Mathematics

Essential Learning Concepts

Contents to be covered by the paper- I in G.C.E. (Ordinary Level) examination year 2016 and beyond
(According to the Grade 10 and 11 Syllabi)

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Essential Learning Concepts

Among the core subjects to be offered by the students at the G.C.E. (Ordinary Level) examination, the subject mathematics stands foremost. The main reason for this is that the success at the G.C.E. (O/L) examination depends on passing mathematics. The dream of following a subject stream, whatever it would be, at the G.C.E. (Advanced Level) comes true only by getting through the subject mathematics.
The students who have the ability as well as the fervour to study either Arts or Commerce at the G.C.E. (A. L.), will have to leave the school system because of their failure of Mathematics at the G.C.E.(O.L.) examination.

Inquiring further into this matter, the Ministry of Education appointed a special advisory committee for making recommendations to promote students' performance in Mathematics at the G.C.E. (O.L.) examination. Given below are some of the recommendations made by that committee through its report.

1. The content of Mathematics prescribed for secondary education.

   (a) School Mathematics should not be tantamount to scholastic or research level mathematics.

   (b) Mathematics at the secondary level in schools aims making the students knowledgeable citizens and help them develop some essential life skills.

   (c) Mathematics is a supporting subject to learn the other subjects.

   (d) To make learning more productive, there should be a sequence of priority in introducing mathematical concepts.

2. As remedy for the condition that everybody should learn the same mathematics at present, Essential Learning Concepts (ELC) have to be identified at Grades 10 and 11. This can be defined as a section that should compulsorily be learnt by one to be considered a person with numeracy (mathematical literacy) who can critically assess the social utility of mathematics.

3. It is also recommended to arrive at a consensus about Basic (Lowest) Achievement Level (BAL) which can be interpreted as the ability to display systematic and conceptual knowledge of solving problems belonging to Essential Learning Concepts.

4. As per the recommendations stated above with regard to the Essential Learning Concepts (ELCs), the composition of the mathematics question paper at the G.C.E. (O.L.) examination can be restructured as follows.

- The first paper of 2 hour duration will only include structured questions and short answer questions related to the ELCs defined in the syllabus. It encompasses the ability range of all the examination candidates and contributes 50% to the final result.

- The second paper of 2 ½ hour duration will carry structured essay questions covering the entire syllabus. This is meant for the students with higher scholastic ability. This will be prepared targeting those who seek higher qualifications and aspire to enter higher academic streams. The contribution made by second paper to the final result is 50%.

- Hence, if the pass mark of the Ordinary Level mathematics paper is considered 35%, any student scoring 70% (This is adjudged the basic achievement level of ELCs) for the first paper can have a pass in mathematics even without scoring any mark for the second paper.

- Taking foregoing facts and also the document entitled 'Essential Learning Concepts' prepared by a team of experts led by Dr. Upali Mampitiya, the department of Mathematics of the National Institute of Education could identify the essential learning concepts a student is supposed to have when entering the Advanced Level Stream after grade 11.These after being subject to deliberation and discussion by a group comprising NCOE lecturers, in-service advisers and teachers were finalized. The subject content and learning outcomes related to the grade 10 and 11 ELCs so formulated are given below.

It is anticipated that question paper I introduced for the G.C.E. (Ordinary Level) examination in 2016 will test whether the student achieve this subject area.

Essential Learning Concepts

Content	Learning Outcomes	Notes
• Square root • Approximation (First approximation only)	• Finds an approximate value for the square root of a whole number that lies between two consecutive perfect squares. • Finds the square root of a whole number which is not a perfect square, to the first approximation. • Recognizes that the square root of a whole number which is not a perfect square is a decimal number.	• Whole numbers less than 100 which are not perfect squares only.
• Arithmetic Progressions • Introduction • n^{th} term	• Identifies a number sequence in which the difference between two consecutive terms is a constant, as an **arithmetic progression.** • Identifies the technical terms relevant to arithmetic progressions. • Finds the n^{th} term of an arithmetic progression using the formula $T_n = a + (n-1)d$ • Finds the value of n, when n^{th} term (T_n) of an arithmetic progression is given.	• a and d are integers only.
• Solving problems involving fractions	• Analyzes instances where fractions are used in day to day life. • Solves problems related to day to day life using fractions with BODMAS rule.	• Expressions involving only three mathematical operations including a bracket.

• Introducing inverse proportions • Problems related to inverse proportions • Work and time	• Identifies the inverse proportion by analyzing relationship between two quantities. • Solves simple problems related to work and time using the knowledge on inverse proportions.	
• Types of taxes (Duty, income tax, rates, VAT) • Introduction • Calculations	• Identifies the taxes - rates, duty, income tax and Value Added Tax(VAT) • Engages in calculations related to rates. • Engages in calculations related to duty. • Engages in calculations related to income tax. • Engages in calculations related to VAT. • Solves problems related to taxes.	• Only calculations such that tax percentage is a whole number and the answer is a numerical value. (problems including algebraic terms or expressions are not expected)
• Simple interest • Interest Rate • Annual/monthly • Calculating the interest	• Identifies **simple interest** as the interest calculated by considering the initial amount, the time and the interest rate. • Recognizes that the interest received during equal time periods with same interest rate is same for a given amount of money. • Calculates the interest for a given amount, for a given period and given interest rate. • Solves problems of finding the interest or the interest rate or the	• Only calculations such that tax percentage is a whole number and the answer is a numerical value (problems including algebraic terms or expressions are not expected)

	time or the amount, when the necessary information are given.	
• Relationship between indices and logarithms • Logarithm ⇔ Power conversion	• Describes the logarithm of a number in terms of the base, when the number is expressed in index form. • Converts an expression in index form to logarithmic form and an expression in logarithm form to index form.	
• Geometric progressions • Introduction • n^{th} term	• Identifies number sequences of which the quotient between a term and the preceding term is a constant, as **geometric progressions.** • Finds the common ratio (r) of a geometric progression such that the values of a and r are integers. • Finds the n^{th} term (T_n) of a geometric progression such that the values of a and r are integers.	• Expressing the final answer in the form of indices is necessary.
• Compound Interest • Calculations of compound interest (Up to two terms)	• Identifies the method of compound interest. • Performs calculations related to compound interest	• Only up to two terms with the percentage of interest is a whole number. (problems including algebraic terms or expressions are not expected)
• Limited Companies • Shares	• Accepts that many people can be involved in a business through the investment in shares. • Accepts that limited companies supply their capital by issuing shares.	

	• Names the price of a share of an established company as the **Market Price of a share**. • States that the **value of shares** (invested funds) is obtained by multiplying the market price of a share by the number of shares. • States that the number of shares that can be bought is obtained by dividing the invested funds (Value of shares) by the market price of a share. • Calculates the **dividend income** that an investor receives by multiplying the dividend paid for a share by the number of shares. • Solves problems involving invested funds (Value of shares), market price of a share, capital profit and dividend paid for a share.	
• Perimeter • Sectors	• Calculates the perimeter of sectors. • Solves problems involving compound plane figures including sectors.	• Perimeter of sectors with angle at the centre is 45^0, 90^0 and 180^0 and the radius of the circle is a whole number of multiple of 7 only. • Perimeter of compound plane figures including only one sector and maximum of two plane figures out of square, rectangle, right angled triangle, trapezium with whole number measurements only. • Finding the radius when arc length and perimeter are given and finding the arc length when radius and perimeter are given only.

• Area • Sectors	• Finds the area of sectors. • Solves problems related to area of compound plane figures including sectors.	• Area of sectors with angle at the centre is 45^0, 90^0 and 180^0 and the radius is a multiple of 7 only. • Area of compound plane figures including only one sector and maximum of two plane figures out of square, rectangle, right angled triangle, trapezium with whole number measurements only. (Finding the radius or the angle at the sector when area of the sector is given is not expected)
• Surface Area • Cylinder(Solid)	• Finds the surface area of a right circular cylinder using the formula $A = 2\pi r^2 + 2\pi rh$, where radius, r is a whole number of multiple of 7 and height h is also a whole number • Finds the value of h of a right circular cylinder when the surface area A is given	• Right circular solid cylinders of which r is a multiple of 7 and height h is a whole number only. • Only the right circular solid cylinders of which A is a whole number, r is a multiple of 7 and h is a whole number value.
• Surface Area • A right prism with a triangular cross-section	• Identifies the shapes of faces of a right prism with a triangular cross-section.	• Finding the surface area is not expected.

• Volume • Cylinder	• Finds the volume of a right circular cylinder using the formula $V=\pi r^2 h$. • Finds the value of height h of a right circular cylinder when the volume V is given. • Finds the value of radius r of a right circular cylinder when volume V is given.	• Only the right circular cylinders of which r is a multiple of 7 and h is a whole number. • Right circular cylinders of which r is a multiple of 7 and V is a whole number only. • Only the right circular cylinders of which h and V are whole numbers. (r should be a perfect square)
• Volume • A right prism with a triangular cross-section	• Calculates the volume of a right prism with a triangular cross-section.	• Right prisms with the area of cross-section is given only (Finding the cross section or the height of the prism when volume is given is not expected)
• Distance and time • Representation by a distance time graph (when the speed is uniform) • Gradient of the graph = $\frac{\text{distance}}{\text{time}}$ =	• Recognizes the **speed** as the rate of change of distance with respect to time. • Writes the relationship between distance, time and speed. • Represents the information on distance and time by a graph. • Recognizes that the **speed** is obtained by the **gradient** of a distance-time graph. • Solves problems related to distance, time and speed. • Solves simple problems related to volume and time.	• Problems excluding unit conversions and final answer is a whole number only. • The instances when giving two quantities of speed= $\frac{\text{distance}}{\text{time}}$ only. • Two instances when giving two quantities of rate= $\frac{\text{volume}}{\text{time}}$ including liquids flowing through pipes.

speed • Volume and time		
• Angle of elevation and the angle of depression.	• Identifies the angle of elevation. • Identifies the angle of depression. • Describes the location of an object in terms of the angle of depression and the angle of elevation.	• Problems of finding the location using a given diagram are included. (Drawing scale diagrams is not expected)
• Trigonometric ratios • Sine • Cosine • Tangent	• Discovers that the sine value of an angle in a right angled triangle is given by the ratio of the length of the opposite side to the length of the hypotenuse. • Discovers that the cosine value of an angle in a right angled triangle is given by the ratio of the length of the adjacent side to the length of the hypotenuse. • Discovers that the tangent value of an angle in a right angled triangle is given by the ratio of the length of the opposite side to the length of the adjacent side.	• Including the problems related to finding the trigonometric ratios, when lengths of any two sides of a right angled triangle are given. • Including the problems related to finding the length of an unknown side, when the trigonometric ratio and the length of one of the sides of corresponding ratio are given.
• Finding factors • Of the form $ax^2 + bx + c$	• Finds the factors of expressions of the form $ax^2 + bx + c$.	• Such that $0< a \leq 5$, $b^2 - 4ac$ is a perfect square and a,b,c □ □
• Least common multiple of algebraic expressions	• Recognizes that the smallest algebraic term that can be divided by several algebraic terms is the least common multiple of these terms. • Finds the least common multiple of given algebraic terms. .	• Only the instances where two unknowns with not more than three terms such as $x^2, 2xy, 3y$ of indices not more than two.
• Algebraic fractions	• Explains the necessity of equivalent fractions for the addition and	

• Addition • Subtraction	subtraction of algebraic fractions. • Adds and simplifies algebraic fractions with algebraic terms and related denominators. • Subtracts and simplifies algebraic fractions with algebraic terms and related denominators. • Simplifies algebraic fractions with algebraic terms and related denominators.	• Instances are not more than three algebraic fractions with equal denominators and the index is not more than two and the denominators with same unknowns only. • (Algebraic expressions in the denominators are not expected)
• Linear equations with algebraic fractions • Solving	• Recognizes that the methods of simplifying algebraic fractions can be used to solve simple equations involving algebraic fractions. • Solves simple equations involving algebraic fractions including algebraic terms in the denominator.	• Instances upto two algebraic fractions with same unknown in the denominator and unequal denominators are included. (Algebraic expressions in the denominators are not expected)
• Simultaneous equations • Solving • Solving quadratic equations • Using factors	• Solves pairs of simultaneous equations with distinct coefficients. • Factorizes the corresponding algebraic expression of an algebraic equation. • Recognizes that for a product of two expressions to be zero, at least one of the expressions should be zero. • Solves quadratic equations using factors. .	• Problems with 2 variables of unequal whole number coefficients and whole number solutions only. • Instances where $ax^2 + bx + c = 0$; $0 < a \leq 5$ $b^2 - 4ac$ is a perfect square only
• Calculating the gradient and the intercept of a straight line of the form $y = mx + c$ (Using	• Calculates the gradient of an equation of the form $y = mx + c$ when coordinates of two points on the straight line are given. • Calculates the gradient of an equation of the form $y = mx + c$ when the graph of the equation is given. • Determines the relationship between the two variables using the	• Only the instances when given the whole number coordinates of two points lie in first quadrant or on its axes • The line segment in the first

coordinates)	gradient and the intercept of the straight line.	quadrant must be drawn. (passing through the origin is also included)

• Algebraic fractions
  • Multiplication
  • Division
	• Multiplies algebraic fractions including algebraic terms
	• Finds the reciprocal of an algebraic fraction.
	• Divides algebraic fractions including algebraic terms.
		• With two unknowns in the numerator or in the denominator or in both the numerator and the denominator only.

• Inequalities
  • Solving and representing solutions on a number line
  • Of the form $ax + b \gtrless c$
  • Of the form $ax+b \begin{matrix}\leq \\ > \end{matrix} cx+d$ (a, b, $c,d \in \mathbb{Z}$)
	• Finds the integral solution set of the inequalities $ax + b < c$; $ax + b > c$; $ax + b \leq c$; $ax + b \geq c$; $ax + b > cx + d$; $ax + b < cx + d$; $ax + b \leq cx + d$ and $ax + b \geq cx + d$.
	• Represents the integral solutions sets of the inequalities $ax + b < c$; $ax + b > c$; $ax + b \leq c$; $ax + b \geq c$; $ax + b > cx + d$, $ax + b < cx + d$, $ax + b \leq cx + d$ and $ax + b \geq cx + d$ on a number line.
	• Finds the intervals of solutions of the inequalities $ax + b < c$; $ax + b > c$; $ax + b \leq c$; $ax + b \geq c$; $ax + b > cx + d$, $ax + b < cx + d$, $ax + b \leq cx + d$ and $ax + b \geq cx + d$.
	• Represents the intervals of solutions of the inequalities $ax + b < c$; $ax + b > c$; $ax + b \leq c$; $ax + b \geq c$; $ax + b > cx + d$, $ax + b < cx + d$, $ax + b \leq cx + d$ and $ax + b \geq cx + d$ on a number line.
	.
		• Only the instances where $a, b, c \in \mathbb{Z}$ and $a > 0$.

• Matrices
  • Introduction (Up to 3 × 3)
  • Adding and
	• Identifies a matrix as a method of presenting information in rows and columns.
	• Recognizes that the order of a matrix is given by the number of rows and the number of columns of the matrix.
		• Only integral elements in multiplication of matrices

subtracting (Up to 3 × 3) • Multiplying a matrix by a scalar (Up to 3 × 3) • Multiplying two matrices (Up to 2 × 2)	• Recognizes row matrices, column matrices, square matrices, unit matrices and symmetric matrices. • Understands through practical situations that to add or subtract matrices, their orders should be equal. • Adds and subtracts two row matrices. • Adds and subtracts two column matrices. • Adds and subtracts matrices of the same order up to matrices of order 3 × 3. • Multiplies a matrix of order up to 3 × 3 by an integer. • Simplifies expressions including matrices under the operations of addition, subtraction and multiplication by an integer. • Understands that to multiply two matrices, the number of columns of the first matrix should be equal to the number of rows of the second matrix. • Multiplies two matrices of order up to 2 × 2.	
• Calculations related to the theorem "The sum of the three interior angles of a triangle is $180^{o.}$ • Calculations related to the theorem "If a side of a triangle is produced, the exterior angle so	• Performs calculations using the theorem, "The sum of the three interior angles of a triangle is 180^{o}". • Performs calculations using the theorem, "If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles".	• Geometrical concepts learnt in lower grades and the subject content learnt in grade 10 or 11 can be used in calculations. (Proving postulates is not expected)

formed is equal to the sum of the two interior opposite angles" .		
• Congruency • Identifying the conditions under which two triangles are congruent • S.A.S. • A.A.S • S.S.S • Hyp. S	• Identifies two plane figures which coincide with each other as **congruent figures**. • Identifies the properties of congruent plane figures. • Identifies the conditions that are necessary and sufficient for two triangles to be congruent as S.A.S., A.A.S., S.S.S. and Hyp.S.	
• Isosceles Triangles • Calculations related to the theorem "If two sides of a triangle are equal, the angles opposite to those sides are equal" • Calculations related to the converse of the theorem "If two sides of a triangle are equal, the angles	• Identifies the theorem, "If two sides of a triangle are equal, the angles opposite to those sides are equal". • Performs calculations using the theorem, "If two sides of a triangle are equal, the angles opposite to those sides are equal". • Performs calculations using the converse of the theorem, "If two sides of a triangle are equal, the angles opposite to those sides are equal".	

opposite to those sides are equal”		
• Properties • Calculations related to the theorem “In a parallelogram, opposite sides are equal; opposite angles are equal; and each diagonal bisects the area of the parallelogram”	• Identifies the theorem, “In a parallelogram, opposite sides are equal; opposite angles are equal; and each diagonal bisects the area of the parallelogram”. • Performs simple calculations using the theorem, “In a parallelogram, opposite sides are equal; opposite angles are equal; and each diagonal bisects the area of the parallelogram”.	
• Angles • Calculations related to the theorem “The angle subtended at the centre of a circle by an arc is equal to twice the angle subtended on the circumference by the same arc”	• Identifies the theorem, The angle subtended at the centre of a circle by an arc is equal to twice the angle subtended on the circumference by the same arc”. • Performs calculations using the theorem, “The angle subtended at the centre of a circle by an arc is equal to twice the angle subtended on the circumference by the same arc”.	
• Chord • Calculations related to the theorem “The straight line joining the mid-point of a chord of a circle to the centre is	• Identifies the theorem, “The straight line joining the mid-point of a chord of a circle to the centre is perpendicular to the chord”. • Performs calculations using the theorem, “The straight line joining the mid-point of a chord of a circle to the centre is perpendicular to the chord”.	

perpendicular to the chord" • Calculations related to the theorem "The perpendicular drawn from the centre of a circle to a chord, bisects the chord"	• Identifies the theorem, "The perpendicular drawn from the centre of a circle to a chord, bisects the chord". • Performs calculations using the theorem, "The perpendicular drawn from the centre of a circle to a chord bisects the chord".	
• Calculations related to the theorem "Angles in the same segment of a circle are equal"	• Identifies the theorem, "Angles in the same segment of a circle are equal". • Performs calculations using the theorem, "Angles in the same segment of a circle are equal".	
• Calculations related to the theorem "The angle in a semi- circle is a right- angle".	• Identifies the theorem, "The angle in a semi-circle is a right-angle". • Performs calculations using the theorem, "The angle in a semi-circle is a right-angle".	
• Using a straight edge and a pair of compasses • Constructs the four basic loci	• Using a straight edge and a pair of compasses, constructs the locus of a point moving at a constant distance from a fixed point. • Using a straight edge and a pair of compasses, constructs the locus of a point moving at an equal distance from two fixed points. • Using a straight edge and a pair of compasses, constructs the locus of a point moving at a constant distance from a straight line. • Using a straight edge and a pair of compasses, constructs the locus of a point moving at an equal distance from two intersecting	• In the maximum of two loci and when one of them is given finding the geometrical position using the other locus, is expected.

	straight lines. • Locates various geometric positions related to one locus using the knowledge of the basic loci.	
• Calculations related to the Pythagoras' Theorem	• For a right-angled triangle, separately names the hypotenuse and the sides which include the right angle. • Identifies Pythagoras' theorem. • Performs calculations using Pythagoras' theorem.	• Problems including only Pythagoras' triples are expected.
• Calculations related to the mid-point theorem • Calculations related to the converse of the mid-point theorem	• Separately names the straight line which joins the mid-points of two sides of a triangle and the third side. • Identifies the mid-point theorem. • Performs calculations using the mid-point theorem. • Identifies the converse of the mid-point theorem. • Performs calculations using the converse of the mid-point theorem.	• Geometrical concepts learnt in lower grades and the subject matter learnt in grade 11 or 12 can be used in calculations. (Proving postulates is not expected)
• Cyclic quadrilaterals • Calculations related to the theorem, "The opposite angles of a cyclic	• Writes the pairs of opposite angles of a cyclic quadrilateral. • Identifies the theorem, "The opposite angles of a cyclic quadrilateral are supplementary". • Performs calculations using the theorem, "The opposite angles of a cyclic quadrilateral are supplementary". • Identifies "If one side of a cyclic quadrilateral is produced, the	• Geometrical concepts learnt in lower grades and the subject matter learnt in grade 10 or 11 can be used in calculations. (Proving postulates is not expected)

quadrilateral are supplementary" • Calculations related to the theorem, "If one side of a cyclic quadrilateral is produced, the exterior angle so formed is equal to the interior opposite angle of the quadrilateral"	exterior angle so formed and the interior opposite angle of the quadrilateral". • Identifies the theorem, "If one side of a cyclic quadrilateral is produced, the exterior angle so formed is equal to the interior opposite angle of the quadrilateral". • Performs calculations using the theorem, "If one side of a cyclic quadrilateral is produced, the exterior angle so formed is equal to the interior opposite angle of the quadrilateral".	
• Types of data • Continuous • Discrete • Grouped frequency distribution • Mid-values	• Identifies continuous and discrete data. • Identifies the mid-value of a class interval. • Finds the mid-value of a class interval.	• Class intervals such that the sum of the two boundaries is less than 100 and the mid value is a whole number only

• Data representation • Pie charts	• Represents a given set of data by a pie chart. • Uses pie charts to communicate information efficiently and effectively. • Solves simple problems related to pie charts.	
• Interpretation of data • Mean of a grouped frequency distribution • Using the mid-value • Using the assumed mean	• Calculates the mean of a grouped set of data using the mid-value. • Calculates the mean of a grouped set of data using the assumed mean. • Identifies the easiest method of finding the mean of a grouped set of data. • Expresses the advantages/disadvantages of calculating the mean as the central tendency measurement to interpret data. • Recognizes that the mean can be used to numerically estimate daily requirements. • Makes predictions for daily requirements by using the mean.	• Class intervals of sum of the two boundaries less than 100 and whole numbered mid value only
• Representing data • Class limits and class boundaries • Histogram (Equal/unequal class intervals)	• Identifies the class limits and class boundaries of a frequency distribution. • Explains the difference between the class limits and class boundaries of a frequency distribution. • Finds the class limits and class boundaries of a frequency distribution. • Represents by a histogram, the information in a frequency distribution of continuous data with equal sized class intervals. • States that the area of each column of a histogram represents the corresponding frequency (f).	• In frequency distributions with unequal class intervals, height of a column of the histogram $= \frac{f}{n}$, is a whole number

	• Obtains the size of a class interval as a multiple of the size of the smallest class interval, for a frequency distribution in unequal class intervals, using $\frac{\text{size of class interval}}{\text{size of smallest class interval}} = n$ • When drawing a histogram for a frequency distribution in unequal class intervals, obtains the height of the column over a class interval using $\frac{f}{n}$. • Represents by a histogram, the information in a frequency distribution of continuous data with unequal sized class intervals. • Prepares the relevant class boundaries of each class interval for a discrete frequency distribution. • Represents the information related to a discrete frequency distribution in a histogram.	
• Representing data • Frequency polygon	• Draws the frequency polygon using the histogram. • Accepts that the area of the frequency polygon is equal to the area of the histogram. • Draws the frequency polygon using the mid-point of each class interval and the corresponding frequency. • States that when a frequency polygon is being drawn, after the midpoint of the interval before the first class interval, the upper	

	midpoints of the columns over the class intervals and the midpoint of the interval after the last class interval are joined, the polygon is completed by joining the end two points along the horizontal axis.	
• Representing data • Cumulative frequency curve	• Obtains the values of the cumulative frequency column by adding the values in the frequency column of a frequency distribution from top to bottom or from bottom to top. • Draws the cumulative frequency curve by using the upper boundary of each class interval and the cumulative frequency of the relevant class interval.	•
• Interpreting data • Introducing quartiles and the inter-quartile range	• Explains quartiles as the values at which a frequency distribution is divided into four equal parts. • Identifies the value in the $\left(\frac{n+1}{4}\right)^{\text{th}}$ position of a set of n values, when the data is arranged in ascending order, as the f**irst quartile** (Q_1). • Identifies the value in the $\frac{1}{2}(n+1)^{\text{th}}$ position of a set of n values, when the data is arranged in ascending order, as the **second quartile** (Q_2). • Identifies the value in the $\frac{3}{4}(n+1)^{\text{th}}$ position of a set of n values, when the data is arranged in ascending order, as the **third quartile** (Q_3).	

	• Shows that the second quartile (Q_2) is the median of a group of data. • Identifies the **inter quartile range** of a group of data as the third quartile – the first quartile ($Q_3 - Q_1$). • Accepts that when the top 25% and the bottom 25% of a group of data arranged in ascending order are removed, the remaining range of values is the inter-quartile range.	
• Cumulative frequency curve (For grouped and ungrouped data) • Quartiles • Inter-quartile range	• Using the cumulative frequency curve, finds the first quartile (Q_1) as the value in the $\left(\frac{1}{4}n\right)^{\text{th}}$ position when the frequency is n. • Using the cumulative frequency curve, finds the second quartile (Q_2) as the value in the $\left(\frac{1}{2}n\right)^{\text{th}}$ position when the frequency is n. • Using the cumulative frequency curve, finds the third quartile (Q_3) as the value in the $\left(\frac{3}{4}n\right)^{\text{th}}$ position when the frequency is n. • Calculates the inter-quartile range by using the first and third quartiles. • Uses quartiles and the inter-quartile range to solve problems in daily life.	• Such that the value of n is a multiple of 4
• Set notation • Descriptive form • As a collection of elements • By Venn diagrams • Generating form	• Identifies methods of denoting sets. • Writes a set in descriptive form, as a collection of elements, in Venn diagram form and in generating form. • Uses set notation methods.	• When given in one set notation and represents in another set notation is expected

• Solving problems related to sets (For 2 sets) • Application of the formula for two finite sets in Venn diagrams $n(A \cup B) = n(A) + n(B) - n(A \cap B)$	• Expresses $n(A \cup B)$ in terms of $n(A)$, $n(B)$ and $n(A \cap B)$, when A and B are two finite sets. • Represents two finite sets in a Venn diagram. • Illustrates in a Venn diagram, a region relevant to a given set operation. • Describes in words, regions in a Venn diagram that contain information relevant to set operations. • Solves problems related to two sets using Venn diagrams. • Solves problems related to two finite sets using the formula $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.	• Problems involved in two sets only
• Events • Simple • Compound	• Separates out and identifies simple events and compound events. • Expresses that if A is an event in a sample space S, the probability of A occurring is $P(A) = \frac{n(A)}{n(S)}$. • Expresses the probability of a compound event.	
• Sample space of a random experiment (With independent events) • Representation on a grid • Representation in a tree diagram • Solving problems involving independent events using a grid or a tree diagram (Not more than two stages)	• Provides examples of independent events. • Represents the sample space of a random experiment on a grid. • Represents all the equally likely outcomes of a process involving two stages in a tree diagram. • When solving problems related to probabilities, explains with reasons whether a grid or a tree diagram is the more suitable method of representing the sample space. • Solves problems using a grid and a tree diagram.	• Not more than two stages