# Mathematics - X STANDARD

| Unit No. & Topic | Expected learning outcomes | Content | Transactional Teaching Strategy | Teaching Aids | No. of Periods |
|---|---|---|---|---|---|
| **1. Number Theory** | To identify an A.P and a G.P<br>To find the nth term of a given A.P/G.P | 1.1 Sequences Arithmetic Progression and Geometric Progression | Use Pattern approach | Dot patterns | **25** |
| | Use of ??notation<br>Computing sum to n terms of an A.P. and a G.P<br>To compute sum of infinity of a G.P computing ? n, ? $n^2$, ? $n^3$ | 1.2 Series Summation of A.P and G.P. | Use patterns to derive formulae Examples to be given from life situation | Dot patterns | |
| **2. Measurement and Mensuration** | To recall formulae for volumes and surface areas of right prism, cylinder, cone, sphere & hemisphere.<br>To compare volumes and surface areas of shapes placed in juxla position | 2.1 volumes volumes of combined shapes | Use 3-D models to create combined shapes | Models & pictures | **15** |
| | To compute number of new shapes made out of given ones when the total volumes remains unchanged | 2.2 invariant volumes conversion under invariance of volume | Choose examples from real life situations | Real-life situations | |

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| **3. Some useful Notations** | Recall of basic ideas of set operations Verification of commutative, associative & idempotent laws of union & intersection of sets. Verifying, De Morgan's laws (only Venn diagrams of finite sets to be used for verification) | 3.1 Set Notation community, associativity and idempotecny of Union and Intersetion Distributive laws complementation De Morgan's laws | Use profusely Venn diagrams for all illustrations | Venn diagrans | **25** |

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| | Expressing relations and functions as sets of ordered pairs<br>Representing relations and functions by arrow diagram<br>Using vertical line lest for a function | 3.2 Functional Notation Relations and Functions and Functions | Discuss relations in real-life situations and their different types<br>Give examples of functions from science, economics, medicine etc. | Graphs, Arrow diagrams, Tables | |
| | To read and interpret a flowchart<br>To construct a flowchart in very simple situation<br>To determine elementary critical path determination using priority table and network | 3.3 Flow chart Notation Reading a Flow chart | Illustrate profusely the concept of flowchart<br>Give examples of critical path determination from life situation | Charts | |

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| **4. Algebra** | To use shythetic division for obtaining remainder when a polynomial expression is divided by a factor of the form **ax+b (a,b**? **Q)**<br>To state and verify remainder theorem in simple cases.<br>To state and apply factor theorem in simple cases | 4.1 Remainder Theorem Rremainder theorem & Factor theorem | IIlustrative examples | Charts | |
| | To use factor method to find the GCD and LCM of given expressions | 4.2 GCD and LCM | Recall GCD and LCM of numbers initially | | |
| | To add, subtract, multiply and divide given rational expressions x | 4.3 Rational expressions Simplification of rational expressions | compare with Operations on fractions | | |
| | To recall extracting square root of numerals by factor and division methods | 4.4 Square Root Computation of Square Root | Compare with the square root operation on | Charts | |

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| | To comppute square root of polynomial expressions (of not more than $4^{th}$ degree) by factor method and division method | | numerals | | |
| | Solution by<br>1. Factor method,<br>2. Completion of Square method<br>3. Formula method<br>4. Identifying nature of roots and Relation among roots understading idea of an imaginary number | 4.5 Quadratic Equations Solution and nature of quadratic equation | help students visualize the nature of roots both algebraically & graphically | Graphs | |
| | Solving equations, using trial and improvement method (up to 2 decimal places) | 4.6 Approximate solutions<br>Method of trial and improvement | Graphical visualization of approximatioon | Graphs | |
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| **5.Problem Solving techiques** | To guess the solution of a simple problem using one or more techniques among pattern search,use of figures, modification of problem, use of notation | 5.1 Guessing a solution Pattern search, Use of figures, modification of problem, use of notations | Use real-life situations Treat examples from algebra, number theory& geometry | Grapphs | |
| | To visulaize grapphs of linear inequations Investigating given graphical simultaneous inequalities and the values at characteristic points. (Two variables, not more than three constaints) | 5.2 Linear Programming | Graphical approach | Graphs | 15 |
| 6. Theor etical Geom etry | To verify and understand the theorems given in appendix A. To apply the theorems in simple problems | 6.1 Theorems for verification<br>Circle through three non collinear points, equal chords, angle in a semicircle idea of locus, similar triangles and tangents | Paper folding, Symmetry & Transformation techniques to be adopted No formal proof to be given. Only verification to | Paper foldings symmetry drawings Transfor m actions | |

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| | | to a circle | be tested through numerical problems and drawing of figures | | |
| | To verify and understand the theorems given in appendix B.<br>To apply the theorems in simple problems | 6.2 Theorems for proofs perpendicular from a chord tko centre, angle subtended at the cntre by an are cyclic quadrilateral, alternate segments, basic proportionallity in a triangle, right triangle | Step-by –step logicaal proof with diagrams to be explained & discussed | Diagrams | 30 |

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| **7. Algebraic Geometry** | To derive the equation of a line in<br>i. Two points form,<br>ii. Slope-point form an<br>iii. Intercepts form<br>To apply these in simple problems | 7.1.Straight line. Equation for a straight line Two points form, Slope-point from and Intercepts form | The form y = mx + c to be taken as the starting point | Graphs | **20** |
| | To derive conditions of lines to be<br>(i) parallel (ii) perpendicular to one another and points to be (iii) collinear<br>Simple verifications of these results | 7.2 Some properties of lines Parallelism, perpendicularity and concurrency | Simple geometrical results related to triangles and quadrilaterals to be verified as applications. | Charts and diagrams | |
| **of Trigono** | To use Trigonometric tables and estimate the values of sine, cosine and tangent ratios only for the range $0^o \leq ? \leq 90^o$ | 8.1Trigonometric ratios Use of Trigonometric tables | The approximate nature of values of be explained | Trigonometric Tables | **20** |

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| | To understand angles of elevation and depression To solve problems on height and distance using tangent ratio only | 8.2 Application Heights and distances | The approximate nature of values to be explained | Charts | |
| **9. Practical Geonometry** | To use the property of a cyclic quadrilateral in construction | 9.1 Cyclic Quadrilateral construction of Cyclic Quadrilateral | Recall relevant theorems in theoretical geometry | | **12** |
| | To construct a triangle when its base, vertical angle and one of the following is given. (i) median to the base (ii) altitude to the base. | 9.2 Special construction of a triangle | Recall related properties of angles in a circle before construction | Diagrams | |
| | To construct tangents / tangent segments to circle through (i) a point on it (ii) a point in its exterior | 9.3 Tangent segments construction of tangent segments | To introduce algebraic verification of length of tangent segments | Diagrams | |
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| **10. Handling Data** | To compute standard deviation and co-efficient of variation when an ungrouped data is given To determine consistency of performance among two different data | 10.1Dispersion Standard Deviation & Variance | Use real-life situation like performance in examination, sports etc. | Statistical information on sports | **12** |
| | To compute probability in simple cases using addition theorem and basic ideas | 10.2Probality Random experiments, Sample space and Events-Mutually Exclusive, complementary, certain and impossible events Addition Theorem | Three diagrams and investigations on coin tossing, die-throwing to be used | Experiments | |

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| **11. Graphs** | Graphing expressions of the form ax2+bx+c<br>To solve equations of the form ax2+bx+c=0 using graphs | 11.1.Quadratic Graphs Solving, quadratic equations through graphs | Interpreting skill also to be taken care of Graphs of quadratics to precede algebraic treatment | Graphs | **15** |
| | To interpret the following graphs Growth and decay rates Gradient of a curve Trapezoidal approximation to area under a curve Distance time graph Velocity time graph | 11.2.Some special graphs Growth and decay rates.<br>Gradient of a curve<br>Trapezodial approximation to area under a curve<br>Distance-time graph<br>Velocity time graph | Real –life situations to be introduced | Graphs | |
| | | | | Total | **224** |

## APPENDIX A

For the following theorems no rigorous proof is expected; only verification through paper-folding, drawing of figures, symmetry principles and transformation techniques is expected. To be tested through numerical problems and simple applications.

1. There is one and only one circle passing through three given non-collinear points
2. Equal chords of a circle are equidistant from the center and its converse
3. Angles in the same segment of a circle are equal
4. Angle in a semi-circle is a right angle and its converse.
5. Equal chords subtend equal angles at the center and its converse.
6. The locus of a point equidistant from two fixed points is the perpendicular bisector of the segment joining the two points.
7. The locus of a point equidistant from two intersecting lines is the pair of bisectors of the angles formed by the given lines.
8. If a line is drawn parallel to one side of a triangle, the other sides are divided in the same ratio.
9. If in two triangles, the corresponding angles are equal, then their corresponding, sides are proportional.
10. If the sides of two triangles, are proportional, the triangles are equiangular.

11. If one angle of a triangle is equal to one angle of the other and the sides including the angles are proportional, then the triangles are similar
12. The ratio of the areas of similar triangles is equal to the ratio of the squares of the corresponding sides.
13. In a triangle, if the square on one side is equal to the sum of the squares on the remaining tow, the angle opposite to the first side is the right angle.
14. A tangent at any point on a circle is perpendicular to the radius through the point of contact.
15. There is one and only one tangent at any point on the circle.
16. If a line touches a circle and from the point to contact a chord is drawn, the angles which this chord makes with the given line are equal respectively to the angles formed in the corresponding alternate segments.
17. If two chords of a circle intersect either inside or outside the circle, the area of the rectangle contained by the parts of the chord is equal in area to the rectangle by parts of the other
18. If two circles touch each other the point of contact lies on the line jointing the centers.

## APPENDIX B

1. Format logical proofs are required for the following theorems
2. Perpendicular from the center of a circle to a chord bisects the chord and its converse.
3. Angle subtended by an arceat the center is double the angle subtended by it at any point on the remaining part of the circles.
4. The sum of the opposite angles of a cyclic quadrilateral is 180 degrees and its converse
5. The lengths of two tangents from an external from an external point to a circle are equal
6. If a line divides any two sides of a triangle in the same ratio, the line is parallel to the third side.
7. The bisector of any angle of a triangle divides the opposite side in the ratio of the corresponding adjacent sides.
8. If a perpendicular is drawn from the vertex of a right angle to a hypotenuse, the triangles on each side of the perpendicular are similar to the whole triangle and to each other.
9. In a right triangle the square on the hypotenuse is equal to the sum of squares on the other two sides.