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Section : A

Sub : Probability Statistics

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Note Attempt all questions.

Q1. The following figure gives the number of children born to 50 women.

i. Construct a Grouped and Ungrouped frequency Distribution of these data.

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	3	3	9	2	2

SOLUTION:

Arrange: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

FOR UNGROUPED:

X	Tally Bar	f
0		1
1		4
2		8
3		14
4		7
5		5
6		4
7		3
8		2
9		1
10		1

FOR GROUPED:

Classes	Boundaries	Mid point	f
0-1	0-1.5	0.75	5
2-3	1.5-3.5	2.5	22
4-5	3.5-5.5	4.5	12
6-7	5.5-7.5	6.5	7
8-9	7.5-9.5	8.5	3
10-11	9.5-11.5	10.5	1

Find Mode and Median from grouped and ungrouped frequency distribution?

FOR UNGROUPED:

x	f	C.F
0	1	1
1	4	5
2	8	13
3	14	27
4	7	34
5	5	39
6	4	43
7	3	46
8	2	48
9	1	49
10	1	50
	$\Sigma f = 50$	

$$\text{MODE} = 3$$

$$\begin{aligned} \text{MEDIAN} &= \text{Size of } \left(\frac{n+1}{2}\right)^{\text{th}} \text{ item} \\ &= \frac{11+1}{2} = \frac{12}{2} = 6^{\text{th}} \text{ item} \end{aligned}$$

So

$$\text{Median} = 5$$

FOR GROUDED:

Classes	Boundries	f	C.F
0-1	0-1.5	5	5
2-3	1.5-3.5	22	27
4-5	3.5-5.5	12	39
6-7	5.5-7.5	7	46
8-9	7.5-9.5	3	49
10-11	9.5-11.5	1	50

→ 25th item of median
→ also highest frequency for mode.

$$\sum f = 50$$

MEDIAN: size of $(\frac{n}{2})^{\text{th}}$ item
 $= \frac{50}{2} = 25^{\text{th}}$ item

Formula

$$\text{Median} = l_1 + \frac{l_2 - l_1}{f} \left(\frac{n}{2} - C \right)$$

$$l_1 = 1.5, \quad l_2 = 3.5 \quad f = 22 \quad C = 5$$

$$\begin{aligned} \text{Median} &= 1.5 + \frac{3.5 - 1.5}{22} (25 - 5) \\ &= 1.5 + \frac{2}{22} (20) \end{aligned}$$

$$= 1.5 + 1.818$$

$$\text{Median} = 2.6818$$

MODE:

Formula

$$\text{Mode} = l + \frac{f_m - f_1}{(f_m - f_1) + (f_m - f_2)} \times h$$

$$l = 1.5 \quad f_m = 22 \quad f_1 = 5 \quad f_2 = 12 \quad h = 2$$

$$\begin{aligned}
 \text{Mode} &= 1.5 + \frac{22-5}{(22-5)+(22-10)} \times 2 \\
 &= 1.5 + \frac{17}{17+10} \times 2 \\
 &= 1.5 + \frac{17}{27} \times 2 \\
 &= 1.5 + \frac{34}{27} \\
 &= 2.759
 \end{aligned}$$

Q3 Define the following.

a) RANDOM STATISTICS:

Statistics in which the samples from population or variables have an equal rights of selection, such as choose the roll no of students randomly from the attendance sheet.

b) INFIRENTIAL STATISTICS:

The branch of statistics in which we summarize our data, analysis the data and tabulate the data but all these in result in the form of non-numerical. So by this we inference the relative problem with our non-numeric results.

c) DESCRIPTIVE STATISTICS:

The branch of statistics in which concepts are related with summarization and description. The analysis of data, collection of data and tabulation of data in the form of numerical.

d) SOURCES OF PRIMARY DATA:

The sources of primary data are as follows:

1. By interview method (telephonic, internet)
2. Questionnaire method
3. Computer interview method
4. Direct personal investigation or questioning
5. Indirect personal investigation.

e) NOMINAL SCALE:

The classification of the observation in mutually exclusive qualitative classes. Such as label the values.

e.g. The students of F.Sc, B.S, M.S, M.Phil will be valued 1, 2, 3, 4.

This is because in analysis the data is needed in the form of numbers not in the form of alphabets.

Q2. Calculate all Quartiles and Deciles?

Classes	2-4	6-8	10-12	14-16	18-20	22-24	26-28	30-32	34-36
F	3	13	6	10	5	3	5	3	2

SOLUTION:

We will find all Quartiles i.e. Q_1 , Q_2 , Q_3 , Q_4 and all deciles i.e. D_1 , D_2 , D_3 , D_4 , D_5 , D_6 , D_7 , D_8 , D_9 , D_{10} .

Classes	Class Boundaries	f	C.F	
2-4	1.5-4.5	3	3	
6-8	5.5-8.5	13	16	Q ₁
10-12	9.5-12.5	6	22	
14-16	13.5-16.5	10	32	Q ₂
18-20	17.5-20.5	5	37	
22-24	21.5-24.5	3	40	Q ₃
26-28	25.5-28.5	5	45	
30-32	29.5-32.5	3	48	
34-36	33.5-36.5	2	50	Q ₄

"QUARTILES"

$$Q_1 = \frac{n}{4} = \frac{50}{4} = 12.5^{\text{th}}$$

$$Q_1 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{n}{4} - c \right)$$

$$l_1 = 5.5, \quad l_2 = 8.5, \quad f = 13, \quad c = 3.$$

$$Q_1 = 5.5 + \frac{8.5 - 5.5}{13} (12.5 - 3)$$

$$\underline{Q_1 = 7.692}$$

$$Q_2 = \frac{2(n)}{4} = \frac{2(50)}{4} = 25^{\text{th}}$$

$$l_1 = 13.5, \quad l_2 = 16.5, \quad f = 10, \quad c = 22$$

$$Q_2 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{2n}{4} - c \right)$$

$$Q_2 = 13.5 + \frac{16.5 - 13.5}{10} (25 - 22)$$

$$\underline{Q_2 = 14.7}$$

$$Q_3 = \frac{3(n)}{4} = \frac{3(50)}{4} = 37.5$$

$$Q_3 = l_1 + \frac{l_2 - l_1}{y} \left(\frac{3(n)}{4} - c \right)$$

$$l_1 = 21.5 \quad l_2 = 24.5 \quad y = 3 \quad c = 37$$

$$Q_3 = 21.5 + \frac{24.5 - 21.5}{3} (37.5 - 37)$$

$$Q_3 = 21.565$$

$$Q_4 = \frac{4(n)}{4} = \frac{4(50)}{4} = 50$$

$$Q_4 = l_1 + \frac{l_2 - l_1}{y} \left(\frac{4(n)}{4} - c \right)$$

$$l_1 = 33.5 + \frac{36.5 - 33.5}{2} (50 - 48)$$

$$Q_4 = 36.5$$

Classes	Class Boundaries	y	C.F	
2-4	1.5 - 4.5	3	3	
6-8	5.5 - 8.5	13	16	D ₁ , D ₂ , D ₃
10-12	9.5 - 12.5	6	22	D ₄
14-16	13.5 - 16.5	10	32	D ₅ , D ₆
18-20	17.5 - 20.5	5	37	D ₇
22-24	21.5 - 24.5	3	40	D ₈
26-28	25.5 - 28.5	5	45	D ₉
30-32	29.5 - 32.5	3	48	
34-36	33.5 - 36.5	2	50	D ₁₀

DECILES

$$D_1 = \left(\frac{n}{10}\right) = \frac{50}{10} = 5$$

$$D_1 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{n}{10} - c\right)$$

$$D_1 = 5.5 + \frac{8.5 - 5.5}{13} (5 - 3)$$

$$\underline{D_1 = 5.9615}$$

$$D_2 = \frac{2(n)}{10} = \frac{2(50)}{10} = 10$$

$$D_2 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{2(n)}{10} - c\right)$$

$$D_2 = 5.5 + \frac{8.5 - 5.5}{13} (10 - 3)$$

$$\underline{D_2 = 7.1153}$$

$$D_3 = \frac{3(n)}{10} = \frac{3(50)}{10} = 15$$

$$D_3 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{3(n)}{10} - c\right)$$

$$D_3 = 5.5 + \frac{8.5 - 5.5}{13} (15 - 3)$$

$$\underline{D_3 = 8.2692}$$

$$D_4 = \frac{4(50)}{10} = 20$$

$$D_4 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{4(n)}{10} - c\right)$$

$$D_4 = 9.5 + \frac{12.5 - 9.5}{6} (20 - 16)$$

$$\underline{D_4 = 11.5}$$

$$D_5 = \frac{5(n)}{10} = \frac{5(50)}{10} = 25$$

$$D_5 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{5(n)}{10} - c \right)$$

$$D_5 = 13.5 + \frac{16.5 - 13.5}{10} (25 - 22)$$

$$\underline{D_5 = 14.4}$$

$$D_6 = \frac{6(n)}{10} = 30$$

$$D_6 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{6(n)}{10} - c \right)$$

$$D_6 = 13.5 + \frac{16.5 - 13.5}{10} (30 - 22)$$

$$\underline{D_6 = 15.9}$$

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

$$D_7 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{7(n)}{10} - c \right)$$

$$D_7 = 17.5 + \frac{20.5 - 17.5}{5} (35 - 32)$$

$$\underline{D_7 = 19.3}$$

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

$$D_8 = l_1 + \frac{l_2 - l_1}{f} \left(\frac{8(n)}{10} - c \right)$$

$$D_8 = 21.5 + \frac{24.5 - 21.5}{3} (40 - 37)$$

$$\underline{D_8 = 24.5}$$

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

$$D_9 = l_1 + \frac{l_2 - l_1}{h} \left(\frac{9(n)}{10} - c \right)$$

$$D_9 = 25 \cdot 5 + \frac{28.5 - 25 \cdot 5}{5} (45 - 40)$$

$$\underline{D_9 = 28.5}$$

$$D_{10} = \frac{10(n)}{10} = \frac{10(50)}{10} = 50$$

$$D_{10} = l_1 + \frac{l_2 - l_1}{h} \left(\frac{10(n)}{10} - c \right)$$

$$D_{10} = 33 \cdot 5 + \frac{36.5 - 33 \cdot 5}{2} (50 - 48)$$

$$\underline{\underline{D_{10} = 36.5}}$$