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Section B

Semester 5<sup>th</sup>

Mid term Exam Summer

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Date 19<sup>th</sup> August, 2020.

Probability & Statistics

Q.4: The following figure give the number of children born to 50 women.

2	6	1	5	4	3	3	8	3	1
4	3	3	0	5	2	1	4	3	3
5	3	3	6	3	3	2	2	7	3
1	4	2	4	4	4	6	8	10	7
7	5	6	5	3	2	3	9	2	2

- (i) Construct a Grouped and ungrouped frequency Distribution of these data?
- (ii) Find mode and Median from grouped & ungrouped frequency distribution.

Solution:-

$$\text{Range} = X_m - X_0$$

$$10 - 0$$

$$\frac{10}{5} = 2$$

Class limit	Frequency
0-2	13
2-4	21
4-6	9
6-8	5
8-10	2

Grouped Data:

$$\text{Median} = l + \frac{h}{2} \left( \frac{n}{2} + c \right)$$

$l$  = lower class boundary

$h$  = class interval

$f$  = frequency

$$= 2 + \frac{2}{21} \left( \frac{50}{2} - 13 \right)$$

$$\text{Median} = 3$$

Mode is most repeated number  
which is 3

Part "B"  
~~Grouped~~

	Freq	Mid	c.F
0-2	13	1	13
2-4	21	3	34
4-6	9	5	43
6-8	5	7	48
8-10	2	9	50

$$\text{Mode} = l + \frac{f_m - f_0}{2f_m - f_0 - f_1} \times h$$

Ungrouped data

$$\begin{aligned} \text{Median} &= \left( \frac{n}{2} \right)^{\text{th}} \\ &= \left( \frac{50}{2} \right) \\ &= 25 \end{aligned}$$

Mode is 3 most repeated number

P.T.O.

Q.102. The following is the distribution of wages per thousand employees frequency distribution in a certain factory.

Classes	Class boundaries	Frequency (f)	Cumulative frequency (CF)
2 - 4	1 - 5	3	3
6 - 8	5 - 9	13	16
10 - 12	9 - 13	6	22
14 - 16	13 - 17	10	32
18 - 20	17 - 21	5	37
22 - 24	21 - 25	3	40
26 - 28	25 - 29	5	45
30 - 32	29 - 33	3	48
34 - 36	33 - 37	2	50

$$\Sigma f = 50$$

Quintiles:

$$Q_2 = \frac{n}{4} \Rightarrow \frac{50}{4} = 12.5$$

12.5 lies in 5 - 9 class boundary

So

$$Q_1 = l + \frac{h}{z} \left( \frac{n}{4} - c \right)$$

$$= 5 + \frac{4}{13} \left( \frac{50}{4} - 3 \right)$$

$$= 5 + .30 (12.5 - 3)$$

$$= 5 + .30 (9.5)$$

$$= 7.85$$

$$Q_2 = \frac{2n}{4} \rightarrow \frac{2 \times 50}{4} = 25$$

25 lies in 13-17 class boundary

So,

$$Q_2 = l + \frac{h}{z} \left( \frac{2n}{4} - c \right)$$

$$= 13 + \frac{4}{10} \left( \frac{2 \times 40}{4} - 22 \right)$$

$$= 13 + \frac{4}{10} (25 - 22)$$

$$= 13 + \frac{4}{10} (3)$$

$$= 13 + 1.2$$

$$Q_2 = 14.2$$

$$Q_2 = \frac{3n}{4} \Rightarrow \frac{3 \times 50}{4} \Rightarrow 37.5$$

37.5 lies in 21-25 class boundary

$$\begin{aligned} \text{So, } Q_3 &= l + \frac{h}{2} \left( \frac{3n}{4} - c \right) \\ &= 21 + \frac{4}{3} \left( \frac{3 \times 50}{4} - 37 \right) \\ &= 21 + \frac{4}{3} (0.5) \\ &= 21 + 0.67 \end{aligned}$$

$$Q_3 = 21.67$$

Deciles

$$D_1 = \frac{4}{10} \rightarrow \frac{50}{10} = 5$$

5 lies in 5-9 class boundary

$$\begin{aligned} \text{Hence } D_1 &= l + \frac{h}{2} \left( \frac{4}{10} - c \right) \\ &= 5 + \frac{4}{13} \left( \frac{50}{10} - 3 \right) \\ &= 5 + \frac{4}{13} (5 - 3) \\ &= 5 + \frac{4}{13} (2) \\ &= 5 + 0.61 \end{aligned}$$

$$D_1 = 5.61$$

$$D_2 = \frac{l+h}{2} \left( \frac{2n}{10} - c \right)$$

$$= \frac{5+4}{13} \left( \frac{2 \times 50}{10} - 3 \right)$$

$$= \frac{5+4}{13} (10 - 3)$$

$$= \frac{5+4}{13} (7)$$

$$D_2 = 5 + 2.15$$

$$D_2 = 7.15$$

$$D_3 = \frac{3n}{10} \Rightarrow \frac{3 \times 50}{10} = 15$$

15 lies 5-9 class boundary

Hence 
$$D_3 = \frac{l+h}{2} \left( \frac{3n}{10} - c \right)$$

$$D_3 = \frac{5+4}{13} \left( \frac{3 \times 50}{10} - 3 \right)$$

$$D_3 = \frac{5+4}{13} (15 - 3)$$

$$D_3 = 5 + 3.67 (12)$$

$$D_3 = 5 + 3.67$$

$$D_3 = 8.67$$

$$D_4 = \frac{4n}{10} \Rightarrow \frac{4 \times 50}{10} \Rightarrow 20$$

20 lies in 9-13 class boundary

$$\text{Hence } D_4 = \frac{l+h}{2} \left( \frac{4n}{10} - c \right)$$

$$D_4 = 9 + \frac{4}{6} (4)$$

$$D_4 = 9 + 2.67$$

$$D_4 = 11.67$$

$$D_5 = \frac{5n}{10} \Rightarrow \frac{50 \times 5}{10} \Rightarrow 25$$

25 lies in 13-17 class boundary

$$\text{Hence } D_5 = \frac{l+h}{2} \left( \frac{5n}{10} - c \right)$$

$$= 13 + \frac{4}{10} (25 - 22)$$

$$= 13 + \frac{4}{10} (3)$$

$$= 14.2$$

$$D_6 = \frac{6n}{10} \Rightarrow \frac{6 \times 50}{10} = 30$$

30 lies in 13-17 class boundary

Hence

$$\begin{aligned}D_6 &= \frac{l+h}{2} \left( \frac{6n}{10} - c \right) \\&= 13 + \frac{4}{10} \left( \frac{6 \times 50}{10} - 22 \right) \\&= 13 + \frac{4}{10} (30 - 22) \\&= 13 + \frac{4}{10} (8) \\&= 13 + 3.2 \\&= 16.2\end{aligned}$$

$$D_7 = \frac{7n}{10} \Rightarrow \frac{7 \times 50}{10} \Rightarrow 35$$

35 lies in 17-21 class boundary

Hence

$$D_7 = \frac{l+h}{2} \left( \frac{7n}{10} - c \right)$$

$$D_7 = 17 + \frac{4}{5} \left( \frac{7 \times 50}{10} - 32 \right)$$

$$D_7 = 17 + \frac{4}{5} (35 - 32)$$

$$= 17 + \frac{4}{5} (3)$$

$$= 17 + 2.4$$

$$= 19.4$$

$$D_8 = \frac{8n}{10} \Rightarrow \frac{8 \times 50}{10} \Rightarrow 40$$

40 lies in 21-25 class boundary

Hence

$$D_8 = l + \frac{h}{2} \left( \frac{8n}{10} - c \right)$$

$$= 21 + \frac{4}{3} \left( \frac{8 \times 50}{10} - 37 \right)$$

$$= 21 + \frac{4}{3} (40 - 37)$$

$$= 21 + \frac{4}{3} (3)$$

$$= 21 + 4$$

$$D_8 = 25$$

$$D_9 = \frac{9n}{10} \Rightarrow \frac{9 \times 50}{10} \Rightarrow \frac{450}{10} \Rightarrow 45$$

45 lies in 25-29 class boundary

Hence

$$D_9 = l + \frac{h}{2} \left( \frac{9n}{10} - c \right)$$

$$D_9 = 25 + \frac{4}{5} \left( \frac{9 \times 50}{10} - 40 \right)$$

$$D_9 = 25 + \frac{4}{5} (45 - 40)$$

$$D_9 = 25 + 4$$

$$D_9 = 29$$

inferential statistics  
Questions No. 3 :-

Define the following terms.

(a) Random Statistics :-

A numeric sequence is said to be statistically random when it contains no recognizable patterns or regularities. Sequences such as the results of an ideal dice roll or the digits of exhibit statistical randomness.

Statistical randomness does not necessarily imply "true" randomness is sufficient objective unpredictability. Pseudorandomness is sufficient for many uses, such as statistics, hence the name Statistical randomness.

## (b) Inferential Statistics:-

The process of reaching generalizations about the whole by examining a portion is called inferential statistics.

→ By using <sup>OR</sup> inferential statistics we draw inference about the characteristics of related problem and our inference gives non-numerical results.

## (c) Descriptive Statistics:-

The collection of data, analysis of data, summarization of data, interpretation of data, tabulation of data at last we get a precise result in numerical form is called descriptive statistics.

→ Descriptive statistics is concerned with the summarization and describing a body of data.

(d) Primary Data :-

The data in original raw form is called primary data.

Source of Primary data :-

- Direct personal investigation.
- Indirect investigation.
- Interview method.
- Collection through local sources.
- Questioner method.
- Collection through Enumerators.
- Computer interview method.

(e) Nominal Scale :-

"It can be defined as " the classification of the observation into mutually exclusive qualitative classes is said to be nominal scale "

Example →

(i) Students are classified as the classification of the observation as male and female. we may use number 1 and 2.

(ii) Rainfall may be classified as heavy, moderate and light. we may use number 1, 2 and 3.

The numbers when they are used only identify the categories. In this scale no particular order is used.