

# Mathematics

Code No. 311

## Introduction

Mathematics is an indispensable subject area in the school education because of its wide application in our day today activities as well as in different fields of education. Access to quality education in mathematics is very important for every individual. Mathematics is considered to be a system of logic. It is the subject of systematic study of quantitative phenomena around us. It is based on certain logical connotation of numbers and integral part of human civilization. Mathematics is a creative activity and is one of the most useful, fascinating and stimulating divisions of human knowledge. It is a process of managing and communicating information and has the power to predict and provide solutions to practical problems as well as enabling the individual to create new imaginative worlds to explore. We use Mathematics in everyday life, in science, in industry, in business and in our free time. Mathematics education is concerned with the acquisition, understanding and application of skills. Mathematical literacy is of central importance in providing the learner with the necessary skills to live a full life as a child and later as an adult. Society needs people who can think and communicate quantitatively and who can recognize situations where Mathematics can be applied to solve problems.

## Rationale

Mathematics is an important discipline of learning at the Senior Secondary stage. It helps the learner in acquiring decision making ability through its applications to real life both in familiar and unfamiliar situations. It predominantly contributes to the development of precision, rational reasoning and analytical thinking. The Senior Secondary stage is most crucial where learners for the first time move towards diversification. At this stage, the learners start thinking, taking important decisions concerning their future career by choosing suitable courses. It is the stage, from where learners would either go for higher academic education in Mathematics or for Professional courses or it may be the end of their academic career. One of the basic aims of learning Mathematics at Senior Secondary level is to be developed problem solving skills and quantificational experiences around the learners. The idea is to allow the learner to realize how and why Mathematics is all around us. In view of these facts, it is important to make Mathematics Education at this level broad based and meaningful. The revised curriculum in Mathematics has been designed to meet the needs of diverse learners.

## Objectives

After completing this course, learner will be able to:

- describe basic concepts, facts, principles, terms, symbols and processes of Mathematics;
- convert the word problems in to the mathematical forms and solve them;
- explain different ways of processing the given data and help for arriving at conclusions;
- express the skills of quantification of experiences and make linkage with day-today life;
- solve wide variety of mathematical problems in daily life and reflect in different context of learning; and

- relate mathematical knowledge and skills to solve variety of problems and develop positive attitude towards Mathematics and its application.

## Scope and job opportunity

This field has a large number of opportunities for employment in different profession, some of these are: Engineering, Architecture, Statisticians, Banking, Econometrics and other professions involves Measurement and Calculation.

## Eligibility conditions

**Age:** 15 years

**Qualification:** 10<sup>th</sup> Pass

**Medium of instruction:** Hindi, English, Urdu, Bengali, Gujarati and Odia medium.

**Duration of the course:** 1 Year

## Weightage

**Theory:** 100 Marks

**Tutor Marked Assignment (TMA):** 20% Marks of the Theory

**Scheme of studies:** Theory (300 hours) and TMA (Self paced)

**Scheme of evaluation:** The learner will be assessed through Continuous and Comprehensive Evaluation (CCE) in the form of Tutor Marked Assignment (TMA) as well as Public Examination. The following table shows the details:

Mode of evaluation	Syllabus/Contents	Duration	Weightage
Tutor Marked Assignment (TMA)	All Contents under SLM Part-1.	Self Paced	20%
Public/Final Examination	All Contents under SLM Part-2.	3 Hours	80%

**Pass criteria:** 33% Marks

## Course content

S. No.	Module/Topics	Duration (in hours)	Module Approach/Description	Weightage (marks)
<b>Part-1: [For Tutor Marked Assignment]</b>				
1.	<b>Module-I Sets, Relations and Functions</b>	30	Sets and functions are the most fundamental concepts which together constitute the foundation of Mathematics. These two	Assessed through TMA

	<ol style="list-style-type: none"> <li>1. Sets</li> <li>2. Relations and Functions-I</li> <li>3. Trigonometric Functions-I</li> <li>4. Trigonometric Functions-II</li> <li>5. Relation between Sides and Angles of A triangle</li> </ol>		<p>fundamental concepts are used in different branches of Mathematics. This module will motivate you to understand different concepts and definitions of sets, relations and functions defined on sets of real numbers. It is of great importance for learners to be able to relate the functions to trigonometric ratios. This module will help to learner in grasping many properties about relations and functions. Further this knowledge will help to understand trigonometric functions, trigonometric identities and values of trigonometric functions for different angles to solve trigonometric equations, use of Sine and Cosine rules to find the angles and sides of a triangle and to understand the graph of trigonometric functions.</p>	
2.	<p><b>Module- II</b>  <b>Sequences and Series</b></p> <ol style="list-style-type: none"> <li>1. Sequence and Series</li> <li>2. Some special sequences</li> </ol>	15	<p>Sequences have many important applications in several spheres of human activities. In this module you will be able to understand the concept of sequence and terms of sequence. Sequences, following specific patterns are called progressions. A sequence is called arithmetic progression if the difference between any two consecutive terms is constant and called geometric progression if the ratios between any two consecutive terms is constant. It is important to define a rule to represent a sequence which helps in finding any term of sequence. You also need a rule to find the sum of any sequence. You will be able to understand arithmetic and geometric mean and</p>	Assessed through TMA

			relation between these two means. Finally in the end of the module you will understand the concept of series and will be able to find the sum of some special series.	
3.	<b>Module –III</b> <b>Algebra-I</b> 8. Complex Numbers 9. Quadratic Equations 10. Principle of Mathematical Induction 11. Permutations and Combinations 12. Binomial Theorem	30	Some equations are not solvable in real number system. Thus, there is a need to extend the real number system to a larger number system so that we can have the solutions of such equations. In this module the real number system shall extend to a larger system called complex number system, so that the solutions of quadratic equations are possible. Induction is the process of reasoning from particular to general. The principle of Mathematical Induction helps us in proving some of the tentative conclusions. In daily life you come across many problems of finding the number of ways of arranging or selecting objects. Under this module you also learn some basic techniques of counting which will enable us to answer the number of ways of arranging or selecting objects in a wide variety of situations. Arrangements lead to Permutations and selection leads to Combinations. The Binomial Theorem enables us to expand any power of a binomial expression.	Assessed through TMA
4.	<b>Module-IV</b> <b>Co-ordinate Geometry</b> 13. Cartesian system of rectangular co-ordinates 14. Straight Lines	30	Coordinate Geometry is that branch of Mathematics which deals with the study of geometry by means of algebra. You will know that a straight line or a curve in a plane can be represented by an algebraic equation. In coordinate geometry,	Assessed through TMA

	<p>15. Circles</p> <p>16. Conic Sections</p>		<p>you can represent a point in a plane by an ordered pair of real numbers, called coordinates of the point, and a straight line or a curve by an algebraic equation with real coefficients. You can use algebra advantageously to the study of straight lines and geometric curves which reveal their nature and properties. The curves known as conics were named after their historical discovery as the intersection of a plane with a right circular cone. In this module you will learn the intersection of a plane with a double napped right circular cone results in different types of curves. You will also understand the standard equations of parabola, ellipse and hyperbola and circle and will study their simple properties.</p>	
5.	<p><b>Module-V</b></p> <p><b>Statistics and Probability</b></p> <p>17. Measures of Dispersion</p> <p>18. Random experiments and events.</p> <p>19. Probability</p>	15	<p>Statistics is one of the fundamental areas of Mathematics that is applied across many disciplines and is useful in analysis in industrial production, market etc. The study of statistics produces statisticians that analyze raw data collected from the field to provide useful insights about a population. The statisticians provide concrete backgrounds of a situation that helps in decision making. The most common measures of variability for quantitative data are the variance; its square root, the standard deviation; the statistical range; inter quartile range; and the absolute deviation. On the other hand, the study of probability helps decision making in government agents and organizations based on</p>	<p>Assessed through TMA</p>

			the theory of chance. Probability has also been extensively used in the determination of high, middle and low quality products in industrial production. The basic idea of statistics and Probability will help in your day today life and in your further higher studies	
<b>Part-2: [For Public Examination]</b>				
6.	<b>Module-VI</b> <b>Algebra-II</b> 20. Matrices 21. Determinants 22. Inverse of a Matrix and its Applications	30	The study of the field of Linear Algebra will equip you with the requisite background knowledge and understanding which will enable you to understand such topics as simple linear equations and their solutions; vectors and operations on vectors; matrices and operations on matrices. Matrices are used in a large number of disciplines. In this module you shall learn about matrices and shall confine yourself to the study of basic laws of matrix algebra. You shall also understand the concept of elementary row and column operation and invertible matrices. In this module you shall learn about determinants, their expressions, minors and cofactors, their elementary properties, applications of determinants in finding the area of triangle, adjoint and inverse of a square matrix, consistency and inconsistency of system of linear equations and unique solution of linear equations in two or three variables using inverse of a matrix.	17
7.	<b>Module-VII</b> <b>Relations and Functions</b> 23. Relation and	30	In this module you will learn about reflexive, symmetric, transitive and equivalence relations.	12

	<p>Functions-II</p> <p>24. Inverse Trigonometric Functions</p>		<p>You will also learn about the composition of functions and their different properties. This module will help you to test the bijectivity of functions and to find the inverse of any function. The binary operations like addition and multiplication constitute the set of real numbers as one of the most familiar algebraic structure. You will be able to find identity element and inverse of an element of a set. You will also study about inverse trigonometric functions, its domain, and range and simplify expressions involving inverse trigonometric functions. The inverse trigonometric functions play a very important role in calculus and are used extensively in science and engineering.</p>	
8.	<p><b>Module-VIII</b></p> <p><b>Calculus</b></p> <p>25. Limits Continuity</p> <p>26. Differentiation</p> <p>27. Differentiation of Trigonometric functions</p> <p>28. Differentiation of exponential and Logarithmic functions</p> <p>29. Application of Derivatives</p> <p>30. Integration</p> <p>31. Definite Integrals</p> <p>32. Differential equations</p>	60	<p>Calculus is an important part of Mathematics at senior secondary level. This module begins by introducing the concept of limits. The concept of limit leads to understand the concept of continuity of elementary functions. In this module, you will learn about the basic concept of the derivative and integral functions. Derivatives have a wide range of applications in various fields and disciplines. You will learn that how derivative can be used to determine the rate of change of various quantities. you will also understand that integration and differentiation are inverse operations. You will come across two types of problems in integrals i.e. problem of finding a function whose derivative is given and problem of finding the</p>	45

			area bounded by the graph. These two problems lead to the two forms of integrals, indefinite integrals and definite integrals, which together form integral calculus. In the end of the module you will be able to define and solve differential equations i.e. to find the unknown function that satisfy the given differential equation	
9.	<b>Module-IX</b> <b>Vectors and Three Dimensional Geometry</b> 33. Introduction to 3-D 34. Vectors 35. Plane 36. Straight Line	30	There are many physical situations which cannot be described completely by using just one number. For example, if you know that an aeroplane is travelling at 700 km/h, you may like to know the direction in which it is flying. In this module you will about vectors that are very helpful in describing and analyzing many physical situations around us. Earlier you have studied analytical geometry in two dimensions, now you shall use vector algebra to Three-Dimensional geometry which helps us to solve different physical situations through geometry. In the end of this module you shall study about the direction cosines and direction ratios of a line and also know to find angle between two lines, shortest distance between two lines, the vector and Cartesian equations of a line and a plane, angle between two planes, angle between a line and a plane and distance of a point from a plane.	17
10.	<b>Module-X</b> <b>Linear Programming and Mathematical Reasoning</b> 37. Linear Programming	30	Linear equations and linear in equations in one and two variables. These equations can be solved algebraically or graphically. On the basis of solutions of linear in	09



	38. Mathematical Reasoning		equations you will be able to solve problems on linear programming. The main objective of study of logic is to construct good or sound arguments, and to recognize bad or unsound arguments. Logic is a science of reasoning. In this module you will learn about study of logic in Mathematics, which is prominently called Boolean logic.	
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