes	Pointers	
DH 5.1	Recognise the criteria for collecting and organising discrete and continuous statistical data	DH 5.1.1	Demonstrate recognition of various stages involved in statistics
		DH 5.1.2	Use simple methods to collect data, and analyse the related problem
		DH 5.1.3	Identify and distinguish between discrete and continuous data
		DH 5.1.4	Compare different ways of organising the same set of data
DH 5.2	Construct and choose appropriate statistical charts to represent data	DH 5.2.1	Construct various statistical charts and diagrams including stem-and-leaf diagrams, pie charts, histograms, scatter diagrams and broken line graphs
		DH 5.2.2	Construct frequency polygons and curves, cumulative frequency polygons and curves
		DH 5.2.3	Compare the presentations of the same set of data by different graphs or the same type of graphs but in different scales
		DH 5.2.4	Choose appropriate diagrams or graphs to present a set of data
DH 5.3	Interpret statistical diagrams and graphs	DH 5.3.1	Read and obtain information from statistical diagrams and graphs
		DH 5.3.2	Identify key information presented in the data and graphs
		DH 5.3.3	Identify sources of deception in misleading graphs and their accompanying statements
DH 5.4	Find the measures of the central tendency of a set of data	DH 5.4.1	Find the mean, median and mode from a given set of ungrouped data
		DH 5.4.2	Find the mean, median and modal class from a given set of grouped data, and recognise that the obtained arithmetic mean is only an estimation

Level 6 Students describe the central tendency of a set of data by an appropriate measure. They estimate probability from empirical data. They calculate theoretical probabilities by simple counting.

Code	Learning Outcomes	Pointers	
DH 6.1	Interpret and select appropriate measures to describe the central tendency of a set of data	DH 6.1.1	Compare 2 data sets with given means, medians and modes
		DH 6.1.2	Construct data sets with given mean, median and mode
		DH 6.1.3	Select an appropriate measure of central tendency for a given context
		DH 6.1.4	Describe the effect on the central tendency of the data set by (i) deleting an item; (ii) adding a common constant to each item; (iii) multiplying each item by a common constant; and (iv) inserting a zero
		DH 6.1.5	Describe the weighted mean and provide real-life examples in using the weighted mean
DH 6.2	Identify the misuse of average in daily life	DH 6.2.1	Recognise the misuse of averages in daily-life situations
		DH 6.2.2	Point out the dangers on the misuse of averages
DH 6.3	Recognise the idea of probability	DH 6.3.1	Recognise the meaning of probability
		DH 6.3.2	Find out the use of probability in daily-life activities, including geometric probability
		DH 6.3.3	Compare and distinguish between empirical and theoretical probabilities in different contexts
DH 6.4	Solve statistical and probability problems	DH 6.4.1	Use the vocabulary of probability to interpret the results of an experiment
		DH 6.4.2	Estimate probabilities from experimental data
		DH 6.4.3	Calculate the theoretical probability by simple counting
		DH 6.4.4	Recognise the meaning of expectation

Level 7 Students compute the measures of dispersion from data. They compare data sets by using appropriate measures of dispersion. They assess statistical investigations presented in different sources.

Code	Learning Outcomes	Pointers	
DH 7.1	Recognise and compute the measures of dispersion	DH 7.1.1	Find the range and inter-quartile range from a given set of ungrouped data
		DH 7.1.2	Find the range and inter-quartile range from a given set of grouped data
		DH 7.1.3	Construct and interpret box-and-whisker diagrams
		DH 7.1.4	Use formulas to find the standard deviation for both grouped and ungrouped data sets
DH 7.2	Select and use the measures of dispersion to compare different data sets	DH 7.2.1	Use box-and-whisker diagrams to compare the distributions of different sets of data
		DH 7.2.2	Compare the dispersions of different sets of data using appropriate measures
DH 7.3	Assess statistical investigations	DH 7.3.1	Recognise different techniques in survey sampling
		DH 7.3.2	Recognise the basic principles of questionnaire design
		DH 7.3.3	Recognise the uses and abuses of statistical methods in various daily-life activities or investigations
		DH 7.3.4	Assess statistical investigations presented in different sources such as news media, research reports, etc.

Level 8 Students use the counting principle, laws of probability and measures of dispersion to solve problems. They identify the effect of changing item(s) of a set of data to its dispersion.

Code	Learning Outcomes	Pointers	
DH 8.1	Apply the counting principle to solve problems	DH 8.1.1	Apply addition rule and multiplication rule in the counting principle to solve problems
		DH 8.1.2	Recognise the concepts and notations of permutation and combination
		DH 8.1.3	Solve problems on the permutation of distinct objects without repetition
		DH 8.1.4	Solve problems on the combination of distinct objects without repetition
DH 8.2	Apply laws of probability to solve problems	DH 8.2.1	Recognise the notation of set language including union, intersection and complement
		DH 8.2.2	Recognise the concept of Venn Diagram
		DH 8.2.3	Apply the addition law of probability to solve problems
		DH 8.2.4	Apply the multiplication law of probability to solve problems
		DH 8.2.5	Recognise the concept and notation of conditional probability
		DH 8.2.6	Apply permutation and combination to solve probability problems
DH 8.3	Apply standard deviation to solve real-life problems	DH 8.3.1	Solve real-life problems involving standard scores
		DH 8.3.2	Solve real-life problems involving the normal distribution
DH 8.4	Determine the effect of changing item(s) of a set of data to its dispersion	DH 8.4.1	Describe the effect on the dispersion of the data set by (i) adding an item; (ii) removing an item; (iii) adding a common constant to each item; and (iv) multiplying each item by a common constant