Learning Outcomes for Mathematics

Class- IX

Suggested Pedagogical Processes	Learning Outcomes
The learners may be provided with opportunities individually or in groups and encouraged to — • work with real numbers and consolidate the concepts of numbers learnt in earlier classes. Some such opportunities could be: ▪ to observe and discuss real numbers. ▪ to recall and observe the processes involved in different mathematical concepts studied earlier and find situations in which they come across irrational numbers. For example, finding the length of the diagonal of a square with side, say, 2 units or area of a circle with a given radius, etc. • to observe the properties of different types of numbers, such as, the denseness of the numbers, by devising different methods based on the knowledge of numbers gained in earlier classes. One of them could be by representing them on the number line. • to facilitate in making mental estimations in different situations, such as, arranging numbers like 2, 21/2, 23/2, 25/2, etc., in ascending (or descending) order in a given time frame or telling between which two integers the numbers like, √17, √23, √59, – √2, etc., lie. • y apply relevant results to factorise the polynomials. • draw and compare the graphs of linear equations in one or two	**The learner —** • **Applies** logical reasoning in classifying real numbers, proving their properties and using them in different situations. • **identifies/ classifies** polynomials among algebraic expressions and factorises them by applying appropriate algebraic identities. • **relates** the algebraic and graphical representations of a linear equation in one or two variables and applies the concept to daily life situations. • **identifies** similarities and differences among different geometrical shapes. • **derives** proofs of mathematical statements particularly related to geometrical concepts, like parallel lines, triangles, quadrilaterals, circles, etc., by

variables. • discuss the proofs of mathematical statements using axioms and postulates. • play the following games related to geometry. ▪ For Euclid's axioms, if one group says, If equals are added to equals, then the results are equal. The other group may be encouraged to provide example such as, If $a = b$, then $a + 3 = b + 3$, another group may extend it further as $a + 3 + 5 = b + 3 + 5$, and so on. ▪ By observing different objects in the surroundings one group may find the similarities and the other group may find the differences with reference to different geometrical shapes— lines, rays, angles, parallel lines, perpendicular lines, congruent shapes, non-congruent shapes, etc., and justify their findings logically. • work with algebraic identities using models and explore the use of algebraic identities in familiar contexts. • discuss in groups about the properties of triangles and construction of geometrical shapes such as, triangles, line segment and its bisector, angle and its bisector under different conditions. • find and discuss ways to fix position of a point in a plane and different properties related to it. • engage in a survey and discuss about different ways to represent data pictorially such as, bar graphs, histograms (with varying base	applying axiomatic approach and solves problems using them. • **finds** areas of all types of triangles by using appropriate formulae and apply them in real life situations. **constructs** different geometrical shapes like bisectors of line segments, angles and triangles under given conditions and provides reasons for the processes of such constructions. • **develops** strategies to locate points in a Cartesian plane. • **identifies and classifies** the daily life situations in which mean, median and mode can be used. • **analyses** data by representing it in different forms like, tabular form (grouped or ungrouped), bar graph, histogram (with equal and varying width and length), and frequency polygon. • **calculates** empirical probability through experiments and describes its use in words.

lengths) and frequency polygons. • collect data from their surroundings and calculate central tendencies such as, mean, mode or median. • explore the features of solid objects from daily life situations to identify them as cubes, cuboids, cylinders, etc. • play games involving throwing a dice, tossing a coin, etc., and find their chance of happening. • do a project of collecting situations corresponding to different numbers representing probabilities. • visualise the concepts using Geogebra and other ICT tools.	• **derives** formulae for surface areas and volumes of different solid objects like, cubes, cuboids, right circular cylinders/ cones, spheres and hemispheres and applies them to objects found in the surroundings. • **solves** problems that are not in the familiar context of the child using above learning. These problems should include the situations to which the child is not exposed earlier.

Learning Outcomes for Mathematics

Class- X

Suggested Pedagogical Processes	Learning Outcomes
The learners may be provided with opportunities individually or in groups and encouraged to — • extend the methods of finding LCM and HCF of large numbers learnt earlier to general form. • discuss different aspects of polynomials, such as — their degree, type (linear, quadratic, cubic), zeroes, etc., relationship between their visual representation and their zeroes. • play a game which may involve a series of acts of factorising a polynomial and using one of its factors to form a new one. For example, one group factorizing say, ($x3 – 2x2 – x – 2$) and using one of its factors $x–1$ to construct another polynomial, which is further factorized by another group to continue the	**The learner —** • **generalises** properties of numbers and relations among them studied earlier to evolve results, such as, Euclid's division algorithm, Fundamental Theorem of Arithmetic and applies them to solve problems related to real life contexts . • **develops** a relationship between algebraic and graphical methods of finding the zeroes of a polynomial.