Mathematics

GRADE 9

SLOs for Assessment Key:

1.Assessible / Attainable - (Not included in drop down list)
2. Ambiguous (assessable in longer run) - (Grey)
3. Not assessable in Summitive - (Grey)
4. Repetitive (with in same grade) - (Grey)
5. Repetitive (with in same learning level) - (Grey)

Domains	Standards	Benchmarks	Topic/Title	NC SLO #	~~NCC~~	NCP (2022) - SLO	Cognitive Domain
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	**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	**Real Numbers**	[SLO: M-09-A-01]:		Explain, with examples, that civilizations throughout history have systematically studied living things [e.g., the history of numbers from Sumerians and its development to the present Arabic system.	Understand
				[SLO: M-09-A-02]		Describe the set of real numbers as a combination of rational and irrational numbers	Understand
				[SLO: M-09-A-03]:		Demonstrate and verify the properties of equality and inequality of real numbers	Analyse
				[SLO: M-09-A-04]:		Apply laws of indices to simplify radical expressions	Apply
				[SLO: M-09-A-05]:		Express a number in scientific notations and vice versa.	Understand
				[SLO: M-09-A-06]:		Describe logarithm of a number	Understand
				[SLO: M-09-A-07]:	Analysis	Differentiate between common and natural logarithm	Understand
				[SLO: M-09-A-08]:		Apply laws of logarithm to real life situations such as growth and decay, loudness of sound	Apply
				[SLO: M-09-A-09]:		Apply concepts of rational numbers to real word problems (such as inventory (stock taking), temperature, banking, measures of gain and loss, sources of income and expenditure).	Evaluate
				[SLO: M-09-A-10]		Describe mathematics as the study of pattern, structure, and relationships	Understand
				[SLO: M-09-A-11]		Identify sets and apply operations on three sets (Subsets, overlapping sets and disjoint sets), using Venn diagrams	Apply
				[SLO: M-09-A-12]	apply	Solve problems on classification and cataloguing by using Venn diagrams for Scenarios involving two sets and three sets. Further application of sets	Analyse

	nonlinear equations numerically by simple iterative formula.	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.	**Sets and Functions**	[SLO: M-09-A-13]:		Verify and apply properties/laws of union and intersection of three sets through analytical and Venn diagram method	Analyse
				[SLO: M-09-A-14]		Apply concepts from set theory to real world problems (such as in demographic classification, categorising products in shopping malls and music playlist by genre) Relation	Apply
				[SLO: M-09-A-15]		Explain product, Binary Relations and its domain and range	Understand
				[SLO: M-09-A-16]	understand	Recognise that a relation can be represented by table, order pair and graphs	Apply
			Factorization	[SLO: M-09-A-17]		Identify common factors, trinomial factoring, concretely, pictorially and symbolically	Understand
				[SLO: M-09-A-18]		Factorize quadratic and cubic algebraic expressions: od + ' + b*or x4+'px +q o ax'+bx + ¢ o (ax'+ bx + c)(uxZ + bx + d| ® (x + a)(x + b) (x + ©) ® (x +a)(x + b)(x +¢) o a*+3a°b+3ab'+b' o o'-3d% +3ab"-b' o o'b'	Analyse
				[SLO: M-09-A-19]:		Find highest common factor and least common multiple of algebraic expressions and know relationship of LCM and HCF	Apply
				[SLO: M-09-A-20]:		Find square root of algebraic expression by factorization and division	Apply
				[SLO: M-09-A-21]:		Apply the concepts of factorization of quadratic and cubic algebraic expressions to real world problems (such as engineering, physics, and finance.)	Apply
			Linear Equations and Inequalities in one variable	[SLO: M-09-A-22]		Solve linear equations and inequalities with rational coefficients and represent the solution set on a real line Linear Inequalities in two variables	Apply
				[SLO: M-10-A-23]		Solve two linear inequalities with two unknowns simultaneously	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 vector addition, dot/ cross product, scalar product,	**Coordinate Geometry**	[SLO: M-09-B-01]:		Derive distance formula by locating the position of two points in coordinate plane	Evaluate
				[SLO: M-09-B-02]		Calculate the midpoint of a line segment	Apply
				[SLO: M-09-B-03]		Find the gradient of a straight line when coordinates of two points are given	Apply
				[SLO: M-09-B-04]		Find the equation of a straight line in the form	Apply
				[SLO: M-09-B-05]		Find the gradient of parallel and perpendicular lines	Apply
				[SLO: M-09-B-06		Apply distance and midpoint formulas to solve real life situations such as physical measurements or distances between locations	Apply
				[SLO: M-09-B-07]		Apply concepts from coordinate Geometry to real world problems (such as, aviation and navigation, landscaping, map reading, longitude and latitude)	Apply

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	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		[SLO: M-09-B-08]		Derive equation of a straight line in slope form $y = mx + c$, point-slope form, two-point form, intercepts form, symmetric form, normal form	Evaluate
				[SLO: M-09-B-09]			Apply
			Angle Between Lines	[SLO: M-09-B-10]		Show that a linear equation in two variables represents a straight line and reduce the general form of the equation of a straight line to the other standard forms	Apply
				[SLO: M-09-B-11]		Find the equation of the family of lines passing through the point of intersection of two given lines	Apply
				[SLO: M-09-B-12]		Calculate angles of the triangle when the slopes of the sides are given	Apply
			Logic	[SLO: M-09-B-13]	Analysis	Differentiate between a mathematical statement and its proof	Understand
				[SLO: M-09-B-14]	Analysis	Differentiate between an axiom, conjecture and theorem	Understand
				[SLO: M-09-B-15]		Formulate simple deductive proofs [algebraic proofs that require showing the LHS to be equal to the RHS. E.g., showing $(x-3)^2 + 5 = x^2 - 6x + 14$]	Evaluate
			Similar Figures	[SLO: M-09-B-16]		Identify similarity of polygons. Area and Volume of Similar Figures	Understand
				[SLO: M-09-B-17]:		Solve problems using the relationship between areas of similar figures and volume of different solids	Evaluate
			Geometrical Properties of regular polygons, Triangles and Parallelograms	[SLO: M-09-B-18]		Solve real life problems that involve the properties of regular polygons, triangles and parallelograms (such as building architectural structures, fencing, tiling, painting, carpeting a room)	Evaluate
			Loci	[SLO: M-09-B-19]		Solve real life problems using the following loci and the method of intersecting loci for sets of points in two dimensions which are: at a given distance from a given point, at a given distance from a given straight line, equidistant from two given points equidistant from two given intersecting straight lines	Apply
			Trigonometry	[SLO: M-09-B-20]		Identify angles in standard position, expressed in degrees and radians	Understand
				[SLO: M-09-B-21]		Apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to find a side or of an angle of a right-angled triangle	Apply
				[SLO: M-09-B-22]		Solve real life trigonometric problems in two dimensions involving angles of elevation and depression.	Apply
			Trigonometric Identities	[SLO: M-09-B-23]		Prove the trigonometric identities and apply them to show different trigonometric relations	Evaluate
				[SLO: M-09-B-24]		Solve real life problems involving trigonometric identities	Apply
			Bearing	[SLO: M-09-B-25]:		Interpret and use three figure bearings	Apply
				[SLO: M-09-B-26]:		Solve problems involving bearing	Apply
				[SLO: M-09-B-27]:		Apply the concepts of trigonometry	Apply
			Construction of Triangle	[SLO: M-09-B-28]:		Construct a triangle having given two sides and the included angle.	Apply
				[SLO: M-09-B-29]:		Construct a triangle having given one side and two of the angles	Apply
				[SLO: M-09-B-30]:		Construct a triangle having given two of its sides and the angle opposite to one of them (with all the three possibilities).	Apply
				[SLO: M-09-B-31]:		Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle and verify their concurrency	Evaluate
		Benchmark I: Students will be able to find measures of central tendency and dispersion to draw conclusion	**Frequency Distribution**	[SLO: M-09-C -01]	Understanding	Construct a grouped frequency table, histogram (with unequal class intervals) and frequency polygon	Apply
				[SLO: M-09-C -02]		Calculate the mean modal class and median of a grouped frequency distribution	Apply

Information Handling	The students will be able to collect, organize, analyze, display and interpret data/ information	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.	**Measure of Central Tendency**	[SLO: M-09-C -03]:	Apply	Solve real life situations involving mean, weighted mean, median, and mode for given data (such as allocation of funds in different projects, forecasting future demographics, marketing, forecasting government budgets).	Evaluate
			Probability	[SLO: M-09-C -04]:	Apply	Calculate the probability of a single event and the probability of event not occurring	Evaluate
				[SLO: M-09-C -05]:	Apply	Solve real life problems involving probability	Evaluate
			Relative and expected frequencies	[SLO: M-09-C -06]:		Calculate relative frequency as an estimate of probability	Apply
				[SLO: M-09-C -07]:		Calculate expected frequencies	Apply
				SLO: M-09-C -08		Solve real life problems involving relative and expected frequencies.	Apply