Mathematics	
GRADE 10	

Domains	Standards	Benchmarks	Topic/Title	NC SLO #		NCP (2022) - SLO	Cognitive Domain
				[SLO: M-10-A-01]		Identify complex numbers, complex conjugate, absolute value or modulus of a complex number	Understand
				[SLO: M-10-A -02]		Apply algebraic properties and perform basic operations on complex numbers	Apply
				[SLO: M-10-A-03]		Demonstrate additive identity and multiplicative identity for the set of complex numbers	Understand
				[SLO: M-10-A-04]		Find additive inverse and multiplicative inverse of a complex number z	Apply
				[SLO: M-10-A-05]		Demonstrate the following properties of a complex number z.	Apply
				[SLO: M-10-A-06]		Find real and imaginary parts of complex numbers of the type $(x+iy)^n$,	Apply
				[SLO: M-10-A-07]		Explain, with examples, how mathematical models and equations are often used to make predictions and test hypotheses in science. [e.g, In physics, mathematical equations are used to describe the motion of objects and the behaviour of energy and matter. In chemistry, mathematical models are used to predict the behaviour of chemical reactions and the properties of molecules. In biology, mathematical models are used to predict the growth and spread of populations and the spread of disease.]	Understand
				[SLO: M-10-A-08]		Solve the simultaneous linear equations with complex coefficients,	Apply
				[SLO: M-10-A-09]		Apply the Geometric interpretation of a complex number $$|z| = |-z| = |\bar{z}| = |-\bar{z}|$$ $$\bar{\bar{z}} = z,\ z\,\bar{z} = |z|^2$$ $$\overline{z_1 z_2} = \bar{z}_1\,\bar{z}_2,\ \left(\overline{\frac{z_1}{z_2}}\right) = \frac{\bar{z}_1}{\bar{z}_2},\ z_2 \neq 0.$$	Apply
		Complex Number		[SLO: M-10-A-10]		Apply the geometric interpretation of the modulus of a complex number.	Apply
				[SLO: M-10-A-11]		Apply the geometric interpretation of algebraic operations	Apply
				[SLO: M-10-A-12]		Solve quadratic equations of the form is not equal to 0 by factorization, quadratic formula, completing square and graphs.	Apply
				[SLO: M-10-A-13]		Draw the graphs of the quadratic function. A is not equal to 0	Apply
				[SLO: M-10-A-14]		Establish relationship between roots and coefficients of quadratic equations	Understand
				[SLO: M-10-A-15]		Form a quadratic equation when roots are given	Apply
				[SLO: M-10-A-16]		Find discriminant of a given quadratic equation	Apply
				[SLO: M-10-A-17]		Identify the nature of roots of a quadratic equation through discriminant.	Understand

Numbers and Algebra	1.compare the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have real solutions. 2.understand vectors and matrices as systems that have some of the properties of the real number system.　3.use number-theory arguments to justify relationships involving whole number 4. analyse and interpret mathematical situations by manipulating algebraic expressions and relations, 5. model and solve contextual problems, 6. interpret functions, calculate rate of change of functions, apply differentiation, integrate analytically, 7. utilise integration, solve simple ordinary differential equations, solve nonlinear equations numerically by simple iterative formula.	**Benchmark I**: Students will be able to identify Real Numbers and their properties to carry out basic operations. **Benchmark II**: Students will be able to add, subtract, and multiply matrices, evaluate the determinant of matrices to find the inverse of matrices, solve simultaneous linear equations using matrices, **Benchmark III**: Students will be able to use Venn diagrams to demonstrate and describe operations of sets and apply in real life situations. Express functions, inverse functions, and composite functions. **Benchmark IV**: Students will be able to simplify, factorise and manipulate Algebraic Fractions, Identify and rationalise surds, and factorise algebraic expressions **Benchmark V**: Students will be able to solve linear equations, a system of two linear equations with two variables and solve linear inequalities. **Benchmark VI**: Students will be able to solve Quadratic equations by using different methods and solve real world situations by formulating a quadratic equation **Benchmark VII**: Students will be able to plot and interpret the Graphs in practical situations such as travel graphs, conversion graphs and speed time graphs.		[SLO: M-10-A-18]		Solve a pair of linear and quadratic equations simultaneously	Apply
				[SLO: M-10-A-19]		Solve word problems involving quadratic equations.	Analyse
				[SLO: M-10-A-20]		Solve quadratic inequalities in one unknown.	Apply
				[SLO: M-10-A-21]		Apply the concept of quadratic equations, and quadratic inequalities, to real world problems (such as in physics, engineering, and finance, i.e. calculating max and min heights in projectile motion, determining the max price on a company's budget, stability of population, growth of business, the relationship between hours worked and amount earned etc.).	Analyse
			Matrices and determinants	[SLO: M-10-A-22]		Display information in the form of matrix of order 2	Apply
				[SLO: M-10-A-23]		Solve situations involving sum, difference, and product of two matrices	Apply
				[SLO: M-10-A-24]		Calculate the product of the scalar quantity and a matrix	Apply
				[SLO: M-10-A-25]		Evaluate the determinant and inverse of a matrix of order 2×2	Apply
				[SLO: M-10-A-26]		Solve the simultaneous linear equations in two variables using matrix inversion method and Cramer's rule	Analyse
				[SLO: M-10-A-27]	its not suitable for summative assessment	Explain, with examples, how mathematics plays a key role in the development of new scientific theories and technologies. [e.g., Mathematical models and simulations are used to design and optimize new materials and drugs, and to understand the behaviour of complex systems such as the human brain.]	Understand
				[SLO: M-10-A-28]		Apply concepts of matrices to real world problems (such as engineering, economics, computer graphics, and physics)	Analyse
			Functions and Graphs	[SLO: M-10-A-29]		Recognize notation and determine the value of a function	Apply
				[SLO: M-10-A-30]		Identify types of functions (into, onto, one-to-one, injective, surjective and bijective) by using Venn diagrams	Apply
				[SLO: M-10-A-31]	Knowledge	Explain operations on, and compositions of, functions.	Apply
				[SLO: M-10-A-32]		Find the inverse of a given function.	Apply
				[SLO: M-10-A-33]:		Formulate composite functions as defined by $$gf(x) = f(g(x)).$$	Apply
				[SLO: M-10-A-34]:		Apply concepts from functions to real world problems (such as finance, transportation, and sales.)	Apply
			Graphs of basic Functions	[SLO: M-10-A-35]		Plot graphs of constant function, identity function, linear function and absolute valued functions	Apply
				[SLO: M-10-A-36]		Solve absolute value equations and inequalities in one variable and express the solution as a range of values on a number line.	Apply
				[SLO: M-10-A-37]		Apply concepts of absolute valued functions to real-world problems (such as to calculate energy wave, magnitude and distance).	Apply
				[SLO: M-10-A-38]		Apply concepts from functions to real world problems (such as finance, transportation, and sales.)	Apply
			Algebraic Fractions	[SLO: M-10-A-39]	knowledge	Describe rational expressions	Understand
				[SLO: M-10-A-40]		Factorize and simplify rational expressions	Apply
				[SLO: M-10-A-41]		Demonstrate manipulation of algebraic fractions	Apply

				Topic	SLO	Description	Level
				Linear Inequalities in two variables:	[SLO: M-10-A-42]	Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials, or trinomials).	Apply
					[SLO: M-10-A-43]	Apply the concept of rational equations (limited to numerators and denominators that are monomials, binomials, or trinomials) to real world problems (such as the amount of work a person can do in certain amount of time, rates, and work)	Apply
					[SLO: M-10-A-44]	Solve two linear inequalities with two unknowns simultaneously	Apply
					[SLO: M-10-A-45]	Interpret and Identify regions in plane bounded by two linear inequalities in two unknowns.	Understand
				Quadratic Equations	[SLO: M-10-A-46]	Solve quadratic equations by using the methods of: • factorization, • completing squares, and quadratic formula	Apply
					[SLO: M-10-A-47]	Solve problems of "changing the subject of formula".	Apply
					[SLO: M-10-A-48]	Solve fractional equations that can be reduced to quadratic equations	Apply
					[SLO: M-10-A-49]	Solve real world situations by formulating a quadratic equation	Apply
				Plotting and Interpreting the Graphs	[SLO: M-10-A-50]	Draw graphs of functions of the form (Including the sums of few of these and taking n as a rational number)	Apply
					[SLO: M-10-A-51]	Solve a system of one linear and one quadratic equation graphically and interpret the solution	Analyse
					[SLO: M-10-A-52]	Discover exponential growth/decay of a practical phenomenon through its graph	Understand
					[SLO: M-10-A-53]	Determine the gradients of curves through tangents. Curves sketching	Apply
					[SLO: M-10-A-54]	Identify, sketch and interpret graphs of the Linear functions	Analyse
					[SLO: M-10-A-55]	Identify, sketch and interpret graphs of the Nonlinear functions such as Quadratic, Cubic, Reciprocal, and Exponential.	Analyse
					[SLO: M-10-A-56]	Sketch graph of the function where n is a + ve integer, − ve integer, rational number for	Apply
					[SLO: M-10-A-57]	Apply co $y = x n$ hing and interpreting graph to real life problems (such as in tax payment, income and salary problems and cost and profit analysis)	Analyse
				Vectors in Plane	[SLO: M-10-B-01]	Introduce rectangular coordinate system in plane	Understand
					[SLO: M-10-B-02]	Represent vectors as directed line segment	Understand
					[SLO: M-10-B-03]	Express a vector in terms of two non-zero and non-parallel coplanar vectors	Apply
			Apply		[SLO: M-10-B-04] understand	Express a vector in terms of position vector	Apply
					[SLO: M-10-B-05] understand	Express translation by a vector	Apply
					[SLO: M-10-B-06]	Find the magnitude of a vector.	Apply
					[SLO: M-10-B-07]	Add and subtract vectors	Apply
					[SLO: M-10-B-08]	Multiply a vector by a scalar	Apply
					[SLO: M-10-B-09]	Solve geometrical problems involving the use of vectors	Apply
					[SLO: M-10-B-10]	Apply concepts from geometrical problems involving the use of vectors (such as parallel and perpendicular lines in geometrical shapes, vector projectile motion, crosswinds aviation, military usage, designing roller coasters).	Apply
				Application of Trigonometry	[SLO: M-10-B-11]	Extend sine and cosine functions to angles between 90° and 180°	Understand
					[SLO: M-10-B-12]	Solve problems using the laws of sine, cosine and the area formulas for any triangle	Apply
					[SLO: M-10-B-13]	solve simple trigonometric problems in three dimensions	Apply
					[SLO: M-10-B-14]	Apply concepts of trigonometry to real life world problems (such as video games, flight engineering, navigation, sound waves)	Apply
			Benchmark I: Students will be able to use and interpret Cartesian coordinates in two dimensions and solve problems involving coordinate geometry Benchmark II: Students will be able to Identify vectors in plane and apply		[SLO: M-10-B-15]	Solve problems by using the property of a circle: One and only one circle can pass through three non- collinear points	Apply
					[SLO: M-10-B-16]	Solve problems by using the property of circle: A straight line, drawn from the centre of a circle to bisect a chord (which is not a diameter) is perpendicular to the chord.	Apply
					[SLO: M-10-B-17]	Solve problems by using the property of a circle: Perpendicular from the centre of a circle on a chord bisects it	Apply

Domain	Standards	Benchmarks	Topic	SLO		Student Learning Outcomes	Cognitive Level
Geometry	Apply characteristics and properties of angles, triangles, parallelograms and circles to develop arguments about their geometric relationships. Solve problems involving coordinate geometry, plane analytical geometry and vectors. Recognize trigonometric identities, analyze conic sections, draw and interpret graphs of functions.	Identify vectors in plane and apply vector addition, dot/ cross product, scalar product, Benchmark III: Students will be able to find volume and surface area of composite solids and solve problems using the relationship between areas of similar figures and volume of different solids Benchmark IV: Students will be able to apply characteristics and properties of angles, triangles, parallelograms and circles to develop arguments about their geometric relationships. Benchmark V: Students will be able to use trigonometric identities to verify relationships between trigonometric ratios. Apply appropriate laws and formulae of trigonometry to solve the triangles and relevant problems. Benchmark VI: Students will be able to calculate unknown angles and solve problems by using the properties of circles	**Chords and Arcs of a Circle**	[SLO: M-10-B-18]		Solve problems by using the property of circle: If two chords of a circle are congruent then they will be equidistant from the centre	Apply
				[SLO: M-10-B-19]		Solve problems by using the property of a circle: Two chords of a circle which are equidistant from the centre are congruent	Apply
				[SLO: M-10-B-20]		Solve problems by using the property of circle: If two arcs of a circle (or of congruent circles) are congruent then the corresponding chords are equal.	Apply
				[SLO: M-10-B-21]		Solve problems by using the property of circle: If two chords of a circle (or of congruent circles) are equal, then their corresponding arcs (minor, major or semi-circular) are congruent.	Apply
				[SLO: M-10-B-22]		Solve problems by using the property of circle: Equal chords of a circle (or of congruent circles) subtend equal angles at the centre (at the corresponding centres)	Apply
				[SLO: M-10-B-23]		Solve problems by using the property of circle: If the angles subtended by two chords of a circle (or congruent circles) at the centre (corresponding centres) are equal, the chords are equal	Apply
				[SLO: M-10-B-24]		Apply concepts of chords and arcs of a circle to real life world problems (such as decorative features, rainbow, bridges, roller coaster track).	Apply
			Tangent and Angles of a Circle	[SLO: M-10-B-25]		Solve problems by using the property of circle: If a line is drawn perpendicular to a radial segment of a circle at its outer end point, it is tangent to the circle at that point	Apply
				[SLO: M-10-B-26]		Solve problems by using the property of a circle: The tangent to a circle and the radial segment joining the point of contact and the centre are perpendicular to each other	Apply
				[SLO: M-10-B-27]		Solve problems by using the property of circle: The two tangents drawn to a circle from a point outside it, are equal in length.	Apply
				[SLO: M-10-B-28]		Solve problems by using the property of a circle: If two circles touch externally or internally, the distance between their centres is respectively equal to the sum or difference of their radii.	Apply
				[SLO: M-10-B-29]		Solve problems by using the property of circle: The measure of a central angle of a minor arc of a circle is double that of the angle subtended by the corresponding major arc.	Apply
				[SLO: M-10-B-30]		Solve problems by using the property of circle: Any two angles in the same segment of a circle are equal	Apply
				[SLO: M-10-B-31]		Solve problems by using the property of circle: The angle in a semi-circle is a right angle, in a segment greater than a semi-circle is less than a right angle, in a segment less than a semi-circle is greater than a right angle	Apply
				[SLO: M-10-B-32]		Solve problems by using the property of circle: The opposite angles of any quadrilateral inscribed in a circle are supplementary	Apply
				[SLO: M-10-B-33]		Apply concepts of tangents and angles of a circle to real life world problems (such as architecture, monuments, pyramids)	Apply
			Practical Geometry of Circles	[SLO: M-10-B-34]		Locate the centre of a given circle	Apply
				[SLO: M-10-B-35]		Draw a circle passing through three given noncollinear points	Apply
				[SLO: M-10-B-36]		Complete the circle: -by finding the centre, - without finding the centre, when a part of its circumference is given	Apply
			Tangent to the Circle	[SLO: M-10-B-37]		● Draw a tangent to a given arc, without using the centre, through a given point P when P is • the middle point of the arc, • at the end of the arc, outside the arc	Apply
				[SLO: M-10-B-38]		● Draw a tangent to a given circle from a point P when P lies • on the circumference • outside the circle	Apply
				[SLO: M-10-B-39]		Draw two tangents to a circle meeting each other at a given angle	Apply
				[SLO: M-10-B-40]		Apply concepts of practical geometry of a circle to real life world problems (such as athletic tracks, recreational parks, ferris wheels, mechanical machines)	Apply
Information Handling	The students will be able to collect, organize, analyze, display and interpret data/ information	Benchmark I: Students will be able to find measures of central tendency and dispersion to draw conclusion, construct and interpret cumulative frequency curve, measure correlation using scatter diagram, Benchmark II: Students will be able to predict the outcomes of single and combined events using diagrams, find probability and recognize probabilities of compound events.	**Cumulative Frequency Distribution and measures of dispersion**	[SLO: M-10-C-01]		Construct cumulative frequency table, cumulative frequency polygon or Ogive	Apply
				[SLO: M-10-C-02]	Understand/ analysis	Interpret the median, quartiles, deciles, percentiles, and inter quartile range from cumulative frequency curve.	Apply
				[SLO: M-10-C-03]		Interpret and analyse box and whisker plots Correlation	Apply
				[SLO: M-10-C-04]		Construct and interpret data from scatter diagrams and also draw lines of best fit	Analyse
				[SLO: M-10-C-05]		Measure correlation using scatter diagram	Apply
			Measure of Dispersion	[SLO: M-10-C-06]		Calculate the range, standard deviation and variance for grouped data	Apply
				[SLO: M-10-C-07]	Anlysis	Use the mean and standard deviation to compare two sets of data	Evaluate
				[SLO: M-10-C-08]		Solve real life situations involving variance, and standard deviation for grouped data	Apply
				[SLO: M-10-C-09]		Apply concepts from measures of dispersion to solve real life situations (such as determining the consistency of data, checking variability in forecasting, manufacturing, finance, economics)	Apply
			Probability of Combined Events	[SLO: M-10-C-10]		Calculate the probability of combined events using, where appropriate: sample space diagrams, possibility diagram, tree diagrams, Venn diagrams.	Apply
				[SLO: M-10-C-11]		Apply addition law of probability to solve problems involving mutually exclusive events (such as left and right hand turns, tossing a coin, even and odd numbers on a die, winning and losing a game)	Apply
				[SLO: M-10-C-12]		Apply the Multiplication law of probability to solve problems involving independent and dependent events (trading, flipping a coin, such as 2 cards being drawn 1 by 1 with replacement and without replacement etc.)	Apply