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Subject:

Probability & Statistics

Major Mid Assignment:

Submitted To:

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Question No 1:

1) Grouped 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

$$\text{Range} = \text{largest value} - \text{smallest value} \\ = 10 - 0$$

Suppose we ^{= 10} take '6' classes of equal size
so width of equal class interval
would be = $\frac{10}{6} = 1.66 \Rightarrow 2$

Frequency Distribution of number of children born

Class	Class Boundaries	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
			50

Ungrouped frequency Distribution :

By scanning the data, we find that the number of children born is a discrete variable and the range is small, so that the data can be conveniently sorted by taking the values of classes as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. The frequency distribution is then constructed as

Number of children born	Tally	frequency
0		1
1		4
2	 	8
3	 	14
4	 	7
5	 	5
6		4
7		3
8		2
9		1
10		1
		50

Part (B):

The modal group is 2-4 having highest frequency

Estimated mode

$$= l + \frac{f_m + f_{m-1}}{(f_m - f_{m-1}) + (f_m - f_{m+1})} \times W$$

$$= 1.5 + \frac{22 + 5}{(22 - 5) + (22 - 12)} \times 3$$

$$= 1.5 + \frac{27}{(17 + 10)} \times 3$$

$$= 1.5 + \frac{27}{27} \times 3$$

$$= 1.5 + (1) \times 3$$

$$= 1.5 + 3$$

estimated mode = 4.5

Median of grouped data

Class	frequency (f)	Cumulative freq (C.F)
0-2	5	5
2-4	22	27
4-6	12	39
6-8	7	46
8-10	3	49
10	1	50

Median Class

$$= \left(\frac{n}{2}\right)^{\text{th}} \text{ obs}$$

$$= \left(\frac{50}{2}\right)^{\text{th}}$$

Median class = 25th observation

from CF, 25th obs lies in class 2-4

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times w$$

$$= 2 + \frac{25 - 5}{22} \times 2$$

$$= 2 + \frac{20}{22} \times 2$$

$$= 2 + 1.8$$

$$\text{Median} = 3.8$$

Mode and Median of ungrouped data

$$\text{Mode} = 3$$

$$\text{Median} = \left(\frac{11 + 1}{2}\right)^{\text{th}}$$

$$= \left(\frac{12}{2}\right)^{\text{th}}$$

$$= 6^{\text{th}} \text{ data point}$$

$$\text{So median} = 5.$$

Question No 2:

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

$\Sigma = 50$

Quartiles:

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

12.5 lies in 5-9 class boundary

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

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

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

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

$$= 7.85$$

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

25 lies in 13-17 class boundary.

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

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

$$Q_2 = 13 + \frac{4}{10} (25 - 22)$$

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

$$Q_2 = 14.2$$

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

37.5 lies in 21-25 class boundary

So

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

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

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

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

$$= 21 + 0.67$$

$$Q_3 = 21.67$$

Deciles:

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

5 lies in 5-9 class boundary

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

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

$$= 5 + \frac{4}{13} (12)$$

$$= 5 + 0.61$$

$$D_1 = 5.61$$

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

10 lies in 5-9

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

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

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

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

$$D_2 = 5 + 2.15$$

$$D_2 = 7.15$$

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

15 lies in 5-9 class boundary

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

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

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

$$D_3 = 5 + 3.69$$

$$D_3 = 8.69$$

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

20 lies in 9-13 class boundary

$$\text{Hence } D_4 = l + \frac{b}{f} (4n - c)$$

$$D_4 = 9 + \frac{4}{6} (20 - 16)$$

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

$$D_4 = 9 + 2.67$$

$$D_4 = 11.67$$

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

25 lies in 13-17 class boundary

$$\text{Hence } D_5 = l + \frac{b}{f} (5n_{10} - c)$$

$$D_5 = 13 + \frac{4}{10} (5 \times \frac{50}{10} - 22)$$

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

$$= 13 + \frac{4}{10} (3) = 14.2$$

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

30 lies in 13-17 class boundary

Hence

$$D_6 = l + \frac{b}{f} (6n_{10} - c)$$

$$= 13 + \frac{4}{10} (6 \times \frac{50}{10} - 22)$$

$$= 13 + \frac{4}{10} (30 - 22)$$

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

$$= 13 + 3 \cdot 2$$

$$= 16 \cdot 2$$

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

35 lies in 17-21 class

Hence

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

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

$$D_7 = 17 + 4 \left(35 - 32 \right)$$

$$= 17 + 2 \cdot 9$$

$$= 19 \cdot 4$$

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

40 lies in 21-25 class boundary

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

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

$$= 21 + 4 \left(3 \right)$$

$$= 21 + 4 = 25$$

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

45 lies in 25-29 class

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

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

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

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

$$D_q = 25 + 4$$

$$D_q = 29.$$

Question No 3:

Define :

1) RANDOM STATISTICS:

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

2) DESCRIPTIVE STATISTICS:

Descriptive can be defined as:

→ 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.

3) INFERENCEAL STATISTICS:

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

4) SOURCES OF PRIMARY DATA:

- i) Direct personal investigation
- ii) Indirect investigation.
- iii) Interview method
- iv) Collection through Enumerators
- v) Questioner method.
- vi) Collection through local sources.
- vii) Computer interview method.

5) NOMINAL SCALE:

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

E.g

- Students are classified as male and female. We may use number 1 and 2.
- Rainfall may be classified as heavy, moderate and light. We may use 1, 2 and 3.