

[Aim: 100|100 in Maths]

STATISTICS

LECTURE - **2**



#Abhi tak ki kahaani:-

MEAN (\bar{x})

Direct Method

(i) $x_i^o = \frac{UL + LL}{2}$

(ii) $f_i x_i^o$

(iii)
$$\bar{x} = \frac{\sum f_i x_i^o}{\sum f_i}$$

Assumed-mean Method

(i) x_i^o

(ii) $d_i^o = x_i^o - a$

$f_i d_i^o$

(iv)
$$\bar{x} = a + \frac{\sum f_i d_i^o}{\sum f_i}$$

Step-deviation Method

(i) x_i

(ii) d_i

(iii) $U_i^o = \frac{d_i}{h}$ $[h = \text{class size} = U - L]$

(iv) $f_i U_i^o$

(v)
$$\bar{x} = a + \left(\frac{\sum f_i U_i^o}{\sum f_i} \right) h$$

#LP : The length of 40 leaves of a plant are measured correct to nearest millimeter , and the data obtained is represented in the following table .

| LENGTHS (in mm) | 188 - 126 | 127 - 135 | 136 - 144 | 154 - 162 | 163 - 171 | 171 - 180 | 172 - 180 |
|----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| No. of leaves | 3 | 5 | 9 | 12 | 5 | 4 | 2 |

Find the mean length of leaves .

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→ Table on next

C.I.

| Length(mm) | No. of leaves (f_i) | C.I. (Exc) | $\bar{x}_i = \frac{U_L + U_U}{2}$ | $d_i = x_i - a$ | $V_i = \frac{d_i}{h/9}$ | $f_i V_i$ |
|------------|-------------------------|---------------|-----------------------------------|-----------------|-------------------------|-----------|
| 118-126 | 3 | 117.5 - 126.5 | 122 | -27 | -3 | -9 |
| 127-135 | 5 | 126.5 - 135.5 | 131 | -18 | -2 | -10 |
| 136-144 | 9 | 135.5 - 144.5 | 140 | -9 | -1 | -9 |
| 145-153 | 12 | 144.5 - 153.5 | 149 $\leftarrow a$ | 0 | 0 | 0 |
| 154-162 | 5 | 153.5 - 162.5 | 158 | 9 | 1 | 5 |
| 163-171 | 4 | 162.5 - 171.5 | 167 | 18 | 2 | 8 |
| 172-180 | 2 | 171.5 - 180.5 | 176 | 27 | 3 | 6 |
| <u>40</u> | | | | | | <u>-9</u> |

Inclusive

$$\bar{x} = a + \left(\frac{\sum f_i V_i}{\sum f_i} \right) h$$

$$\Rightarrow 149 + \left(\frac{-9}{40} \right) \times 9$$

#LP : The mean of the following distribution is 53. Find 'K'??

[CBSE 2019]

| Class | Frequency (f_i) | $X_i = \frac{UL+LL}{2}$ | $d_i = x_i - a$ | $U_i = \frac{d_i}{h(20)}$ | $f_i U_i$ |
|--------|---------------------|-------------------------|-----------------|---------------------------|-----------------|
| 0 - 20 | 12 | 10 | -40 | -2 | -24 |
| 20-40 | 15 | 30 | -20 | -1 | -15 |
| 40-60 | 32 | 50 $\leftarrow a$ | 0 | 0 | 0 |
| 60-80 | $?$ = K | 70 | 20 | 1 | K |
| 80-100 | 13 | 90 | 40 | 2 | 26 2 |

$\bar{x} = 53$

$\bar{x} = a + \left(\frac{\sum f_i U_i}{\sum f_i} \right) h$

$$\begin{aligned} 53 &= 50 + \left(\frac{K-13}{K+72} \right) 20 \\ 3 &= \left(\frac{K-13}{K+72} \right) 20 \\ \frac{3}{20} &= \frac{K-13}{K+72} \\ 3K + 216 &= 20K - 260 \\ 476 &= 17K \\ K &= 28 \end{aligned}$$

#LP : Find the missing frequency in the following frequency distribution if it is known that the mean of the distribution is 1.46.

| No. of accidents (x) | 0 | 1 | 2 | 3 | 4 | 5 | Total |
|-------------------------|----|--------|--------|----|----|---|-------|
| Frequency | 46 | ? P | ? q | 25 | 10 | 5 | 200 |

| x_i | f_i | $f_i x_i$ |
|-------|-------|-----------|
| 0 | 46 | 0 |
| 1 | P | P |
| 2 | q | 2q |
| 3 | 25 | 75 |
| 4 | 10 | 40 |
| 5 | | |

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

$$1.46 = \frac{140 + 2q + p}{200}$$

~~$$\frac{200 \times 1.46}{100} = 140 + 2q + p$$~~

~~$$292 = 140 + 2q + p$$~~

MEDIAN

← middle value

→ for grouped data,

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

where, ✓ l = lower limit of median class

✓ n = no. of observations ($\sum f_i$)

✗ cf = cumulative frequency of class preceding median class

✓ f = frequency of median class

✗ h = class-size

HLP: following frequency distribution gives monthly consumption of electricity of 68 consumers of a locality. Find median.

| Monthly Consumption | no. of consumers (f_i) | c.f. |
|-------------------------|----------------------------|---------------|
| 65-85 | 4 | 4 |
| 85-105 | 5 | 9 |
| 105-125 | 13 | 22 |
| median class | $f = 20$ | cf |
| 125-145 | 14 | 36 |
| 145-165 | 14 | 56 |
| 165-185 | 8 | 64 |
| 185-205 | 4 | 68 |
| | $\sum f_i = n = 68$ | |

$$h = UL - LL \\ = 20$$

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

$$= 125 + \left(\frac{34 - 22}{20} \right) 20$$

$$= 125 + 12 = 137$$

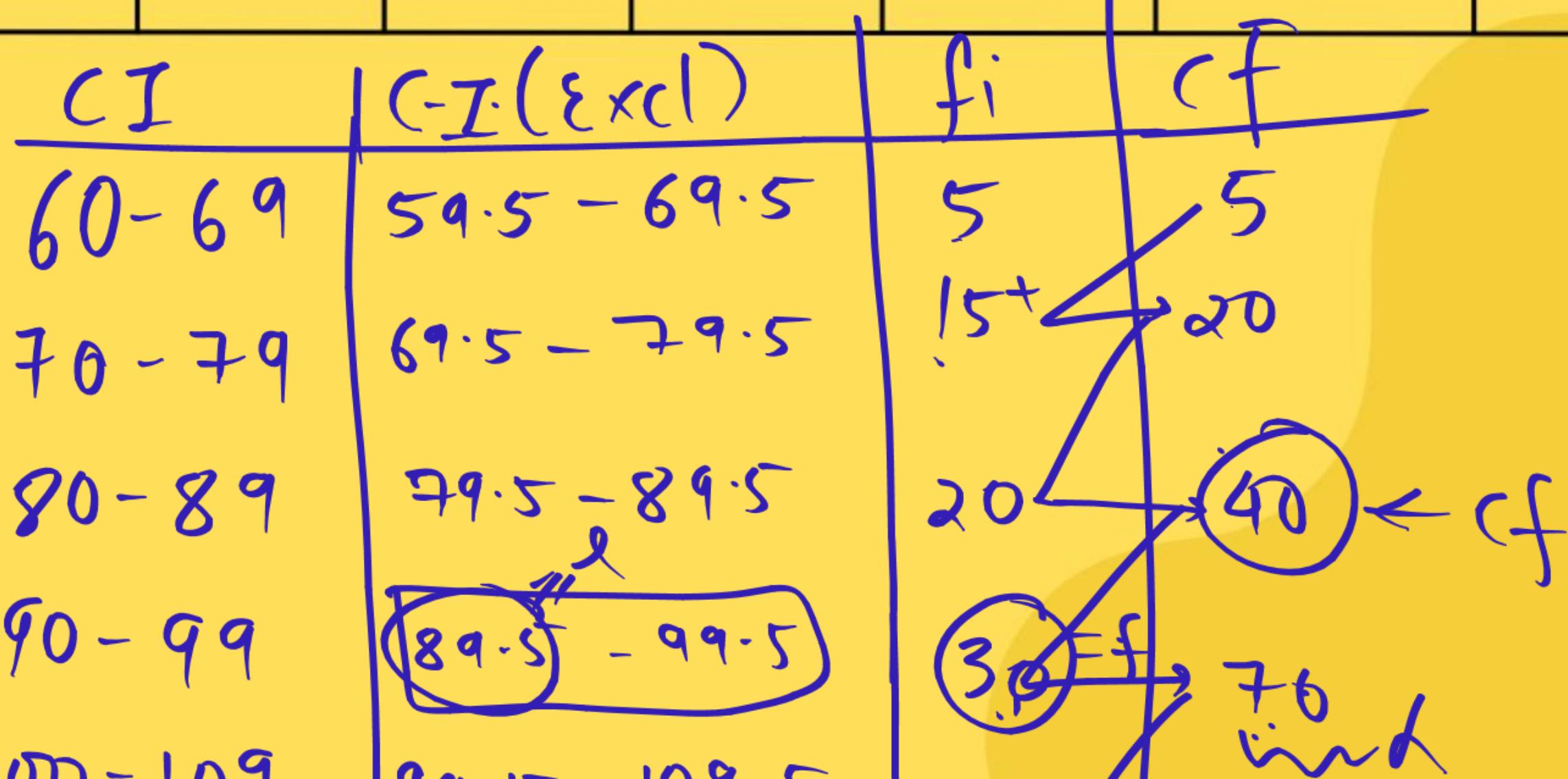
- (i) calculate all c.f.
- (ii) $\frac{n}{2} = \frac{68}{2} = 34$
- (iii) 34 तक just ~~से~~ till value c.f. की table से

→ इसका corresponding class ही median class है।

#LP : Find the median of the following frequency distribution :

Med

| Weekly wagers (in ₹) | 60-69 | 70-79 | 80-89 | 90-99 | 100-109 | 110-119 |
|--------------------------|-------|-------|-------|-------|---------|---------|
| No. of days | 5 | 15 | 20 | 30 | 20 | 8 |



Med

THANK YOU
COODIES 