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Section: A

Subject:

Probability & Statistics

Question No. 2

ii) Grouped Frequency Distribution:

By scanning the data, we find that the largest number of body is "10" & the smallest number is "0", so that the range is

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

Suppose we take '6' rows of equal size, the width of equal class interval would be

$$\frac{10}{6} \Rightarrow 1.66 \Rightarrow \underline{\underline{2}}$$

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. As the range is small, so that the data can be conveniently separated by taking the values of classes as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. The frequency distribution then constructed are:

Number of Children	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

Q1 (b) Median for grouped data.

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

l = lower class boundary

h = class interval

f = frequency

Putting the values

$$\frac{n}{2} \text{ terms} = \frac{50}{2} = 25$$

$$\text{low class boundary} = 1.5$$

$$\text{upper class boundary} = 3.5$$

$$\text{class boundary } h = 3.5 - 1.5 = 2$$

$$f = 22$$

$$c = 5$$

Put the values

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

$$= 1.5 + \frac{20}{11}$$

$$= 1.5 + 1.82$$

$$\text{Median} = 3.32 \text{ Grouped data}$$

Median of ungrouped data.

Arrange data in ascending order

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

$$\begin{aligned}\text{Median} &= \frac{n}{2} \\ &= \frac{50}{2} \\ &= 25^{\text{th}} \text{ value} = \boxed{3}\end{aligned}$$

Mode of ungrouped data.

Maximum frequency number of the ungrouped data is called mode.

Mode = 3 → which is used 14 times.

Mode of grouped data.

$$\text{Formula} = l + \frac{f_m - f_a}{2f_m - f_1 - f_3} \times h$$

$$= 1.5 + \frac{22 - 5}{2(22) - 12 - 5} \times 2$$

$$= 1.5 + \frac{17}{27} \times 2$$

$$\text{Mode} = 2.76.$$

Question No. 2

Classes	Class Boundaries	Frequency (f)	Commulative frequency (CF)
2-4			
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:

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

12 lies in 5-9 class boundary

$$\begin{aligned}
 Q_1 &= l + h/f \left(\frac{n}{4} - c \right) \\
 &= 5 + \frac{4}{18} \left(\frac{50}{4} - 3 \right) \\
 &= 5 + .30 (12.5 - 3) \\
 &= 5 + .30 (9.5) \\
 &= 7.85
 \end{aligned}$$

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

25 lies in 13-17 (class boundary)

So,

$$\begin{aligned}
 Q_2 &= l + h/f \left(\frac{2n}{4} - c \right) \\
 &= 13 + \frac{4}{10} \left(\frac{2 \times 50}{4} - 22 \right) \\
 &= 13 + \frac{4}{10} (25 - 22)
 \end{aligned}$$

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

$$= 13 + 1.2$$

$$Q_2 = 14.2$$

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

37.5 lies in 21-25 class boundary.

So,

$$Q_3 = l + h \left(\frac{3n}{4} - c \right)$$
$$= 21 + \frac{4}{3} \left(\frac{3 \times 50}{4} - 37 \right)$$

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

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

$$= 21 + 0.67$$

$$Q_3 = 21.67$$

Duciles..

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

5 lies in 5-9 class boundary

Hence,

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

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

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

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

$$= 5 + 0.61$$

$$D_1 = 5.61$$

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

10 lies in 5-9 (class boundary)

Hence,

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

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

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

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

$$D_2 = 5 + 2.15$$

$$D_2 = 7.15$$

Now,

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

15 lies in 5-9 class boundary

Hence,

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

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

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

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

$$D_3 = 5 + 3.69$$

$$D_3 = 5 + 3.69 = 8.69$$

$$D_3 = 8.69$$

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

20 lies in 9-13 class boundary

Hence,

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

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

$$D_4 = 9 + 2.67$$

$$D_n = 11.67$$

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

25 lies in 13-17 class boundary

Hence,

$$D_f = l + h \left[\frac{f_n}{10} - 1 \right]$$

$$D_f = 13 + \frac{4}{10} \left[\frac{5 \times 50}{10} - 22 \right]$$

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

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

$$= 14.2$$

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

30 lies in 13-17 class boundary

Hence,

$$D_6 = l + h \left[\frac{6n}{10} - 1 \right]$$

$$= 13 + \frac{4}{10} \left[\frac{6 \times 50}{10} - 22 \right]$$

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

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

$$= 13 + 2.2$$

$$= 16.2$$

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

35 lies in 17-21 class boundary

Hence,

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

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

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

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

$$= 17 + 2.4$$

$$D_7 = 19.4$$

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

40 lies in 21-25 class boundary

Hence,

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

$$D_9 = 21 + \frac{4}{3} \left(\frac{9 \times 50}{10} - 37 \right)$$

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

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

$$= 21 + 4$$

$$D_9 = 25$$

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

45 lies in 25-29 (less boundary)

Hence,

$$D_9 = 25 + \frac{4}{3} \left(\frac{9 \times 50}{10} - 40 \right)$$

$$D_9 = 25 + \frac{4}{3} \left(\frac{9 \times 50}{10} - 40 \right)$$

$$D_9 = 25 + \frac{4}{3} (45 - 40)$$

$$D_9 = 25 + \frac{4}{3} (5)$$

$$D_9 = 25 + 4$$

$$D_9 = 29$$

Question No.3

(a) Random Statistics:

In statistics, randomness refers to the apparent lack of pattern or predictability in events. So random statistics refers to the assignment of a numerical value to each possible outcome of an event space.

(b) Inferential Statistics:

Inferential statistics is the process of using data analysis to deduce properties of an underlying distribution of probability.

(c) Descriptive Statistics:

A descriptive statistic is a summary statistic that quantitatively describes or summarizes features from a collection of information. While descriptive statistics is the process of using by analysing those statistics.

(d) Sources of Primary Data:

Primary data is data that is collected by a researcher from first-hand sources using methods like surveys, interviews or experiments. Primary data is usually collected with the research project in mind.

(e) Nominal Scale:

A nominal scale is a scale of measurement used to assign events or objects into discrete categories.