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Paper: Probability and Statistics.

Q.No 1:- The following figure gives the number of children to 50 women.....

Sol:- Group frequency distribution.

By scanning the data we find that the largest number of baby born is '10' and the smallest number is '0' so that the range is.

$$\begin{aligned} \text{Range} &= \text{largest value} - \text{Smallest Value} \\ &= 10 - 0 \\ &= 10. \end{aligned}$$

So, Suppose we take '6' classes equal size
Width of equal class interval would be

$$10/6 = 1.66 \Rightarrow 2.$$

Frequency Distribution of no. of children born.

Class	Class boundary	Tally	frequency
0-1	-0.5 - 1.5		5
2-3	1.5 - 3.5		22
4-5	3.5 - 5.5		12
6-7	5.5 - 7.5		7
8-9	7.5 - 9.5		3
10-11	9.5 - 11.5		1
			<u>50</u>

ii) Ungroup frequency Distribution:-

By scanning the data, we find that the number of children born is a ~~single~~ discrete variable and their range is small, so that the data can be conveniently sorted by taking the values of classes 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. A their frequency distribution is then constructed as:

No. of children born	Tally	frequency (f)
0		1
1		4
2		8
3		14
4		7
5		5
6		4
7		3
8		2
9		1
10		1

50.

Median for group data:-

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

l = lower class boundary.

h = class interval.

f = frequency.

Putting values.

$$\frac{n}{2} \text{ term} = \frac{50}{2} = 25.$$

Lower class boundary = 1.5

Upper class boundary = 3.5

Class boundary = $h = 3.5 - 1.5 = 2$.

$f = 22$.

$c = 5$

Putting values.

$$1.5 + \frac{2}{22} (25 - 5).$$

$$1.5 + \frac{1}{11} (20).$$

$$1.5 + 1.82$$

Median = 3.32 (grouped data).

Q No 2: The following is the distribution of wages per thousand employes in a certain factory.

Classes	2-4	6-8	10-12	14-16	18-20	22-24
F	3	13	6	10	5	3

Classes	26-28	30-32	34-36
F	5	3	2

Calculate all Quartiles and Deciles.

Sol:-

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
		<u>Σf = 50</u>	

Quartiles:-

$$Q_1 = \frac{n}{4} \Rightarrow \frac{50}{4} = 12.5$$

12.5 lies in 5-9 class boundary.

Sol:-

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

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

$$5 + \frac{4}{13} (12.5 - 3)$$

$$5 + .30(9.5) \Rightarrow 7.85$$

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

So, 25 lies in 13-17 class boundary.

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

$$= 13 + \frac{4}{10} \left(\frac{2 \times 50}{4} - 22 \right)$$

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

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

$$= 13 + 0.4(3)$$

$$Q_2 = 13 + 1.2 \Rightarrow 14.2$$

$$Q_3 = \frac{3n}{4} \Rightarrow \frac{3 \times 50}{4} \Rightarrow 37.5$$

So, 37.5 lies in 21-25 class boundary.

So!

$$Q_3 = l + h \left(\frac{3n}{4} - c \right)$$

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

$$21 + \frac{4}{3} (37.5 - 37)$$

$$21 + \frac{4}{3} (0.5)$$

$$D_3 = 21 + 0.67 \Rightarrow 21.67$$

Deciles :-

$$D_1 = \frac{n}{10} \Rightarrow \frac{50}{10} = 5$$

So: 5 lies in 5-9 class boundary.

$$D_1 = l + \frac{h}{f} \left(\frac{n}{10} - c \right)$$

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

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

$$5 + \frac{4}{13} (2)$$

$$5 + 0.61$$

$$D_1 = 5.61$$

$$D_2 = \frac{2n}{10} \Rightarrow \frac{2 \times 50}{10} = 10$$

10 lies in 5-9 class boundary.

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

$$D_2 = 5 + \frac{4}{13} \left(\frac{2 \times 50}{10} - 3 \right)$$

$$D_2 = 5 + \frac{4}{13} (10 - 3)$$

$$D_2 = 5 + \frac{4}{13} (7)$$

$$D_2 = 5 + 2 \cdot 15$$

$$D_2 = 5 + 2 \cdot 15 = 7 \cdot 15$$

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

15 lies in 5-9 class boundary.

Hence:

$$D_3 = 5 + \frac{4}{7} \left(\frac{3n}{10} - 3 \right)$$

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

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

$$D_3 = 5 + 0.307 (12)$$

$$D_3 = 5 + 3.69 \Rightarrow 8.69$$

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

20 lies in 9-13 class boundary.

$$9 + \frac{4}{6} (20 - 16)$$

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

$$D_4 = 9 + 2.67 = 11.67$$

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

25 lies in 13-17 class boundary.

Hence:

$$D_5 = \frac{l+h}{f} \left(\frac{S_n}{10} - c \right).$$

$$D_5 = 13 + \frac{4}{10} (25 - 22).$$

$$D_5 = 13 + \frac{4}{10} (3).$$

$$D_5 = 14.2.$$

$$D_6 = \frac{6_n}{10} = \frac{6 \times 50}{10} = 30.$$

30 lies in 13-17 class boundary.

Hence:

$$D_6 = \frac{l+h}{f} \left(\frac{6_n}{10} - c \right)$$

$$D_6 = 13 + \frac{4}{10} \left(\frac{300}{10} - 22 \right).$$

$$D_6 = 13 + \frac{4}{10} (8).$$

$$D_6 = 13 + 3.2 = 16.32.$$

$$D_7 = \frac{7_n}{10} = \frac{7 \times 50}{10} = 35.$$

35 lies in 17-21 class boundary.

Hence:

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

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

$$D_7 = 17 + \frac{4}{5} (3).$$

$$D_7 = 17 + 2.4 \Rightarrow 19.4.$$

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

40 lies in 21-25 class boundary.

Hence.

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

$$D_8 = 21 + \frac{4}{3} (40 - 37).$$

$$D_8 = 21 + \frac{4}{3} (3).$$

$$D_8 = 21 + 4 = 25.$$

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

45 lies in 25-29 class boundary.

So:

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

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

$$D_9 = 25 + \frac{4}{5} (5).$$

$$D_9 = 25 + 4 \Rightarrow 29.$$



Ans. 3: Define the following:

(a):- Random Statistics:-

In statistics a random variable is an assignment of numerical value to each possible outcome of an event space. This association facilitates the identification & the calculation of probabilities of the events.

(b):- Inferential Statistics:-

Inferential statistics is a branch of statistics through which we collect the data, analyze the data, summarize the data, interpret the data, and tabulate the data to get precise in non-numerical form.

(c):- Descriptive Statistics:-

Descriptive statistic is that branch of statistics which deals with concepts and methods concerned with summarization and description of important aspect of numerical data.

(d):- Sources of Primary Data:-

- (i) Direct personal investigation.
- (ii) Indirect investigation.
- (iii) Interview method.

- iv) Collection through local sources.
- v) Collection through Enumerators.
- vi) Questioner method.
- vii) Computer interview method.

e) Normal Scale :-

It can be define as the classification of the observation into mutually exclusive qualitative classes is said to be normal scale.

E.g.:-

(i) Students are classified as a 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 number when they are used, only identify the categories. In this scale no particular order is used.

