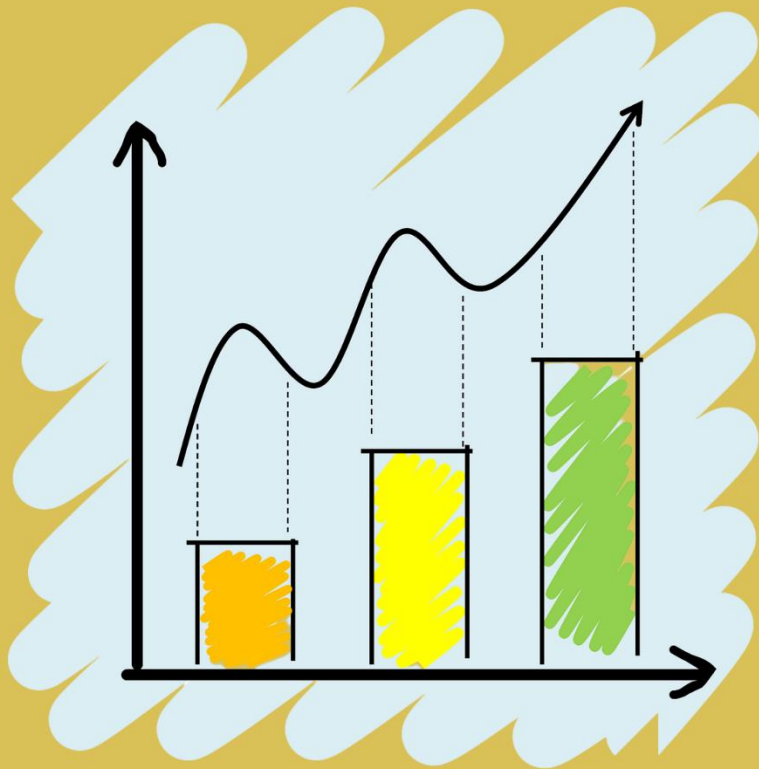


# Practical Manual

## STAT 3202

### Statistical Methods and applications



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FINAL REMARKS OF COURSE TEACHER

Exercise No: 1

## Construction of Frequency Distribution

### Steps in construction of frequency distribution:

- Step 1. Determine the number of classes
- Step 2. Determine the class width
- Step 3. Set up the individual class limits
- Step 4. Tally the items into the classes
- Step 5. Count the number of items in each class

1. The following data related to the grain yield in (g /plot) of a sorghum variety from experimental plots of equal area from a continuous frequency distribution. Prepare a frequency distribution and cumulative frequency distribution.

196	169	126	181	174	164	209	143	65	165
194	129	166	164	154	139	128	120	80	168
150	186	156	179	153	157	155	115	676	171
118	143	191	148	152	187	129	119	139	177
191	214	167	165	186	111	155	164	125	99
86	170	111	169	141	164	89	180	225	139
127	136	144	165	154	74	156	142	162	160
171	134	177	178	168	165	188	131	154	107
189	156	176	150	142	144	153	190	183	180
161	170	195	136	91	187	152	145	98	166

### **SOLUTION:**

Number of Classes,  $k = 1 + 3.322 \log_{10} N =$

Class width,  $C = | \max - \min | / k =$

Lower limit as  $L = \min - \frac{c' - k' - (\max - \min)}{2} =$

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Exercise No: 2

### Measures of Central Tendency

1. If the weights of 5 ear heads of sorghum are 100, 102, 118, 124 & 126, find the mean weight?
2. Calculate the mean value for the frequency distribution of weights of sorghum ear heads?

Wt of ear head	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
number	6	28	35	55	30	15	12	9

3. If the weight of sorghum ear heads are 45, 60, 48, 100 & 65, find the median
4. Find out the median and mode for the following data

Wt of ear head	40-60	60-80	80-100	100-120	120-140	140-160	160-180	180-200
number	6	28	35	55	30	15	12	9

5. Calculate the mode value for the following frequency distribution

C.I	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Freq.	4	2	18	22	21	19	10	3	1

6. Find out the mean, median and mode for weekly wages of 100 workers in a farm

Weekly wages	Number of workers
20-24	4
25-29	5
30-34	12
34-39	23
40-44	31
45-49	10
50-54	8
55-59	5
60-64	2

7. The following data gives number of flowers observed from 20 plants. Find the arithmetic mean, geometric mean, harmonic mean

42, 88, 37, 75, 98, 93, 73, 62, 96, 80, 52, 76, 66, 54, 73, 69, 83, 62, 53, 79

8. Table below gives the distribution of the heights of 60 students in a Senior High school. Find  $Q_1$  &  $Q_3$

Height	145-150	150-155	155-160	160-165	165-170	170-175
No: of students	3	9	16	18	10	4

9. Find  $P_{25}$ ,  $P_{50}$  &  $P_{75}$  and  $D_5$  and  $Q_2$  for the data given below

class	frequency	cf
0-10	11	11
10-20	18	29
20-30	25	54
30-40	28	82
40-50	30	112
50-60	33	145
60-70	22	167
70-80	15	182
80-90	12	194
90-100	10	204

Exercise No: 3

Measures of Dispersion

1. The following value represent district wise yield value of black pepper in Kerala. Find Range and Quartile deviation

300,350,550,420,340,655,250,360,250,315,200,138,275,120

2. Find the mean deviation about mean for the following data

Class interval	Frequency
13-17	2
17-21	22
21-25	19
25-29	14
29-33	3
33-37	4
37-41	6
41-45	1
45-49	1

3. Compute standard deviation and variance for the following data

Class interval	Frequency
2.5-3.5	4
3.5-4.5	6
4.5-5.5	10
5.5-6.5	26
6.5-7.5	24
7.5-8.5	15
8.5-9.5	10
9.5-10.5	5

4. The following table shows average distribution of wage of 200 workers in a factory. Compute quartile deviation for the data

wages	No: of workers
0-40	30
40-80	25
80-120	30
120-160	45
160-200	25
200-240	13
240-280	24
280-320	8

5. The following are the data on number of insects caught during different days by two different types of traps. Determine which trap show more variation with respect to the number of insects caught

Trap 1: 41 34 33 36 40 25 31 37 34 30 38

Trap 2: 52 57 62 55 64 57 56 55

6. The following value represents the yield obtained from 15 mango trees. Find the quartile deviation, mean deviation and standard deviation.

105,102,91,86,150,96,70,175,110,101,99,66,120,135,79

Exercise No: 4

### Skewness and Kurtosis

1. Two frequency distributions show the following results. Which of the two is more skewed?

Distribution	Mean	Median	Standard Deviation
I	120	80	12
II	70	65	12

2. The first 4 moments about the A. M. for a frequency distribution are 0, 2.5, 0.7 and 18.75. Find skewness and kurtosis.
3. Calculate the Bowley's coefficient of skewness

Class	Frequency
100-200	50
200-300	250
300-400	100
400-500	100
500-600	300
600-700	50
700-800	50
800-900	50
900-1000	50

4. In a frequency distribution mean = 65, median = 70,  $S_{kp} = -0.6$ , find mode and coefficient of variation?
5. In a frequency distribution, the  $S_{kp}$  based on quartiles is 0.6, sum of lower and upper quartiles is 100 and median is 38, find the quartiles?



## Exercise No: 5

Correlation Analysis

1. The gain in weight of 10 children (x) and the increase in levels of protein content in their diet (y) are recorded as follows. Find the correlation between increase in weight and level of protein content

X	3	4	8	10	12	11	9	8	13	15
Y	5	7	10	12	13	14	11	8	16	20

2. The following are data based on an average number of tillers (x) and the corresponding yield (y) from 10 samples of turmeric crop. Find the correlation between yield and number of tillers

X	3.5	3.5	3.5	3.8	3.6	3.7	2.8	4.2	4	4.5
Y	2	1.8	1.9	2.1	2	2.3	1.7	2.5	2.6	3

3. The following are data on grain yield (y), number of ears per plant ( $x_1$ ), ear length ( $x_2$ ) and 100 grain weight ( $x_3$ ) of eight varieties of barley. Compute the correlation coefficient of grain yield with  $x_1$ ,  $x_2$  and  $x_3$

Y	104.9	88	80	80.8	60	96.4	91.4	91.8
$X_1$	50.2	41.8	39.2	37.8	35.6	53.4	43.8	50.6
$X_2$	20.5	19.5	19	20	20	19.2	19.5	19.7
$X_3$	3.9	3.7	4.5	4.3	4.1	4.2	4.3	4.2

4. The marks obtained by 9 recruits in the selection test (x) and proficiency test (y) are given below. Find Spearman's rank correlation coefficient

X	10	15	12	17	13	16	24	14	22
y	30	42	45	46	33	34	40	35	39

5. Three officers gave the following ranks to 6 candidates in an interview. Find the degree of agreement among the three officers.

Officers	Rating by officers to 6 candidates					
	1	2	3	4	5	6
1	1	6	3	2	5	4
2	1	5	6	4	2	3
3	6	3	2	5	4	1

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Exercise No: 6

### Regression Analysis

1. Estimate the linear regression of 100 grain weight (y) on ear length (x)

X	20.43	21.91	19.82	22.1	21.92	22.46	20.36	20.47	21.48	21.76	21.14	20.52
Y	3.92	4.42	4.17	4.32	4.39	3.57	3.92	3.3	4.25	3.91	3.87	4.47

2. Following data represents yield and yield attributing characters, estimate linear regression of y on  $x_1$  and y on  $x_2$

Grain yield (y)	Ear weight ( $x_1$ )	Ear length ( $x_2$ )
85.65	2.04	20.28
83.85	2.5	20.04
96.37	2.15	21.65
117.03	2.11	20.04
115.79	2.74	21.2
68.69	2.02	22.11
108.45	2.14	20.01
50.68	1.64	19.76
98.26	2.24	20.19
108.07	2.55	21.73
88.74	2.19	21.98
101.41	1.99	21.86
72.28	2.53	20.1

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Exercise No: 7

### Probability

1. A bag contains 3 red, 6 white and 7 blue balls. What is the probability that two balls drawn at random are one is white and other is blue?
2. A committee of five persons is to be made from 6 men and 9 women. If the selection is made randomly, what is the probability that the committee consist of 3 men and 2 women?
3. A bag contains 6 red and 5 blue balls. If 2 of them are drawn at random, what is the probability that one is red and one is blue?
4. From a pack of 17 cards numbered from 1 to 17, one is drawn at random. What is the probability that the number on that card is divisible by 3 or 7.
5. A candidate is appearing for two examinations A and B. Probability that he will pass the exam A is  $\frac{3}{5}$  and probability of passing B is  $\frac{1}{3}$ . The probability that he will pass both exams is  $\frac{1}{8}$ . What is the probability that the candidate will pass the either exam A or B?
6. Tickets were numbered from 1 to 100. They are well shuffled and a ticket is drawn at random. Find the probability that ticket drawn is
  - (a) an even number
  - (b) a number 5 or multiple of 5
  - (c) a number greater than 75
  - (d) a number which is a square
7. 20 candidates appear in two examinations A and B. Eight passed exam A, Seven passed exam B, Eight failed in both A and B. If one candidate is selected at random, find the probability that
  - (a) Passed both exam A and B.
  - (b) Failed only in A
  - (c) Failed in A or B

Exercise No: 8

## Probability Distributions

Binomial Distribution:

1. Determine the Binomial distribution for which mean is 4 and variance is 3
2. The incidence of disease due to Malnutrition is noticed in 20% of children in an area. What is the probability that out of 6 children selected at random (i) No child to get the disease (ii) One child to get the disease and (iii) 4 or more children will get the disease?
3. If on average, rain falls on 12 days in every 30 days, find the probability that (1) 1<sup>st</sup> of 4 days even in a week will be fine and the remaining days as wet.
4. The incidence of occupational disease in industry is such that the workers have 20% of chance of suffering from it. What is the probability that out of 6 workers 4 or more workers will have the chance of suffering from occupational disease?

Poisson Distribution:

1. 10% of tools produced in certain manufacturing process turned out to be defective. Find the probability that in a sample of 10 tools chosen at random if the no of defective follows Poisson distribution a) exactly 2 will be defective b) At least 4 will be defective c) At most 4 will be defective
2. A company known on the past experience that 3% of the bulbs they produced are defective. Assuming Poisson distribution find the probability of getting the following in a sample of 100 bulbs:  
  - (a) No defective
  - (b) 1 defective
  - (c) 2 Defectives
  - (d) 3 defectives.
3. It is noted that one tree out of 2000 trees of a farm used to get fire every year by lightning. If there are 4000 trees in a farm, what is the probability that exactly five trees will get fire during that year?
4. A book contains 200 printing mistakes distributed randomly throughout its 200 pages. What is the probability that a page observed at random contain at least 2 printing mistakes?

Normal Distribution:

1. Height of Barley plants in a field is assumed to follow normal distribution with an average height of 87.5 cm and with a S.D of 10 cm. A sample of 150 plants was selected from a plot of the field. Find the number of plants
  - (a) Having height between 70 cm and 90 cm
  - (b) Having height more than 100 cm.
  - (c)  $< 70$  cm.
2. Find the probability that a standard normal variate will lie between 0 and 1.25
3. Given that the average height attained by certain tree species is 50m with standard deviation of 8m. Find the probability that the height of tree grown in a farm is in between 34 and 62ms.
4. Given that the average number of rainy days in a place per year is normally distributed with mean number of days is 200 and standard deviation of 25 days. Find the probability that in a particular year there are more than 240 rainy days.
5. It is known that the average duration of crop is 120 days with a standard deviation of 40 days. Assuming that the duration of crop is normally distributed. Find
  - a. Probability that duration of crop exceeds 150 days
  - b. Probability that the duration between 100 and 150 days
  - c. Probability between 60 and 90 days.

## Exercise No: 9

Testing of Hypothesis

## Z test:

1. A sample of 900 leaves has got a mean weight of 3.4 gm. Test whether the sample is taken from a large population of leaves with mean 3.25 gm and standard deviation 2.61 gm
2. For a particular variety of wheat, it was estimated that 5 % of the plants were attacked by a certain disease. A sample of 600 plants of the same variety was observed and found that 50 plants were infected with that disease. Test whether the sample results are in conformity with the population.
3. In a survey on paddy farmers in 2 Panchayat, it was observed that 100 out of 350 farmers were adopted New technologies for production in the 1st Panchayat and 250 out of 600 farmers were adopted new technologies in the 2nd pan. Test the prop of paddy farmers in 2 Panchayat with respect to the adaptaion of technologies?
4. A breeder claims that the number of filled grains per panicle is more in a new variety of paddy ACM5 compared to that of an old variety ADT 36. To verify his claim a random sample of 50 plants of ACM 5 and 60 plants of ADT36 were selected from the experimental field. The following results were obtained. Test whether the claim of breeder is correct?  

$$\bar{x}_1 = 139.4 \quad \bar{x}_2 = 112.9 \quad S_1 = 26.86 \quad S_2 = 20.11$$
5. The correlation between yield and number of panicles based on a sample of 7 plants of paddy was found to be 0.86. Test whether the correlation of the population can be equal to 0.9?

## t and F test:

1. The height of plants in a particular field is assumed to follow the normal distribution. A random sample of 10 plants selected. The height in cm. was recorded as 143, 126, 137, 109, 137, 120, 114, 120, 126, and 131. Test whether the mean of the population is 120cm
2. The effectiveness of two sources of nitrogen namely ammonium chloride and urea were tested by an experiment on rice. The grain yield from two samples under the two sources is as follows.  
 Ammo. Chloride: 13.4, 10.9, 11.2, 11.8, 14.0, 15.3, 14.2, 12.6, 17.0, 16.2, 16.5, 15.7  
 Urea: 12.0, 11.7, 10.7, 11.2, 14.8, 14.4, 13.9, 13.7, 16.9, 16.0, 15.6, 16.0  
 Assess which source of nitrogen is better for paddy.
3. The data related to two random samples from two populations are given below. Test the significance between two population variances  
 Sample 1: 20, 16, 26, 27, 23, 22, 18, 24, 25, 14  
 Sample 2: 27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37

4. The following are marks obtained to students in two different subjects. Test whether there is any difference between marks of two subjects

Subject A: 16, 10, 28, 26, 15, 12, 18

Subject B: 30, 18, 35, 51, 40, 60, 17, 55

Exercise No: 10

### Chi-square test

1. Below given are votes obtained for two candidates in an election from the rural and urban areas. Test if the nature of area related to voting performance

	A	B	Total
Rural	620	380	1000
Urban	550	450	1000
Total	1170	830	2000

2. Sample analysis of examination results of 200 MBA students was made. It was found that 46 students have failed, 68 secured a third division, 62 secured second division and rest in first division. Are these figures in agreement with general examination result which is in the ratio of 4:3:2:1 for various categories respectively
3. A survey was conducted on 500 paddy farmers to study the impact of education on the adoption of HYV of rice. The education level was divided into 3 groups based on their score and are represented as low, medium and high. Similarly, the level of adoption was also divided into three groups low, average and high. Test whether education has any impact on adoption

Adoption level	Education		
	low	medium	high
Low	55	90	65
Average	25	100	55
High	145	80	25



## Exercise No: 11

Completely Randomized Design (CRD)

1. In order to find out the yielding abilities of five varieties of sesamum, an experiment was conducted in green house using a CRD with four pots per variety. The results are given in the table below. Analyze the data.

Variety				
V1	V2	V3	V4	V5
25	25	24	20	14
21	28	24	17	15
21	24	16	16	13
18	25	21	19	11

2. A varietal trial on green gram was conducted in a CRD with 5 varieties, V<sub>1</sub>, V<sub>2</sub>, V<sub>3</sub>, V<sub>4</sub> and V<sub>5</sub> with 3,4,5,4 and 4 replications respectively. The results are given below. Analyze the data

Variety				
V1	V2	V3	V4	V5
1.6	2.5	1.3	2.0	1.6
1.2	2.2	0.9	1.5	1.0
1.5	2.4	0.8	1.6	0.8
	1.9	1.1	1.4	0.9
		1.0		

Date \_\_\_\_\_

Exercise No: 12

### Randomized Block Design (RBD)

1. An experiment was conducted in RBD to study the comparative performance of fodder sorghum under rain fed conditions. The results are given below. Analyze the data

Variety	Replication			
	1	2	3	4
African tall	22.9	25.9	39.1	33.9
Co -11	29.5	30.4	35.3	29.6
FS-1	28.8	24.4	32.1	28.6
K-7	47.0	40.9	42.8	32.1
Co -24	28.9	20.4	21.1	31.8

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Exercise No: 13

### Latin Square Design (LSD)

1. An experiment was conducted in LSD to compare the yield of 5 varieties of wheat. The layout data pertaining to yield are given below. Analyse the data

E 7	C 11	B 6	A 5	D 6
A 3	E 7	C 11	D 7	B 5
B 4	D 8	A 4	C 9	E 8
D 8	A 5	E 9	B 4	C 12
C 10	B 5	D 9	E 8	A 4