



Higher Secondary - First year

STATISTICS

Teachers'
Resource
Book





PREFACE

Statistics provides the student a wide range of knowledge, skills related activities and a system through which the student may describe and analyse, make predictions and solve problems. Based on these objectives, this textbook on Statistics is designed within the framework of TNCF 2017 by the textbook committee of subject experts.

In this new text book we have extensively revised the chapters of the previous text book, in the interest of clarity, accuracy and the application point of view. In every chapter, in the beginning, objectives of the lessons are given to transform the classroom process a learner centric. In some lessons, success stories are given as a source of inspiration. Directions are provided to students to conduct activities in order to explore and enrich the concept.

An ICT corner has been introduced in each unit for the first time to enhance digital literacy skills. To motivate the students to further explore the content digitally and take them to virtual world by scanning QR Code with their mobile phones.

As this textbook involves many problems based on numerical calculations, to save the time, the students are advised to use the calculators so that they can concentrate on results and inferences.

Many examples and exercise problems have been given in each chapter. But these problems only will not be sufficient to sharpen the student's statistical skill. The teacher and the student may discuss together and design their own problems and enhance the evaluation part of this textbook.

The Teacher's Manual on Statistics will help the teachers, know the role of presenting the challenging topics or concepts and to teach the subjects in the classroom effectively and to deal the problems with the suitable strategies. This will give the teachers a kind of guidelines to teach the topics. In the classroom situation, the teacher may adopt any suitable technique or method to make the children understand.

We hope this Teacher's Manual will be very useful to the teachers when they take classes for the students of statistics.

Authors.





TEACHER'S MANUAL

I. Introduction

The text book on statistics is designed within the framework of TNCF2017 by the textbook committee of subject experts and handling teachers in schools.

The aim of this manual is to help the teacher to have a clear idea about textbook. The challenging parts are identified by the authors and they are explained in detail separately for each chapter.

Let us briefly see the content of each chapter by analyzing what are already studied in earlier classes, what are already dealt in the previous textbook and what are new.

1. Scope of Statistics and Types of data

Many ideas, function and applications of statistics discussed in this chapter are available in the previous Text Book. The new term 'Big data' and its application are discussed in detail, 'Measurement of Scales' is introduced in this chapter.

2. Collection of data and Sampling Methods

Almost all concepts and terms discussed in this chapter are available in the previous textbook. In sampling methods, snowball sampling technique only is introduced in the new text book.

3. Classification and Tabulation data

The same topics were discussed in the previous textbook. The new topic 'Stem and leaf' is introduced in this text book.

4. Diagrammatic and Graphical representation of data

Pareto diagram is the only diagram newly introduced in this textbook. Other topics are already available in the previous text book.

5. Measures of Central Tendency

Though the same syllabus was discussed in the previous text book, some more new problems are included in this chapter.

6. Measures of Dispersion

Except the new topic 'The Box plot' all the other topics were discussed already in the previous text book.

7. Some Mathematical Methods

Permutations, combinations, Binomial series, exponential series, logarithmic series, limits, differentiation, integration, Double integrals are the new topics introduced in the present text book of the above, except double integral Binomial and other series all the other topics are brought up from the Twelfth standard.

8. Elementary Probability Theory

All the topics in this chapter are same as in the previous text book in XII standard.

9. Random variables and Mathematical Expectation.

The main concepts on Random Variables and Mathematical Expectation, which are in 12th std text book are brought to the 11th standard text book. The new topic introduced are

- (i) Joint and marginal probability mass function
- (ii) Joint and marginal probability density function
- (iii) Addition and Multiplication Theorem on Expectation

10. Probability distributions

All topics in this chapter are brought from 12th standard statistics textbook. In addition to that, fitting of normal distribution is newly introduced in this book

II. Special features of the present textbook

The following special features are given in the Statistics text book.

Career Guidance

List of further studies and profession

Do you know

Amazing facts related to statistics are given in each chapter.

Note

Additional information about the concepts

To enhance digital skills among students

QR code

To motivate the students to further explore the content digitally and take them into virtual world.

Glossary

Tamil translation of some important statistical terms

Reference Books

List of related books for further studies of the topics

Web links

List of digital resources.

Month/Week	Content	Transactional Periods
June I week	1.1 Origin and growth of statistics 1.2 Definitions 1.3 Functions of statistics 1.4 Scope and application	7 Periods
June II week	1.5 Big data 1.6 Variable and types of data 1.7 Measurement scales	7 Periods
June III week	2.1 Categories and sources of data 2.2 Methods of collecting primary data 2.3 Secondary data 2.4 Population	7 Periods
June IV week	2.5 Census method 2.6 Sampling methods 2.7 Probability sampling 2.8 Non probability sampling 2.9 Sampling and Non- sampling errors	7 Periods
July I week	3.1 Classification of data 3.2 Types of classification 3.3 Tabulation	7 Periods
July II week	3.4 Types of table 3.5 Components of a table 3.6 Frequency distribution	7 Periods



July III week	3.7 Cumulative frequency distribution 3.8 Bivariate frequency distribution 3.9 Stem and Leaf plot	7 Periods
July IV week	I Mid-Term Examination	
August I week	4.1 Meaning and significance of diagrams and graphs 4.2 Rules for constructing diagrams. 4.3 Types of diagrams	7 Periods
August II week	4.4 Types of graphs 4.5 Comparison among tables, diagrams and graphs 5.1 Definition of measures of central tendency 5.2 Characteristics for a good statistical average	7 Periods
August III week	5.3 Various measures of central tendency (1)	7 Periods
August IV week	5.3 Various measures of central tendency (2) 5.4 Empirical relationship among mean median and mode	7 Periods
September I week	5.5 Partition measures	7 Periods
September II week	Quarterly Examination	
October I week	6.1 Characteristics of a good measure of dispersion 6.2 Types of measure of dispersion 6.3 Absolute measures 6.4 Combined mean and Combined standard deviation	7 Periods
October II week	6.5 Relative measures 6.6 Moments 6.7 Skewness and kurtosis 6.8 Box plot	7 Periods
October III week	7.1 Fundamental principles of counting 7.2 Permutations 7.3 Combinations 7.4 Introduction to Binomial, Exponential and Logarithmic series	7 Periods
October IV week	7.5 Introduction to elementary calculus	7 Periods





November I week	8.1 Random experiments, Sample space, Sample points and event 8.2 Definitions of Probability 8.3 Axioms of probability 8.4 Addition theorem on Probability	7 Periods
November II week	8.5 Conditional Probability 8.6 Independent events 8.7 Multiplication theorem on Probability 8.8 Bayes' Theorem and its applications	7 Periods
November III week	Second Midterm examination	
November IV week	9.1 Definition of random variable 9.2 Discrete and continuous random variable 9.3 Probability mass function and probability density function 9.4 Distribution function and its properties 9.5 Joint and marginal probability mass functions	7 Periods
December I week	9.6 Mathematical expectation for discrete and continuous random variable 9.7 Addition and Multiplication theorem on expectation 9.8 Moments 9.9 Moment generating function 9.10 Characteristic function	7 Periods
December II week	Half Yearly Examination	
January I week	10.1 Discrete distributions	7 Periods
January II week	10.2 Continuous distributions 10.3 Fitting of Binomial, Poisson and Normal distributions	7 Periods
	Revision Examinations	



Challenges in the Chapter

Chapter 1

Scope of Statistics and Types of Data

Unit

1.5 Big Data
1.7 Measurement Scales

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To know about Big data. To understand different types of Measurement Scales. 	<ul style="list-style-type: none"> Knows about Big data and its applications. Differentiates ratio, Interval Scales. Understands that ratio scales are used for further calculations.
Recall (Testing previous knowledge): <p>Teachers may recall the previous knowledge in the respective content such as Basic knowledge of Qualitative and Quantitative data, nominal and ordinal scales.</p>	
Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <ul style="list-style-type: none"> 1.5 Big data and Challenges with Big data. 1.7.3 Interval Scales 1.7.4 Ratio Scales 	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Search Website for Big data and magazines.
Practical Activity	Teaching Learning Resources
<ol style="list-style-type: none"> Search the Big data information from magazines and web sites. Daily temperature may be converted from Centigrade to Fahrenheit. Conversion of Measures (Pounds to gm, cm to Inch, etc.,) 	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <ul style="list-style-type: none"> Reference Books Daily Newspapers, Magazines, etc., Text books , Websites.



Practical Activity	Teaching Learning Resources
Recap (Summarize the today's class room concepts)	Teachers can summarize the today's taught concepts or ask the students to summarize it. Teacher / Student summarize the topic discussed in the Class and the doubts of students are cleared then and there in the Class. We can give the applications of Big data in different fields.
Extensive Activities	To strengthen concepts teachers may give the following activities to the students <ul style="list-style-type: none"> various exercises or assignments Collect data from Newspaper and Media for further Statistical Investigation.
Student's Challenge	Remedial measure
Big data Interval Scales i. To convert centigrade to Fahrenheit 100° F to Centigrade 100° C to Fahrenheit	To know about Big data we can only collect the Information, but we cannot collect and analyze the data by ourselves. We have to use some software to collect and analyze. $100^{\circ} F = \frac{5}{9} [100^{\circ} - 32^{\circ}]$ $= \frac{5}{9} \times 68^{\circ} = 37.77^{\circ} C]$ $100^{\circ} C = 32 + \frac{5}{9} \times 100$ $= 32 + 180 = 212^{\circ} F$
Student's Challenge	Remedial measure
i. 60° F 120° F	$60^{\circ} F = = \frac{5}{9} [60^{\circ} - 32^{\circ}] C = 15.570^{\circ} C$ $120^{\circ} F = = \frac{5}{9} [120^{\circ} - 32^{\circ}] C = 48.870^{\circ} C$ We see that double the Fahrenheit value make the changes of more than the tripled value of centigrade. But the temperature remains the same. So, we should use interval scales carefully.



Chapter 2

Collection of Data and Sampling Methods

Unit

- 2.2.3 Questionnaire Method
- 2.7.1 Simple random Sampling
(Table of Random Numbers)
- 2.7.2 Stratified Random Sampling
- 2.7.3 Systematic Random sampling
- 2.8.2 Snowball Sampling

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To Distinguish primary and secondary data To design a questionnaire to collect data To know how to collect data To understand various types of sampling methods 	<ul style="list-style-type: none"> Distinguishes primary and secondary data Designs questionnaire by using the rules to prepare questionnaire Knows to collect the data Understands various types of sampling Methods

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as Teacher recalls the Primary data and Secondary data, Population Census and Sample

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <ul style="list-style-type: none"> (i) Questionnaire method (ii) Use of Random number table (iii) Stratified Random sampling (iv) Systematic Sampling (v) Snowball sampling 	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Inductive and Deductive Method Peer tutoring methods etc.,



Practical Activity	Teaching Learning Resources
<ol style="list-style-type: none"> 1. By giving some topic ask students to prepare a sample Questionnaire. (minimum 15 questions) 2. Select a sample using Random number table. 	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <ul style="list-style-type: none"> • Computer based devices • Random number tables. • Reference Books
Recap (Summarize the today's class room concepts)	Teachers can summarize the today's taught concepts or ask the students to summarize it.
Extensive Activities	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> • various exercises or assignments • Project work on sampling.

Student's Challenge	Remedial measure
<ol style="list-style-type: none"> 1. To prepare a Questionnaire. 2. Simple random sampling (use of Random Number table). 3. Stratified Random Sampling To select Strata 4. Systematic Sampling 5. Snowball sampling 	<p>(1) By showing them the model of a questionnaire, they can modify the topic and prepare a questionnaire</p> <p>(2) While preparing a questionnaire they should concentrate on the General guidelines given.</p> <p>They can use any type of random number table to select the sample.</p> <p>(i) When we select the strata we should see the homogeneity among the units within it.</p> <p>(ii) No. of strata will increase according to the size of the sample.</p> <p>(i) Select the first unit of sample at random</p> <p>(ii) Select next unit using $K = N/n$, where N and n are sizes of the population and sample respectively.</p> <p>It is used only for rare occurrences.</p>

Chapter 3

Classification and Tabulation of Data

Unit

3.8 Bivariate Frequency distribution
3.9 Stem and Leaf plot

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To form the bivariate frequency distribution table. To understand stem and Leaf plot 	<ul style="list-style-type: none"> Forms Bivariate frequency distribution table. Understands stem and Leaf plot.

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ Simple frequency table and extends it to the bivariate table.

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <ul style="list-style-type: none"> (i) Inclusive / Exclusive Limits (ii) Bivariate table (iii) Stem and Leaf plot 	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Inductive and Deductive Method Peer tutoring methods etc.,

Practical Activity	Teaching Learning Resources
<ul style="list-style-type: none"> (i) From Bivariate table using Marks scored by students in two subjects. (ii) Stem and leaf plot using heights of students in a Class. 	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <ul style="list-style-type: none"> Reference Book Website, etc.,



Recap (Summarize the today's class room concepts)	<p>Teachers can summarize the today's taught concepts or ask the students to summarize it.</p> <p>Teacher summarizes the procedure to form bivariate table and also makes the students to frame Stem and leaf plot by given data.</p>
Extensive Activities	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> • various exercises or assignments • Measures the height and weights of students in a class and form bivariate table. • Use the same measurements to make the stem and leaf plot

Student's Challenge	Remedial measure
(i) Inclusive / Exclusive class intervals.	(i) While giving tally marks to the data it should be made with careful attention. [0-9, 10-19,... Inclusive limits 0-10, 10-20, ... Exclusive limits]
(ii) Bivariate Frequency distribution table.	When entering the element in related cell we must be careful about row wise and column wise attributes.
(iii) Stem and Leaf plot	Arrange the data in ascending order before constructing Stem and leaf plot. Stem is the label for leading digit. Leaf is the label for trailing digit.

Chapter 4

Diagrammatic and Graphical representation of Data

Unit

- 4.3.2 Pareto diagram
- 4.3.5 Percentage bar diagram
- 4.4.4 Cumulative frequency curve (Ogive)

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To represent the given data in a diagram/graph and get more information about data To enumerate the unknown value using the graph To understand the data easily by seeing the diagram/ graph 	<ul style="list-style-type: none"> Represents the given data in a diagram/graph by understanding the nature of diagram Enumerates the unknown value from ogives (Median) Understands the nature of data

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ The diagrams/ graph already they have learnt in the previous classes and links with present topic

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>4.3.2 Pareto diagram</p> <p>4.3.5 Percentage bar diagram</p> <p>4.4.4 Ogives</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Website searches



Practical Activity	Teaching Learning Resources
(i) Draw Pareto diagram (ii) Draw percentage bar diagram (iii) Draw ogives	Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students. <ul style="list-style-type: none"> Reference books Websites
Recap (Summarize the today's class room concepts)	Teachers can summarize the today's taught concepts or ask the students to summarize it. Students draw the diagram/ graph in the class by themselves when the data is given.
Extensive Activities	To strengthen concepts teachers may give the following activities to the students <ul style="list-style-type: none"> various exercises or assignments Refer the graphs and diagrams from different sources.

Student's Challenge	Remedial measure
(i) Pareto diagram	Students should first arrange the given data in descending order and find the cumulative percentage. After completion of histogram then they have to draw the cumulative percentage curve
(ii) Percentage bar diagram Percentage and cumulative percentage	Students should find the percentage and cumulative percentage of the given data. In the diagram they have to mark the percentages one above the other (using percentage)
(iii) Cumulative frequency curve (Ogive)	Students should find the less than and more than cumulative frequencies and then draw the curves and the intersection of the curves will give the median value.



Chapter 5

Measures of Central Tendency

Unit

Duration (No. of periods) : 1

Various Measures of Central Tendencies

- Geometric Mean
- Harmonic Mean
- Mode

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> • To know the average as the representative of the entire group • To calculate the Mathematical averages and positional averages • To understand the relationship among the averages and stating their uses. 	<ul style="list-style-type: none"> • Finds the proper average according to the nature of data • Finds the relationship among the central tendencies

Recall (Testing previous knowledge):

- ✓ Mean, Median, Mode which they have studied in the previous classes
- ✓ Knowledge on reciprocals, square root and cube roots of numbers etc.,

Analysis of contents / Sub contents	Transactional Strategies
5.3.2 Geometric Mean Basic calculation of logarithms used. 5.3.3 Harmonic Mean Calculations of reciprocals 5.3.4 Mode Analysis table	<ul style="list-style-type: none"> • Problem Solving Method • Learning by doing Method • Peer Group Method • Inductive Method Deduction Method • Any method suitable to the situation. Practical Activity <ul style="list-style-type: none"> (i) Students to collect the data and find the average height/ weight of a particular class (ii) Finding average Mark of a Student/ Class/ School



Teaching Learning Resources	
<p>Teacher may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <ul style="list-style-type: none"> Records available in Schools, Magazines and in Newspapers etc., Reference books given in Text books Text books etc. 	
Recap (Summarize the today's class room concepts)	Questions are raised to identify the Importance of central tendencies ,about which particular value, observations are clustered.
Extensive Activities	<p>To analyze the data of any nature using the proper method of calculation.</p> <ol style="list-style-type: none"> Sufficient practice should be given for using the log tables/ antilog tables Sufficient practice to find reciprocals using calculator and write the numbers carefully in tables .

Student's Challenge	Remedial measure																								
(1) Finding Logrithm of a number <ul style="list-style-type: none">For finding the logarithmic values, first find the characteristic value and then find the mantissa from the tableFor finding antilogarithm, first find the mantissa from the table and then fix the characteristic part.	Use the below table as a model for finding logarithm and anti-logarithm. <table><tr><th>Number</th><th>Number of integers</th><th>Characteristic</th></tr><tr><td>1234</td><td>4</td><td>3</td></tr><tr><td>123.4</td><td>3</td><td>2</td></tr><tr><td>12.34</td><td>2</td><td>1</td></tr><tr><td>1.234</td><td>1</td><td>0</td></tr><tr><td>0.1234</td><td>0</td><td>-1 or $\bar{1}$</td></tr><tr><td>.0123</td><td>-</td><td>-2 or $\bar{2}$</td></tr><tr><td>.0012</td><td>-</td><td>-3 or $\bar{3}$</td></tr></table>	Number	Number of integers	Characteristic	1234	4	3	123.4	3	2	12.34	2	1	1.234	1	0	0.1234	0	-1 or $\bar{1}$.0123	-	-2 or $\bar{2}$.0012	-	-3 or $\bar{3}$
Number	Number of integers	Characteristic																							
1234	4	3																							
123.4	3	2																							
12.34	2	1																							
1.234	1	0																							
0.1234	0	-1 or $\bar{1}$																							
.0123	-	-2 or $\bar{2}$																							
.0012	-	-3 or $\bar{3}$																							
1. Finding reciprocal and writing the number of digits after decimal point	Insisting the students to write 4 digits after the decimal point. e.g. $\frac{1}{123} = 0.00813$ $= 0.00813$																								
2. Grouping the classes and allotting the tally marks eg. No. 5.26 (for finding Mode)	Tally marks should be given to the classes which have given highest total in a column.																								

Chapter 6

Measures of Dispersion

Unit

6.4 Combined Mean and Variance
6.3.3 Mean deviation about Mean/ Median
6.7.1 Co efficient of Skewness
6.7.2 Co efficient of Kurtosis

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To measure the Mean and Variance of combined data To find the mean deviation about Mean/ Median 	<ul style="list-style-type: none"> Measures the combined Mean and Variance Finds the mean deviation abut mean/ median and uses absolute value in calculation.

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

✓ Mean, Median, Variance and standard deviation

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>6.3.3 Mean deviation about Mean/ Median</p> <p>6.4 combined Mean and Variance</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method (any one of suitable method to find Mean, Median,..) Inductive Method Deductive Method (combined Mean and Variance) Problems may be solved with peer group



Practical Activity	Teaching Learning Resources
(i) Finds the Mean deviation about Mean/ Median using the values found in the practical activity of chapter 5 (ii) The combined Mean and Variance of the two section of a class can be found (for any (iii) category like height, weight etc)	Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students. (i) Reference books (ii) Data from Newspapers, Magazines etc (iii) Text book
Recap (Summarize the today's class room concepts)	Teachers can summarize the today's taught concepts or ask the students to summarize it. Teacher can ask students to summarize the content taught in the class.
Extensive Activities	To strengthen concepts teachers may give the following activities to the students <ul style="list-style-type: none"> various exercises or assignments Do the problems from other books.

Mean Deviation about Mean/ Median In example 6.4 Mean $x = 10$ Median = 9 \bar{x} 7 4 10 9 15 12 7 9 9 18 Combined variance $\sigma_{12} = \sqrt{\frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)}{n_1 + n_2}}$	<table> <tr> <th>$x - \bar{x}$</th><th>$x - median$</th></tr> <tr><td>$7 - 10 = -3 = 3$</td><td>$7 - 9 = -2 = 2$</td></tr> <tr><td>$4 - 10 = -6 = 6$</td><td>$4 - 9 = -5 = 5$</td></tr> <tr><td>$10 - 10 = 0$</td><td>$10 - 9 = 1$</td></tr> <tr><td>$9 - 10 = -1 = 1$</td><td>$9 - 9 = 0$</td></tr> <tr><td>$15 - 10 = 5$</td><td>$15 - 9 = 6$</td></tr> <tr><td>$12 - 10 = 2$</td><td>$12 - 9 = 3$</td></tr> <tr><td>$7 - 10 = -3 = 3$</td><td>$7 - 9 = -2 = 2$</td></tr> <tr><td>$9 - 10 = -1 = 1$</td><td>$9 - 9 = 0$</td></tr> <tr><td>$9 - 10 = -1 = 1$</td><td>$9 - 9 = 0$</td></tr> <tr><td>$18 - 10 = 8$</td><td>$18 - 9 = 9$</td></tr> </table> $n_1, n_2, \sigma_1, \sigma_2, d_1, d_2$ should be entered carefully in the formula	$ x - \bar{x} $	$ x - median $	$ 7 - 10 = -3 = 3$	$ 7 - 9 = -2 = 2$	$ 4 - 10 = -6 = 6$	$ 4 - 9 = -5 = 5$	$ 10 - 10 = 0$	$ 10 - 9 = 1$	$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$	$ 15 - 10 = 5$	$ 15 - 9 = 6$	$ 12 - 10 = 2$	$ 12 - 9 = 3$	$ 7 - 10 = -3 = 3$	$ 7 - 9 = -2 = 2$	$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$	$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$	$ 18 - 10 = 8$	$ 18 - 9 = 9$
$ x - \bar{x} $	$ x - median $																						
$ 7 - 10 = -3 = 3$	$ 7 - 9 = -2 = 2$																						
$ 4 - 10 = -6 = 6$	$ 4 - 9 = -5 = 5$																						
$ 10 - 10 = 0$	$ 10 - 9 = 1$																						
$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$																						
$ 15 - 10 = 5$	$ 15 - 9 = 6$																						
$ 12 - 10 = 2$	$ 12 - 9 = 3$																						
$ 7 - 10 = -3 = 3$	$ 7 - 9 = -2 = 2$																						
$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$																						
$ 9 - 10 = -1 = 1$	$ 9 - 9 = 0$																						
$ 18 - 10 = 8$	$ 18 - 9 = 9$																						



Chapter 7

Some Mathematical Methods - Part I

Unit

7.2 Permutation
7.3 Combination
7.4.1 Binomial Series

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To understand permutation as the arrangement To understand combination as the selection To know the Binomial series 	<ul style="list-style-type: none"> Understands and analyses the difference between permutation and combination Knows the Binomial series and applies in problems

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ Example of seating arrangement in a class and arrangement of items in a shop
- ✓ Teacher recalls the topic set language and the arrangement of elements on power set, to give the introduction to combination. Teacher recalls the Binomial series by recalling algebraic identities such as $(a \pm b)^2$, $(a \pm b)^3 \dots$

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>7.2 Permutation 7.3 Combination 7.4.1 Binomial series</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving using peer group etc and other Innovative method may be used by the teachers for the best learning



Practical Activity	Teaching Learning Resources
Arranging a group of students in a row in all possible ways selecting the students from the group	Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students. (i) Reference books (ii) Websites (iii) Library,etc
Recap (Summarize the today's class room concepts)	Teachers can summarize the today's taught concepts or ask the students to summarize it. Teacher summarizes counting principle, permutation and combination
Extensive Activities	To strengthen concepts teachers may give the following activities to the students ▪ various exercises or assignments ▪ problems from reference books
Student's Challenge	Remedial measure
Using permutations and combination in problems Example 7.5 In how many ways can five students stand for a photograph in a row?	(i) Understand the problem and apply the relevant method according to the arrangement or selection $5P_5 = 5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$
In how many ways five students can be selected from 5 students?	$5C_5 = 1$ In the above problem all the 120 arrangements have the same set of 5 students "Selection" the word itself says the problem comes under combination.
Example 7.10 In how many ways a committee of 5 members can be selected from 6 men and 5 women consisting of 2 men and 3 women?	Selection for men = $6C_2$ Selection for women = $5C_3$ Total no. of ways = $6C_2 \cdot 5C_3 = 150$ ways
Example 7.16 Find the middle term of the expansion $(3x + y)^2$	Number of term = 6 Middle term in the expansion is T_3 and T_4 $T_{r+1} = nC_r x^{n-r} a^r$ $n=5 \quad r=2$ $x = 3x \quad a = y$ To find T_3 $T_3 = 5C_2 (3x)^{5-2} y^2$ Similarly $T_4 = 90 x^2 y^3$ \therefore Middle term are $270 x^3 y^2$ and $90 x^2 y^3$ If in the expansion of $(x + a)^n$ if the value of a is negative, proper changes should be made in the formula $T_{r+1} = (-1)^r nC_r x^{n-r} a^r$



Chapter 7

Some Mathematical Methods - Part II

Unit

7.5.1 Differentiation

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To learn the evaluation of the limits To understand differentiation To know about repeated differentiation 	<ul style="list-style-type: none"> Learns to evaluate limits Understands differentiation, and repeated differentiation.

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

✓ Teacher recalls the functions, polynomial functions, rational functions etc

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>(i) Analysis of content / sub content</p> <p>(ii) Limits (Indeterminate form)</p> <p>(1) Differentiation</p> <p>(2) Product rule</p> <p>(3) Quotient rule</p> <p>(iii) Repeated Differentiation</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Inductive Method
Practical Activity	Teaching Learning Resources
<p>Problems from reference books</p>	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <p>(i) Reference books</p> <p>(ii) Text books</p>



Recap (Summarize the today's class room concepts)	<p>Teachers can summarize the today's taught concepts or ask the students to summarize it.</p> <p>Teacher summarizes the rules used for limits and differentiation for better understanding of students</p>
Extensive Activities	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> various exercises or assignments refer the reference books for more problems to solve
Student's Challenge	Remedial measure
<p>Limit</p> <p>Example 7.19</p> $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$	<p>When substituting limit, we get $\frac{0}{0}$ which is an indeterminate form</p> <p>In this situation we have to factorize the polynomial and simplify and then apply the limit</p> $\lim_{x \rightarrow 2} \frac{(x+2)(x-2)}{(x-2)} = \lim_{x \rightarrow 2} (x+2) = 4$ $y = x^4 e^x$
<p>Differentiation</p> <p>Example 7.20</p> <p>(i) $x^4 e^x$</p>	<p>Product rule</p> $(u v)' = u'v + uv'$ <p>(Writing the product function twice with addition and differentiate only one function at a time)</p> $y = x^4 e^x$ $y' = [x^4]'(e^x) + (x^4)[e^x]'$ $= 4x^3 \times e^x + (x^4)[e^x]'$ $= (4x^3 + x^4) e^x$ <p>(we can also extend the product rule.)</p> $y = \frac{x^2 - 1}{x + 3}$
<p>(ii) $\frac{x^2 - 1}{x + 3}$</p>	<p>Quotient rule</p> $\left[\frac{u}{v} \right]' = \frac{u'v - uv'}{v^2}$ $u = x^2 - 1, \quad v = x + 3$ $y' = \frac{[x^2 - 1]'(x + 3) - (x^2 - 1)(x + 3)'}{(x + 3)^2}$



Chapter 7

Some Mathematical Methods - Part III

Unit

7.5.2 integration

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To know Integration as the reverse process of differentiation To understand Integration of simple functions To apply double Integrals in problems 	<ul style="list-style-type: none"> Knows and understands Integration as the reverse process of differentiation Applies the skill of Integration for double integral
<p>Recall (Testing previous knowledge):</p> <p>Teachers may recall the previous knowledge in the respective content such as</p> <p>✓ Teacher Recalls the formulae used in differentiation to introduce integration</p>	

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>Analysis of contents / sub contents</p> <p>(i) Integration</p> <p>(i) Double Integrals</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Deductive Method
Practical Activity	Teaching Learning Resources
<p>Problems from reference books</p>	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <p>(i) Reference books</p> <p>(ii) Other text books</p>



<p>Recap (Summarize the today's class room concepts)</p>	<p>Teachers can summarize the today's taught concepts or ask the students to summarize it.</p> <p>Teacher summarizes both differentiation and integration.</p>
<p>Extensive Activities</p>	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> various exercises or assignments Refer the reference books and other Text books for more problems to solve the problems.
<p>Student's Challenge</p>	<p>Remedial measure</p>
<p>(i) Integration</p> $\int x^n dx = \frac{x^{n+1}}{n+1} + C$ <p>When n is negative and rational</p> $\int \frac{1}{x^6} dx$	$\begin{aligned}\int x^{-6} dx &= \frac{x^{-6+1}}{-6+1} + c \\ &= \frac{x^{-5}}{-5} + c \\ &= -\frac{1}{5x^5} + c\end{aligned}$
$\int \sqrt{x} dx$	$\begin{aligned}\int \sqrt{x} dx &= \int x^{\frac{1}{2}} dx \\ &= \frac{x^{\frac{1}{2}+1}}{\frac{1}{2}+1} + c \\ &= \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + c \\ &= \frac{2}{3} x^{\frac{3}{2}} + c\end{aligned}$
<p>(ii) Definite Integral</p> $\int_a^b f(x) dx = F(b) - F(a)$ $\int_{-1}^{+1} 5x^4 dx$ <p>Double integral</p> <p>Integral of a two variable function (x,y) over a region R, the double integral can be done by iterated integration $\int_a^b \int_c^d f(x,y) dy dx$</p>	<p>After the completion of integration process, we have to first apply the upper limit and then the lower limit and find the difference</p> $\begin{aligned}&= 5 \int_{-1}^{+1} x^4 dx \\ &= 5 \left[\frac{x^5}{5} \right]_{-1}^{+1} \\ &= [x^5]_{-1}^{+1} \\ &= [1^5 - (-1)^5] \\ &= 1 - (-1) \\ &= 1 + 1 = 2\end{aligned}$

Example 7.2.3

$$\int_0^1 \int_1^2 x^2 y \, dx \, dy, 0 \leq x \leq 1, 1 \leq y \leq 2$$

Let us first integrate with respect to x and then y

We can interchange the order of Integration also.

When we interchange the order of integration, the value will not change.

$$\int_1^2 \left[\int_0^1 x^2 \, dx \right] y \, dy = \int_1^2 \left[\frac{x^3}{3} \right]_0^1 y \, dy$$

$$= \int_1^2 \frac{1}{3} y \, dy$$

$$= \frac{1}{3} \left[\frac{y^2}{2} \right]_1^2$$

$$= \frac{1}{3} \left[\frac{4}{2} - \frac{1}{2} \right]$$

$$= \frac{1}{3} \times \frac{3}{2} = \frac{1}{2}$$

$$\int_0^1 \left[\int_1^2 y \, dy \right] x^2 \, dx$$

$$= \int_0^1 \left[\frac{y^2}{2} \right]_1^2 x^2 \, dx$$

$$= \int_0^1 \left[\frac{4}{2} - \frac{1}{2} \right] x^2 \, dx$$

$$= \int_0^1 \frac{3}{2} x^2 \, dx$$

$$= \frac{3}{2} \left[\frac{x^3}{3} \right]_0^1$$

$$= \frac{3}{2} \left[\frac{1}{3} - 0 \right]$$

$$= \frac{3}{2} \times \frac{1}{3}$$

$$= \frac{1}{2}$$

Chapter 8

Elementary Probability Theory

Unit

8.5.1 Conditional Probability
8.6 Independent Events
8.8 Bayes' Theorem

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To understand conditional probability To identify Independent events To apply Bayes' theorem 	<ul style="list-style-type: none"> Understands Conditional Probability Identifies Independent events and applies in Multiplicative Theorem Understands and applies Bayes' theorem

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ Teacher Recalls sample space, event, probability etc to introduce Conditional Probability, Independent events and Bayes' theorem.

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>8.5.1 Conditional Probability</p> <p>Clear idea should be given so that they can identify the event occurring first and the event which occurs later</p> <p>8.6. Independence events</p> <p>Guidance should be given to students for identifying the independent events.</p> <p>8.7. Bayes' theorem</p> <p>Formula should be written clearly, and it has to be explained clearly to avoid manipulation mistakes</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method and other innovative ideas may be given



Practical Activity	Teaching Learning Resources												
Problems from Reference books and other Text books	Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students. (i) Reference books (ii) Other text books												
Recap (Summarize the today’s class room concepts)	Teachers can summarize the today’s taught concepts or ask the students to summarize it. Teachers summarizes the important points discussed in the class and ask questions to students to identify clearly Bayes’ theorem and Independent events.												
Extensive Activities	To strengthen concepts teachers may give the following activities to the students <ul style="list-style-type: none">various exercises or assignmentsProblems form reference books and other text books are given												
Student’s Challenge	Remedial measure												
(1). 8.5.1 Conditional Probability (two situations) (i) Events occur simultaneously (ii) Events one after another	Example 8.13 has to be discussed <table><tr><td></td><td>\bar{A}</td><td>A</td></tr><tr><td>$\bar{B} (>25)$</td><td>600</td><td>400</td></tr><tr><td>$B (\leq 25)$</td><td>1900</td><td>1100</td></tr><tr><td></td><td>2500</td><td>1500</td></tr></table> By using the above We can easily explain and get the probability $P(A \cap B) = \frac{400}{4000}$ $P(A) = \frac{1500}{4000}$ $P(B/A) = \frac{P(A \cap B)}{P(A)}$ $= \frac{\frac{400}{4000}}{\frac{1500}{4000}} = \frac{400}{1500} = \frac{4}{15}$ $P(B/A) = \frac{400}{1500} = \frac{4}{15}$		\bar{A}	A	$\bar{B} (>25)$	600	400	$B (\leq 25)$	1900	1100		2500	1500
	\bar{A}	A											
$\bar{B} (>25)$	600	400											
$B (\leq 25)$	1900	1100											
	2500	1500											





Student's Challenge	Remedial measure
<p>8.6 Independent events Explain clearly $P(A/B) = P(A)$ and $P(B/A) = P(B)$</p>	<p>In reverse</p> $P(A/B) = \frac{400}{1000} = \frac{4}{10} = \frac{2}{5}$ <p>Explain with suitable example $P(A/B)=P(A)$ When A and B are independent</p> <p>Example 8.16 A-Head in first toss B-Head in second toss</p> $S = \{HH, HT, TH, TT\}$ $P(A) = \frac{1}{2}$ $P(B) = \frac{1}{2}$ $P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{\frac{1}{4}}{\frac{1}{2}} = \frac{1}{2}$ $P(A) = \frac{1}{2}$ <p>A and B are independent. Similarly we can prove the other</p> $P(B_j A) = \frac{P(A B_j) \times P(B_j)}{\sum P(A B_i) \times P(B_i)}, j = 1, 2, \dots, n$ <p>The difference between $P(B_j / A)$ and $P(A / B_j)$ is to be insisted.</p>
<p>Bayes' theorem</p> <p>Enter all values correctly in the formula to find out the probability using Bayes' theorem</p>	

Chapter 9

Random Variable and Mathematical Expectation

Unit

9.5 Joint and Marginal Probability Mass function/ probability density function

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To understand Joint Probability mass function and Joint Probability density function To understand and calculate Marginal Probability mass function and Marginal probability density function 	<ul style="list-style-type: none"> Understands Joint Probability Mass function and Probability density function Understands and calculates Marginal Probability Mass function and Probability density function

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ Teacher recalls double integral and discusses the Joint Probability Mass function and Joint Probability density function

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>Joint Probability Mass function</p> <p>Joint Probability density function</p> <p>Marginal Probability mass function</p> <p>Marginal Probability density function</p>	<p>Teachers may adapt any one of the following methods suitable to the content</p> <p>(i) Learning by doing Method</p> <p>(ii) Inductive /Deductive Method</p> <p>(iii) Peer group Method</p>
<p>Recap (Summarize the today's class room concepts)</p>	<ul style="list-style-type: none"> Teachers can summarize the today's taught concepts or ask the students to summarize it. Summarizes by recalling the definitions of Marginal Probability Mass functions and Marginal Probability Density Functions.



<p>Extensive Activities</p>	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> • various exercises or assignments • Problems given form reference books
Student's Challenge	Remedial measure
<p>Find Joint Probability Mass function for example 9.14</p> <p>Example 9.15</p> $f(x, y) = \frac{1}{8}(x+y) \quad 0 \leq x \leq 2, 0 \leq y \leq 2$ $= 0 \quad \text{otherwise}$ <p>Marginal Probability density function</p>	<p>$P(x, y) = 1/100$</p> $\sum P(x, y) = \frac{1}{100} \times 100 = 1$ <p>Joint probability is 1</p> $= \int_0^2 \int_0^2 \frac{1}{8}(x+y) dx dy$ $= \frac{1}{8} \left\{ \int_0^2 \int_0^2 x dx dy + \int_0^2 \int_0^2 y dy dx \right\}$ $= \frac{1}{8} \left\{ \int_0^2 \left[\int_0^2 x dx \right] dy + \int_0^2 \left[\int_0^2 y dy \right] dx \right\}$ $= \frac{1}{8} \left[\int_0^2 2 dy + \int_0^2 2 dx \right]$ $= \frac{1}{8} \left[(2y)_0^2 + (2x)_0^2 \right]$ $= \frac{1}{8} \left[(4-0) + (4-0) \right]$ $= \frac{1}{8} \times 8 = 1$ <p>$f(x) = \int_{-\infty}^{\infty} f(x, y) dy$</p> $= \int_0^2 \frac{1}{8}(x+y) dy$ $= \frac{1}{8} \left[xy + \frac{y^2}{2} \right]_0^2$ $= \frac{1}{8} \left[2x + \frac{4}{2} \right] - 0$ $= \frac{1}{8} (2(x+1))$ $= \frac{1}{4} (x+1)$ <p>Similarly we can find</p> $g(y) = \frac{1}{4} (y+1)$

Chapter 9

Random Variable and Mathematical Expectation

Unit

9.7 Addition and Multiplication theorem on Expectation

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To understand the concept of expectation To apply the theorems on Expectation for addition and multiplication 	<ul style="list-style-type: none"> Understands the concept of Expectation Applies the theorem on Expectation for Addition and Multiplication

Recall (Testing previous knowledge):

Teachers may recall the previous knowledge in the respective content such as

- ✓ Teacher recalls the concept of Random Variable for both discrete and continuous distributions and then extends the concept.

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <ul style="list-style-type: none"> (i) Addition theorem of random variables for continuous distribution (ii) Application of Multiplication theorem of random variables for discrete distribution 	<p>Teachers may adapt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> (i) Problem Solving Method (ii) Learning by doing Method (iii) Peer Group Method etc
<p>Recap (Summarize the today's class room concepts)</p>	<p>Teachers can summarize the today's taught concepts or ask the students to summarize it.</p> <p>Teacher summarizes expectation on Addition and Multiplication of two variables and insists that expectation of Multiplication of two variables is possible only when the variables are independent</p>



<p>Extensive Activities</p>	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> • Various exercises or assignments • Refer the reference books for more problems to solve
Student's Challenge	Remedial measure
<p>Example 9.24</p> <p>Expectation of addition of two variables (Continuous Distribution)</p> <p>$f(x,y) = \begin{cases} 4xy, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$</p>	$E(X+Y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} (x+y)f(x,y)dxdy$ $= \int_0^1 \int_0^1 (x+y)4xy \, dx \, dy$ $= 4 \left[\int_0^1 \int_0^1 x^2 y \, dx \, dy + \int_0^1 \int_0^1 xy^2 \, dx \, dy \right]$ $= 4 \left[\int_0^1 \left(\int_0^1 x^2 \, dx \right) y \, dy + \int_0^1 \left(\int_0^1 y^2 \, dy \right) x \, dx \right]$ $= 4 \left[\int_0^1 \frac{1}{3} y \, dy + \int_0^1 \frac{1}{3} x \, dx \right]$ $= \frac{4}{3} \left[\int_0^1 y \, dy + \int_0^1 x \, dx \right]$ $= \frac{4}{3} \left[\frac{1}{2} + \frac{1}{2} \right] = \frac{4}{3} \quad \rightarrow (1)$ $E(X) = \int_{-\infty}^{\infty} x f(x) dx$ $= \int_0^1 x \times 2x \, dx$ $= 2 \int_0^1 x^2 \, dx$ $E(X) = 2 \left[\frac{1}{3} \right] = \frac{2}{3}$ $E(Y) = \int_{-\infty}^{\infty} y g(y) dy$ $= \int_0^1 y 2y \, dy$ $= 2 \int_0^1 y^2 \, dy$ $E(y) = 2 \left[\frac{1}{3} \right] = \frac{2}{3}$



Student's Challenge	Remedial measure																
<p>(ii) Expectation of Multiplication of two independent random variables (discrete distribution)</p> <p>Example 9.25</p> <p>Two coins are tossed one by one. I throw is considered as X and II throw is considered as Y. following joint probability distribution is given by,</p> <table><tr><th><div>Y \ X</div></th><th>1</th><th>0</th><th>Total</th></tr><tr><th>1</th><td>0.25</td><td>0.25</td><td>0.5</td></tr><tr><th>0</th><td>0.25</td><td>0.25</td><td>0.5</td></tr><tr><th>Total</th><td>0.5</td><td>0.5</td><td>1</td></tr></table> <p>$E(XY) = E(X)E(Y)$</p>	<div>Y \ X</div>	1	0	Total	1	0.25	0.25	0.5	0	0.25	0.25	0.5	Total	0.5	0.5	1	<div>$E(X) + E(Y) = \frac{2}{3} + \frac{2}{3} = \frac{4}{3} \rightarrow (2)$</div> <div>From (1)&(2)</div> <div>$E(X + Y) = E(X) + E(Y)$</div> <div>$E(Y) = 2 \left[\frac{1}{3} \right] = \frac{2}{3}$</div> <div>$E(X) + E(Y) = \frac{2}{3} + \frac{2}{3} = \frac{4}{3} \rightarrow (2)$</div> <div>From (1)&(2)</div> <div>$E(X + Y) = E(X) + E(Y)$</div> <div>A random variable XY can take the values 0 and 1</div> <div>$E(XY) = \sum \sum xy p(x, y)$</div> <div>$= 1 \times 0.25 + 0 \times 0.25$</div> <div>$+ 0 \times 0.25 + 0 \times 0.25$</div> <div>$= 0.25$</div> <div>$E(X) = \sum x p_i$</div> <div>$= 1 \times 0.5 + 0 \times 0.5$</div> <div>$= 0.5$</div> <div>$E(Y) = \sum y p_i$</div> <div>$= 1 \times 0.5 + 0 \times 0.5 = 0.5$</div> <div>$E(X) \times E(Y) = 0.5 \times 0.5 = 0.25$</div> <div>$E(XY) = E(X) E(Y)$</div>
<div>Y \ X</div>	1	0	Total														
1	0.25	0.25	0.5														
0	0.25	0.25	0.5														
Total	0.5	0.5	1														



Chapter 10

Probability Distributions

Unit

10.3 Fitting of Distributions

Duration (No. of periods) : 1

Learning Objectives	Learning Out comes
<ul style="list-style-type: none"> To fit a frequency distribution to a closely resembling theoretical distribution. 	<ul style="list-style-type: none"> Fits a frequency distribution to a resembling theoretical distribution.
<p>Recall (Testing previous knowledge):</p> <p>Teachers may recall the previous knowledge in the respective content such as</p> <p>✓ Teacher recalls the probability functions, Binomial, Poisson, Normal Distribution.</p>	

Analysis of contents / Sub contents	Transactional Strategies
<p>In this area, the new concepts in the new text book or the challenging contents are given.</p> <p>Fitting of Normal Distribution</p>	<p>Teachers may adopt any one of the following methods suitable to the content</p> <ul style="list-style-type: none"> Problem Solving Method Learning by doing Method Peer Group Method etc
Practical Activity	Teaching Learning Resources
<p>For the distribution of number of heads obtained by tossing a coin sufficiently large number of times, normal distribution can be fitted.</p>	<p>Teachers may collect the suitable teaching learning materials/ resources to introduce the concepts effectively to the students.</p> <p>(iii) Reference Books</p> <p>(iv) Text books</p>
<p>Recap (Summarize the today's class room concepts)</p>	<p>Teachers can summarize the today's taught concepts or ask the students to summarize it.</p> <p>Teacher summarizes the method of fitting of normal distribution clearly and the doubts raised by the students are cleared.</p>



Practical Activity	Teaching Learning Resources																		
Extensive Activities	<p>To strengthen concepts teachers may give the following activities to the students</p> <ul style="list-style-type: none"> various exercises or assignments Average marks of students in a school of huge strength (n is large) fit to a normal -distribution. 																		
Student's Challenge	Remedial measure																		
<p>Example 10.26</p> <p>Fit a normal distribution for the following.</p> <table border="1"> <thead> <tr> <th>Class</th><th>Frequency</th></tr> </thead> <tbody> <tr> <td>60-65</td><td>3</td></tr> <tr> <td>65-70</td><td>21</td></tr> <tr> <td>70-75</td><td>150</td></tr> <tr> <td>75-80</td><td>335</td></tr> <tr> <td>80-85</td><td>326</td></tr> <tr> <td>85-90</td><td>135</td></tr> <tr> <td>90-95</td><td>26</td></tr> <tr> <td>95-100</td><td>4</td></tr> </tbody> </table>	Class	Frequency	60-65	3	65-70	21	70-75	150	75-80	335	80-85	326	85-90	135	90-95	26	95-100	4	<p>$\mu = 79.945$ $\sigma = 5.545$ $N = 1000$</p> <p>x_i - Lower boundary of the class interval</p> $Z_i = \frac{x_i - \mu}{\sigma}$ <p>$\phi(Z_i)$ is area under Standard Normal Distribution from $-\infty$ to Z_i.</p> <p>Find $\Delta\phi(Z_i) = \phi(Z_{i+1}) - \phi(Z_i)$</p> <p>Expected frequency = $N \times \Delta\phi(Z_i)$</p>
Class	Frequency																		
60-65	3																		
65-70	21																		
70-75	150																		
75-80	335																		
80-85	326																		
85-90	135																		
90-95	26																		
95-100	4																		

V. TEACHERS PROFESSIONAL DEVELOPMENT

“Professional development is defined as activities that develop an individual’s skills, knowledge, expertise and other characteristics as a teacher.”

Professional development decides the personality of an employee in any field. In field of education, it is must to update the knowledge and skill for teachers. For producing better children to meet the challenges in future, it is inevitable to enhance the professional skill in all possible ways.

Effective professional development is on-going, includes training, practice and feedback, and provides adequate time and follow-up support. Successful programmes involve teachers in learning activities that are similar to ones they will use with their students, and encourage the development of teachers’ learning communities. There is growing interest in developing schools as learning organisations, and in ways for teachers to share their expertise and experience more systematically.

The development of teachers beyond their initial training can serve a number of objectives including:

- to update individuals’ knowledge of a subject in light of recent advances in the area;
- to update individuals’ skills, attitudes and approaches in light of the development of new teaching techniques and objectives, new circumstances and new educational research;
- to enable individuals to apply changes made to curricula or other aspects of teaching practice;
- to enable schools to develop and apply new strategies concerning the curriculum and other aspects of teaching practice;
- to exchange information and expertise among teachers and others, e.g. academics, industrialists; and
- to help teachers become more effective.

VI. TYPES OF PROFESSIONAL DEVELOPMENT

Teachers are asked to participate in each of the following activities:

- courses/workshops (e.g. on subject matter or methods and/or other education-related topics);
- education conferences or seminars (at which teachers and/or researchers present their research results and discuss education problems);
- qualification programme (e.g. a degree programme);
- observation visits to other schools;
- participation in a network of teachers formed specifically for the professional development of teachers;
- individual or collaborative research on a topic of professional interest; and
- mentoring and/or peer observation and coaching, as part of a formal school arrangement.
- Paper publications/referring the educational journals will enhance the skill and knowledge in academic areas.

Recommendations

The hand book is meant for guiding the teachers at the initial level before handling the classes and to find the suitable methodologies to make the classroom interactions so effective. But the teachers may go for additional preparations for better references and equipping themselves as because inclusion of very few challenging contents dealt in this hand book.

*Wishes for outstanding teaching learning process.
All the best.*



Statistics Teachers' Hand Book – Class XI

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This book has been printed on 80 G.S.M.
Elegant Maplitho paper.

Printed by offset at:

