LESSON PLAN

CLASS XII

APPLIED MATHEMATICS

(241)

Ch-1
Numbers,Quantification and numerical applications

No. of teaching days required to complete this chapter:30

P.K.Testing:
Students should have knowledge of prime numbers,binary numbers and decimal system.

Learning outcomes:
Students will be able to

- Apply arithmetic operations
- enlist simple arithmetic functions
- apply the rule of alligation and mixture
- determine the mean price of mixture
- determine the time taken by two or more piped to fill or empty the tank
- describe the basic concepts of numerical applications

Procedure:
Following topics will be discussed
Arithmetic Modulo
Congruence modulo
Boats and streams
Pipes and cisterns
Races and Games
Linear Inequalities
Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: A project on Prime numbers and divisibility rules.
Art Integration:Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project work will be given.

Ch-2
Algebra

No. of teaching days required to complete this chapter:20

P.K.Testing:
Students should have knowledge of decimal numbers and operations on numbers.

Learning outcomes:
Students will be able to

- Understand and use concept of matrix and related terms
- Differentiate between types of matrices
- Understand and use concept of determinants
- Solve the system of linear equations by using Cramer's Rule and matrix method
- Apply concept of matrices and determinants to formulate and solve real life situations.

Procedure:
Matrices A matrix represents a collection of numbers arranged in an order of rows and columns. It is necessary to enclose the elements of a matrix in parentheses or brackets. A matrix with 9 elements is shown below.

$$[\,1\ 2\ 3\ 5\ 4\ 2\ 4\ 2\ 3\,] \qquad \begin{matrix} 1 & 2 & 3 \\ 6 & 5 & 4 \\ 7 & 8 & 8 \end{matrix}$$

This Matrix [M] has 3 rows and 3 columns. Each element of matrix [M] can be referred to by its row and column number. For example, a2*3=6
Order of a Matrix : The order of a matrix is defined in terms of its number of rows and columns. Order of a matrix = No. of rows ×No. of columns Therefore Matrix [M] is a matrix of order 3 × 3.
Transpose of a Matrix : The transpose [M]T of an m x n matrix [M] is the n x m matrix obtained by interchanging the rows and columns of [M]. if A= [aij] mxn , then AT = [bij] nxm where bij = aji
Properties of transpose of a matrix:

- (AT) ' = A
- (A+B)' = A' + B's
- (AB)' = B'A'

Singular and Nonsingular Matrix:
1. Singular Matrix: A square matrix is said to be singular matrix if its determinant is zero i.e. |A|=0
2. Nonsingular Matrix: A square matrix is said to be non-singular matrix if its determinant is non-zero.
Properties of Matrix addition and multiplication:
1. A+B = B+A (Commutative)
2. (A+B)+C = A+ (B+C) (Associative)
3. AB ≠ BA (Not Commutative)
4. (AB) C = A (BC) (Associative)
5. A (B+C) = AB+AC (Distributive)

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Evolves the idea of matrices as a way of representing and simplifying mathematical concepts.

Art Integration:Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project work will be given.

Ch-3
Differentiation and its Applications

No. of teaching days required to complete this chapter:25

P.K.Testing:
Students should have knowledge of limit ,continuity and derivatives.

Learning outcomes:
Students will be able to

- Find derivatives of implicit functions,parametric functions
- find second order derivative
- define cost and revenue function
- define marginal cost and marginal revenue
- find values of local maxima and local minima at a point
- determine the condition for increasing and decreasing functions

Procedure:
Differentiation is a method of finding the derivative of a function. Differentiation is a process, in Maths, where we find the instantaneous rate of change in function based on one of its variables. The most common example is the rate change of displacement with respect to time, called velocity.
Formulas of differentiation

- Power Rule: $(d/dx)(x^n) = nx^{n-1}$
- Derivative of a constant, a: $(d/dx)(a) = 0$.
- Derivative of a constant multiplied with function f: $(d/dx)(a.f) = af'$
- Sum Rule: $(d/dx)(f \pm g) = f' \pm g'$
- Product Rule: $(d/dx)(fg) = fg' + gf'$
- Quotient Rule: $\frac{d}{dx}(\frac{f}{g}) = \frac{g f' - f g'}{g^2}$.

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Demonstrates ways to relate differentiability and continuity of a function with each other

Art Integration:Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and they will be asked to make PPT and then presentation will be taken.

Ch-4
Integration and its Applications

No. of teaching days required to complete this chapter:25

P.K.Testing:

Students should have knowledge of differentiation and its formulae.

Learning outcomes:

Students will be able to

- define the terms anti derivative and indefinite integrals
- find integrals of simple algebraic functions by substitution,partial fractions and by parts
- apply properties of definite integrals
- Develops the processes in Integral calculus based on the ideas of differential calculus learnt earlier
- . Problem of finding function when where derivative is given
- apply definite integrals to find consumer surplus and producers surplus

Procedure:

The list of basic integral formulas are

- $\int 1\, dx = x + C$
- $\int a\, dx = ax + C$
- $\int x^n\, dx = ((x^{n+1})/(n+1)) + C$; $n \neq 1$
- $\int \sin x\, dx = -\cos x + C$
- $\int \cos x\, dx = \sin x + C$
- $\int \sec^2 x\, dx = \tan x + C$
- $\int \csc^2 x\, dx = -\cot x + C$
- $\int \sec x (\tan x)\, dx = \sec x + C$
- $\int \csc x (\cot x)\, dx = -\csc x + C$
- $\int (1/x)\, dx = \ln |x| + C$
- $\int e^x\, dx = e^x + C$
- $\int a^x\, dx = (a^x/\ln a) + C$; $a>0$, $a \neq 1$

These integral formulas are equally important as differentiation formulas. Some other important integration formulas are:

- $\int \frac{1}{\sqrt{1-x^2}}\, dx = \sin^{-1} x + C$
- $\int \frac{1}{1+x^2}\, dx = \tan^{-1} x + C$
- $\int \frac{1}{|x|\sqrt{x^2-1}}\, dx = \sec^{-1} x + C$
- $\int \sin^n(x)dx = \frac{-1}{n}\sin^{n-1}(x)\cos(x) + \frac{n-1}{n}\int \sin^{n-2}(x)dx$
- $\int \cos^n(x)dx = \frac{1}{n}\cos^{n-1}(x)\sin(x) + \frac{n-1}{n}\int \cos^{n-2}(x)dx$
- $\int \tan^n(x)dx = \frac{1}{n-1}\tan^{n-1}(x) - \int \tan^{n-2}(x)dx$
- $\int \sec^n(x)dx = \frac{1}{n-1}\sec^{n-2}(x)\tan(x) + \frac{n-2}{n-1}\int \sec^{n-2}(x)dx$
- $\int \csc^n(x)dx = \frac{-1}{n-1}\csc^{n-2}(x)\cot(x) + \frac{n-2}{n-1}\int \csc^{n-2}(x)dx$

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:

1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies

Experiential learning: Evolves the idea of matrices as a way of representing and simplifying mathematical concepts.

Art Integration:Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project work will be given.

Ch-5
Probability Distribution

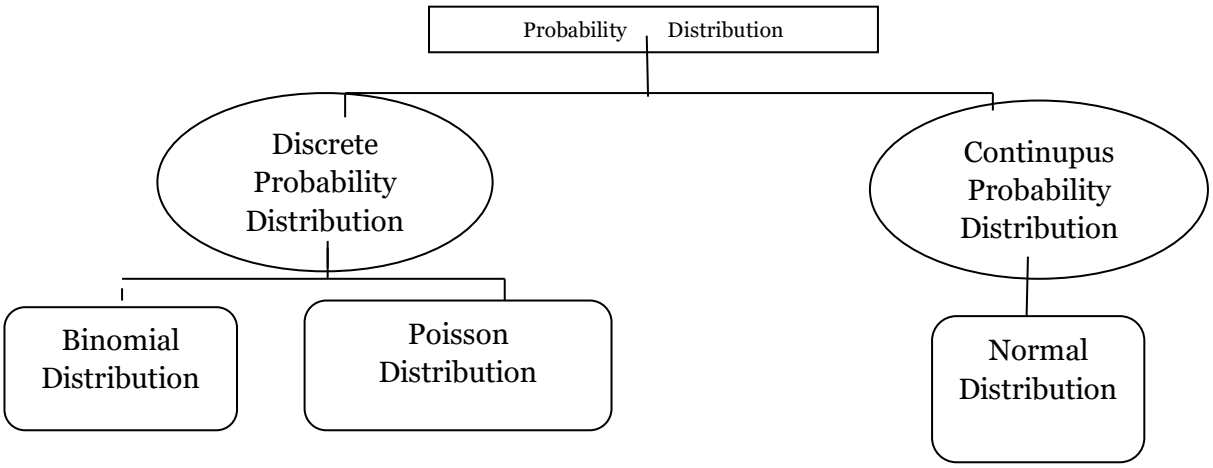
No. of teaching days required to complete this chapter:35

P.K.Testing:
Students should have knowledge of sample space,event and definition of probability.

Learning outcomes:
Students will be able to

- understand the concept of random variable
- write probability distribution of discrete random variable
- understand and apply concept of Binomial distribution
- understand and apply concept of Poisson distribution
- understand and apply concept of Normal distribution

Procedure:



Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Prediction of monsoon from past data.

Art Integration:Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project of Predicting mortality of infants will be given and students will be asked to present the project by PPT.

Ch-6
Inferential Statistics

No. of teaching days required to complete this chapter:10

P.K.Testing:
Students should have basic knowledge of Statistics.

Learning outcomes:
Students will be able to

- develop an understanding of population and sample
- understands the concept of parameter and statistical inference
- understands the idea of hypothesis testing
- use and extend the knowledge of inferential statistics and their applications in real life situations.

Procedure:
Inferential statistics is the process of using data analysis to understand the properties of an underlying distribution of probability. It takes data from a sample and makes inferences about the larger population from which the sample was drawn.We use t-test for this.

t test formula (1 sample) $t = M – \mu$ Sx Sample mean (M) minus population mean you are comparing your sample to (μ), divided by the standard error (Sx).

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Collect information of Vehicle registration data and correlating with pollution and number of accidents

Art Integration: Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project of Predicting mortality of infants will be given and students will be asked to present the project by PPT.

Ch-7
Time Based Data

No. of teaching days required to complete this chapter:30

P.K.Testing:
Students should have basic knowledge of bar graphs and simple arithmetic functions

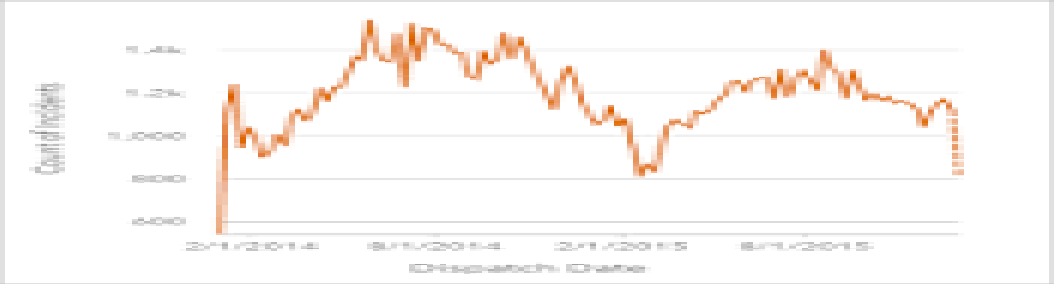
Learning outcomes:
Students will be able to

- familiarize with the characteristics and components of time series
- analysis time series for univariate data
- learn to compute and review trend analysis by method of moving averages
- learn to compute straight line trend analysis by using least squares method.

Procedure:

What is the plot of time series?

Time series graphs are **created by plotting an aggregated value (either a count or a statistic, such as sum or average) on a time line**. The values are aggregated using time intervals based on the time range in the data being plotted.



Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Analysis of a career graph of asports person. Conclude tghe best year of his/her career

Art Integration: Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project will be given and students will be asked to present the project by PPT.

Ch-8
Financial Mathematics

No. of teaching days required to complete this chapter: 50

P.K.Testing:
Students should have basic knowledge of financial mathematics terms like annuity, simple interest and compound interest.

Learning outcomes:
Students will be able to

- explain the concept of perpetuity and sinking fund
- Calculate EMI using various methods
- understand the concept of CAGR
- Differentiate between CAGR and Annual growth rate
- define the concept of linear method of depreciation
- calculate depreciation using linear method of depreciation.

Procedure:
All financial mathematics concepts are tested, from the mundane simple interest calculations, to timelines to present value and future value annuities or investments. If different amounts are invested at irregular intervals draw a timeline. Some important formulas to be used are as follows:

Simple interest:

$$SI=Prt$$
$$A= I+ SI$$

Compound Intertest

$$A=P(1+\frac{r}{100})^n$$

Effective rate:

$$r_e=P(1+\frac{r}{100})^n - 1$$

Future value of ordinary annuties and sinlimg fund:

$$S = R(\frac{(1=i)^n-1}{i})$$

Annuties Due:

$$S = R(\frac{(1+i)^n-1}{i}) - R$$

Present Value of an ordinary annuties and amortization:

$$P = R(\frac{1-(1+i)^{-n}}{i})$$

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies
Experiential learning: Project on Risk assessments by insurance firms from data.

Art Integration: Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project will be given and students will be asked to present the project by PPT.

Ch-9
Linear Programming Problems

No. of teaching days required to complete this chapter: 15

P.K.Testing:
Students should have basic knowledge of financial mathematics terms like annuity, simple interest and compound interest.

Learning outcomes:
Students will be able to

- understand the concept of LPP
- Know the mathematical formulation of LPP
- Distinguish between feasible solution and optimal solution
- Find optimal solution of LPP by graphical method
- Know the meaning of optimisation

Procedure:
Linear Programming problems: Linear programming problem is one in which we have to find optimal value (maximum or minimum) of a linear function of several variables (called objective function) subject to certain conditions that the variables are non-negative and satisfying by a set of linear inequalities with Variables are sometimes called division variables.

Terms related to Linear Programming
Objective Function: A linear function z = px + qy (p and q are constants) which has to be maximised or minimised, is called an objective function.

Constraints: The linear inequalities or equations or restrictions on the variables of the linear programming problem are called constraints. The conditions $x \geq 0$, $y \geq 0$ are called non-negative restrictions.

Optimal Value: The maximum or minimum value of an objective function is known as its optimal value.

Optimisation Problem: A problem, which seeks to maximise or minimise a linear function subject to certain constraints as determined by a set of linear inequalities, is called an optimisation problem.

Feasible Region: The common region determined by all the constraints including non-negative constraints x,y>0 of a linear programming problem is called the feasible region for the problem. The region other than the feasible region is called an infeasible region. The feasible region is always a convex polygon.

Feasible Solutions: Points within and on the boundary of the feasible region represent feasible solutions of the constraints. Any point outside the feasible region is called an infeasible solution.

Optimal Feasible Solution: Any point in the feasible region that gives the optimal value of the objective function is called the optimal feasible solution.

Bounded and Unbounded Region: A feasible region of a system of linear inequalities is said to be bounded, if it can be enclosed within a circle. Otherwise, it is called unbounded.

$$P = R\left(\frac{1-(1+i)^{-n}}{i}\right)$$

Resources: Mathematics handbook for Class XII by CBSE, Reference book by ML Aggarwal and Neeraj Raj Jain

Assessment for Students:
1. Multiple Choice Questions will be given.
2.Case study question related to topic will be given.
3.Exercise which are given in book.

Feedback and Remedial teaching: Retest will be taken on the basis of their marks in assessment and required revisions will be given to weak students.

Pedagogical Strategies

Experiential learning: To minimize the cost of the food, meeting the dietary requirements of the staple food of the adolescent students of your school

Art Integration: Figures and computer

Inter Disciplinary-linkages and infusion of life skills: Groups of students will be made and project will be given and students will be asked to present the project by PPT.