Research Methodology & Statistics MSC 502, Monsoon Semester, 2022-2023

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1. Here are ages of 50 members of a social service program.

83	51	66	61	82	65	54	56	92	60
65	87	68	64	51	70	75	66	74	68
44	55	78	69	98	67	82	77	79	62
38	88	76	99	84	47	60	42	66	74
91	71	83	80	68	65	51	56	73	55

Use this data to construct *relative frequency distribution* using six equal intervals. The State policies on social service programs requires approximately 50% of the program participants to be older than 50.

(a) Is the program in compliance with the policy?

(b) Suppose the Director of social services wanted to know the proportion of program participants between 45-80 years old. Could you estimate the answer for her?

2. The results of a survey of incomes of 600 persons during a certain period are given in the table below.

Income	Below 3000	3000.-3999	4000 - 4999	5000 - 5999	6000 - 6999	7000 - 7999	8000 - 8999	9000 - 9999
Frequency	66	36	98	130	178	74	12	6

Construct a cumulative frequency table for the distribution and draw the cumulative frequency curve. From the graph, estimate the percentage of persons whose income is between 6500 and 9200.

3. In order to estimate the demand for a product, it may be important to identify the age groups to whom it will appeal, and the sizes of these groups. The table describes the resident population (in millions) by age in 1995 and 2005.

Age Group	1995	2005
Under 5 years	20	16
5-9	18	16
10-14	16	18
15-19	13	21
20-24	10	21
25-29	10	19
30-34	11	17
35-39	12	13
40-44	11	11
45-49	10	11
50-54	9	11
55-59	8	11
60-64	7	10
65 and over	16	25

(i) On the same graph, construct a cumulative relative frequency distribution for the 1995 and 2005 data.

(ii) Use your graph to determine what changes occurred in the age distribution between 1995 and 2005.

(iii) For its certain product, a company has identified the target age group as 16 to 22 years. What is the proportion change in the target market?

Measures of Central Tendency

4. The frequency distribution below shows the life of 400 bulbs tested at L&M Tube Company.

Life (in hours)	300 - 400	400 - 500	500 - 600	600 - 700	700 - 800	800 - 900	900 - 1000	1000 - 1100	1100 - 1200
No. of tubes	14	46	58	76	68	62	48	22	6

   a. Estimate the mean, median and mode of life of the bulb manufactured by the company.
   b. Estimate the lower and upper quartiles.
   c. A bulb is of good quality if its life is higher than the specification limit, *L*. Moreover, it was also found that 15% of the bulbs produced is defective. Estimate *L*.
   d. A tube having life more than 540 hours are of exportable quality. From the above test done by L&M Tube Company find what percentage of tubes are of exportable quality.

5. The distribution of weights of 100 men is shown below

Weights (Kg)	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99	100 - 109
Frequency	6	12	25	30	15	9	3

   a. For the above distribution find the mean of weights
   b. From the graph, estimate the Quartiles range and the percentage of men whose weight is between 68 to 82 kg.

6. Before purchasing stock in an electronic firm, the management of a mutual fund wants information concerning the price movements of the firm's stock during the last year. Thirty days of the last year were randomly selected and the closing price (in nearest Rs.) was recorded for each day.

33	20	45	41	52	36	21	33	41	36	48	29	50	28	33
49	26	51	28	32	35	32	28	50	35	39	30	30	28	29

   The mutual fund's management has decided it should purchase the stock only if the mean closing price for the last year is Rs 41 or more.

   a) Compute mean, median and mode of the closing prices.
   b) Construct a relative frequency histogram for the data and locate mean, median and mode on it.
   c) Do you think the mutual fund should purchase the firm's stock?

Measures of Dispersion

7. A time study was conducted in a factory with the help of two samples A and B consisting of 10 workers. The times taken by the workers in each case were recorded. From the particulars given below state which of the sample is more variable and which takes less time on an average?

Time taken in minutes										
Sample A	130	125	120	135	140	145	130	145	140	150
Sample B	132	146	137	145	130	125	138	140	143	144

8. The loads at which specimens of a certain alloy failed (in MPa) are as given below.

19.8	18.5	17.6	11.9	15.4	15.4	14.1	13.6	15.4	11.4
8.8	7.5	11.9	19.5	14.9	12.7	15.8	10.1	7.9	16.7

Compute (i) Range (ii) Quartile Deviation
(iii) Mean Absolute Deviation (iv) Standard Deviation

9. A study was conducted by the Mail Service Limited to investigate the daily volume of mails received per day. Daily mail volumes were observed for 100 days and subsequently the following frequency distribution was computed.

Mails in thousands	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100	100 - 110
Frequency	5	13	22	32	17	8	3

(i) Estimate the Quartile Deviation.
(ii) For the above distribution find the standard deviation of daily mail volume.
(iii) Find Coefficient of Variation
(iv) Estimate measures for skewness and kurtosis and interpret the results.