Mathematics - IX STANDARD

Unit No. & Topic	Expected learning outcomes	Content	Transactional Teaching Strategy	Teaching Aids	No. of Periods
1. Number Theory	To classify numbers as belonging to N, W, Z or Q	1.1 Number Systems The notations N, W, Z and Q	Use algebraic equaition like 5x-10=0, 5x=0, 5x+10=0, 5x±3=0 to illustrate different categories of numbers	Chart or a tree diagram	**30**
	To understand the effects of binary operations of addition, subtraction, multiplication, division, taking GCD, LCM etc in the different number systems	Fundamental operations in N,W, Z and Q- some properties	Discriminate a unary operation from a binary operation through examples	Operation tables: For example that of {01,1} under addition multiplicat ion	
	With the help of ‘ operation tables, recognize similarities (or otherwise) in the structure	Structure of N, W Z and Q	Pointing out the ‘ isomorphic’ structure wherever possible, without actually defining it.	Operation tables of different varieties	
	Making coordinates on a line, using N,W, Z and Q	1.2 The real Number line Notion of 1-1 correspondence	Mark points on a line and illustrate ‘ order’	Number line diagrams	
	To recognize ‘ gaps’ on the line even after using N,W,Z and Q To appreciate the existence of irrational numbers and know to mark some of them on a line	Need for irrational Numbers	Use 2 (diagonal length of unit square) as example, cite solutions of equations like $x^2 \pm 3=0$ to show the ‘ insufficiency’ of using N,W,Z and Q		

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1. Number Theory	To define rational and irrational numbers using decimals, To compute an approximate value of a fraction whose denominator is of the form a+b?c (a,b,c ER)	Manipulation of irrational numbers	As a starting point explain how 1=.999999… and 1/3=.33333.. etc make sense. Indicate the usefulness of using the conjugate of the denominator	Charts, Calculators operations	
	State (without proof) the denseness property of real numbers and describe its meaning	Denseness in R	Explain several non-examples where the denseness property fails	Diagrams	
	To recognize "clock-like" structure in different situations	1.3 Modular Arithmetic ' Modulo' Principle	Motivate with Spiro graph patterns. Star with questions like; Tell the day of a date	Clock face Railway time-table; Calender; Spiro graph	
	To partition N and Z into disjoint classes under different modulo structures To define congruence (mod m) relation in general terms. To perform addition and multiplication in modulo m To solve very simple and elementary equations in congruence (mod m)	Conguruence modulo m (m E W) relation	From operation tables using representative of classes. For eg. Use addition (mod 5), Multiplication (mod4) etc. illustrate that an equation like 4x = 2 (mod 3) may have an infinite solution set.		

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2. Measurements	To recall formulae for area and perimeter of standard plane figures (Quadrialerals, triangles, circles)	2.1 Area & Perimeter Formula for area and perimeter.	Deal with basic questions on computation of area / perimeter	Charts and figures	**15**

	To identify the figures kept in juxta – position. To apply formulae to compute the area / perimeter of such figures	2.2 Combined figures Study of area / perimeter of not more than three figures placed in juxta posion.	Use figures / photos wherein is found plane figures placed adjacently. (For example a shed whose cross section is a triangle over a rectangle or a sector removed from a triangled etc)	Geometric designs consisting of combined plane shapes	
3. Some useful Notations	To write a number in the form k.10 n? with 1≤ k <10, nZ, k ??Q To appreciate the concise way of expressing very large or very small data. To convert a number in scientific notation to usual for, of expression and vice-versa	3.1 Scientific Notation The concept of scientific notation	Use very large and very small data of numerical expression in Astronomy, Geography, Business, Science, Engineering etc to introduce the concept	Data from different life situations; Scientific data from journals.	**30**

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3. Some useful Notatiosn	Understanding logarithmic notation Converting an expression given in exponential form to logarithmic form and vice-versa.	3.2 Notation of logarithums Exponential and logarithmic notations	Start with expressions of the form $x= a^n$ where n is an integer and then discuss when n can be an approximate value	Chart	
	To power basic rules of logarithms To use basic logarithmic rules to simplify expressions	Rules of logarithms (Produce, Quotient, Power and Change of Base)	Use Powers of 2 to explain the laws and then prove formally using index laws.	Table of Powers of 2.	

	Defining logarithms to the base 10 To know how to use log tables Applying, common logarithms to find approximate values of given expression.	Common logarithms	Define and explain characteristic and mantissa illustrate with simple problems; involving products quotients powers square and cube roots. Using 2^{10}, = 10^3, 3^4 = 80., derive approximate values of logarithms of 1 to 10	Log table	
	To describe a set in (i) words; (ii) list (iii) set builder forms To identify different types of sets. To define subset,Universal set and Power set	3.3 Set Notation Describing a set	Number sets from N.W,Z and Q to be introduced first and then sets of general nature to be given	Chart giving different number sets	
	To understand and perform Union, Intersection, difference and complementtation.	Set operations	Use of finite sets to illustrate the concept	Examples from life situation	
	To use Venn diagram to illustrate sets.	Venn diagrams	Diagrams to be restricted to two sets only	Life situations	

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4. Algebra	To expand / simplify algebraic expressions using identities	4.1 Algebraic Identities (x+a) (x=b) $(a+b)^2$, $(a-b)^2$, a^2-b^2, $(a+b+c)^2$ (x+a)(x+b) (x+c) $(a+b)^3$, $(a-b)^3$	Use of Paper - folding Diagrammatic explanation	Paper folds Diagrams	**30**
	To factorize polynomials using algebraic identities	Factorization	Treat factorization as the reverse process of multiplication initially	Charts on identities	

	To multiply a polynomial by another polynomial To divide a polynomial by another polynomial	Polynomials - Multiplication & Division	Start with quadratic polynomials		
5. Problems solving Techniques	To understand the difference between verification & proof. To know how & where to use the symbols ✍, ✍ To adopt simple methods of proofs to derive elementary results.	5.1 Conjectures & proofs Axioms, ✍, ✍ methods of proofs numerical & geometric proofs, proof by contradiction, proof by construction, counter example	Conjecturing, through pattern discover Verificatiion through paper folding & specific subsituations; choose examples from Number theory, Algebra & Geometry Application of proof to Solution of non mathematical life problems	Pattern Charts paper folds	**10**

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	Recognizing algebraic formulae as models for different situations Recognizing Straight lines as a model for Direct variation Recognizing Rectangle as a model for inverse variation	5.2 Mathematical models Algebraic & Geometric models	Generalize specific situation & obtain formulae use graphs of is line to explain direct variation Use rectangles as a model for Inverse variation. List out formulae in science and maths to identify types of variations Eg. PV=Constant	Graphs & Charts	
6. Theoretical Geometry	To verify and understand the theorems given in Apprendix A. To apply the theorems in simple problems	6.1 Theorems for verification Relation between points, lines & planes parallel lines and transversal; ongru- ents Parallelograms points of con-currence in triangle	Paper folding, Symmetry & Transformatio n techniques to be adopted No formal proof to be given. Only verification to be tested through numerical problems	Paper folds symmetry drawings Transform ations	**30**

	To verify and understand the theorems given in Appendix B. To apply the theorems in simple problems	6.2 Theorems for proofs Theorems on linear pair,. vertically oppostite angles, angle-sum property of a triangle properties of aparallelograms	Step-by-step logical proof with diagrams to be explained & discussed	Diagrams	

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7. Algebra Geometry	To identify co-ordinates of given points To plot points with given co-ordinates	7.1 Use of co-ordinates Introducing Co-ordinates idea of quardrants	Use graph sheet as a starting point	**Graph Sheet**	**30**
	To define slope as 'rise' divided by 'run To calculate slope of a line through two given points To understand the equation y = mx+c	7.2 Slope of a line concept of slope Form y=mx + c of a line	Interpreting slopes of descending & ascending lines Identifying the meaning of 'm' & 'c' in practical situations	Real-life situations	
	To derive the distance formula To apply the distance formula in geometrical situations	7.3 Distance concept Derivation of distance formula	Classify triangles into difference types by calculating their sides Extend it to quadrilaterals	Suitable diagrams	
	To distinguish between internal & external division To derive ration formula To compute the mid-point of a line segment To compute the centroid of a triangle	7.4 Ratio concept Ratio formula	Simple problems involving ratios to be introduced first	Charts	

	To compute the area of a triangle given its vertices To use the formula to derive conditions of collinearity of points	7.5 Area concept Area formula for a triangle	Approach through diagrams	Simple diagrams	

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8. Trigometry	8.1 Trigonometric rations The degree measure of an angle Definition of sine, consine, tangent ratio & their reciprocals and their values for specific angles	Encourage students to identify details sufficient to compute a given trigonometric ratio	Chart	Chart	**15**
	To derive the following identities. i) $\sin^2 A + \cos^2 A = 1$ ii) $1 + \tan^2 A = \sec^2 A$ iii) $1 + \cot^2 A = \csc^2 A$ sing(90-A) = cosA cot(90-A) = tanA cos(90-A) = sin A sec (90-A) = cscA tan(90-A) = cotA csc (90-A) = sec A To apply the above identifies to prove simple relations	8.2 Trigonometric identifies Relationship between trigonometric ratios Trigonometric ratios of complementary angle	Encourage both using a righ triangle as a starting point & the basic identities to derive results	Chart	
9. Practical Geometry	To locate through drawing appropriate line the centroid Otheocentre, circumcentre and incentre of a given triangle	9.1 Concurrency in a Centrroid, Orthocentre Circumcentre and incentre of a triangle	Introduce with paper folding techniquest	Paper folds	**10**
	Give two lengths, construct 1) the Arithmetic & Geometric Means 2) the Mean proportional	9.2 Geometric interpretation of averages	Introduce idea of means first before construction. Illustrate the concept of mean proportional with an application to find square root.	Paper folds	

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10. Handling Data	To form a frequency distribution of an ungrouped data To compute Mean, Median and mode of a grouped data in simple cases and interpret the nature of a data	10.1Measures of central tendency Grouped and ungrouped data; Mean, Median and mode for a given data	Recall the concept of Mean, Median and mode in the case of ungrouped data initially. Give illustrations from life situations	Statistical details from life situations	**12**
	To recognize the nature of spread of a given data. To draw a scatter diagram for a given data. To draw a line of best fit by eye	10.2scatter diagram Graphic view of a given data, scatter diagram idea of line of best fit	Discuss about the nature of a given data based on its scatter diagram; take examples from class situations (like marks and study hours etc)	Real life situations	
11. Graph	To drawn the graph of a line given (i)'m' and 'c' (ii) two points and (iii) the equation y = mx+c	11.1 Linear graphs Graph of a straight line	Discuss the minimum data needed to plot a line Interpret a given linear graph in different ways.	Graph board	**12**
	To solve graphically simulatenous equations in two variables identify graphical situations for (i) one solution (ii) many solutions and (iii) no solution	11.2 Application of linear graphs Graphical Solution of simulatenous equiations.	Discuss the correspondence between the given simulatanceous equations and their graphical representations	Graph board	
				Total	**224**