DAY 6

In last section, we have discussed about Exclusive Series of Class Intervals. In this section, we shall discuss some more class intervals like inclusive series, less than form or more than form.

1. Find the Median Height for the following distribution:-

Height	**below 140**	**below 145**	**below 150**	**below 155**	**below 160**	**below 165**
No. of girls	**4**	**11**	**29**	**40**	**46**	**51**

Sol:- Here, we change this data in Exclusive class intervals. In given, Upper limits of corresponding intervals are 140, 145, 150, 155, …… which means that class size is 5. So the Class intervals are 135-140, 140-145, 145-150, ……,160-165 along these frequencies also changed as follows:

Height	Frequency(f)	cf
135-140	4	4
140-145	$11-4=7$	11
145-150	$29-11=18$	29
150-155	$40-29=11$	40
155-160	$46-40=6$	46
160-165	$51-46=5$	51
Total	$\Sigma f=51$	

Median: $\left(\frac{\mathrm{N}}{2}\right)^{\text{th}}$ term $=\left(\frac{51}{2}\right)^{\text{th}}$ term $=25.5^{\text{th}}$term

Since 25.5^{th}term lies in **class interval** $145-150$

$\therefore$ **Median Class Interval** $=$ **145 − 150**

$\Rightarrow$ L $=145, cf=11, f=18$ and $i=5$

$$\therefore \text{ Median} = \mathrm{L}+\left(\frac{\frac{\mathrm{N}}{2}-cf}{f}\right)\times i$$

$$=145+\left(\frac{\frac{51}{2}-11}{18}\right)\times 5=145+\left(\frac{25.5-11}{18}\right)\times 5$$

$$=145+\frac{14.5}{18}\times 5=145+9.06=154.06 \text{ (app)}$$

Hence Median value is 141.66

2. Find the Median Height for the following distribution:-

Length(mm)	**118-126**	**127-135**	**136-144**	**145-153**	**154-162**	**163-171**	**172-180**
No. of leaves	**3**	**5**	**9**	**12**	**5**	**4**	**2**

Sol:- Here given data is in the form of inclusive series

***i.e.* upper limit of one class ≠ lower limit of next class**

So first we equal both limits. For that take **half the difference of both limits. Subtract that difference in each lower limit and add in each upper limit,** we have 117.5-126.5, 126.5-135.5, 135.5-144.5,……,171.5-180.5 we get Exclusive class intervals as follows:

Length(mm)	Frequency(f)	cf
117.5-126.5	3	3
126.5-135.5	5	8
135.5-144.5	9	17
144.5-153.5	12	29
153.5-162.5	5	34
162.5-171.5	4	38
171.5-180.5	2	40
Total	$\Sigma f = 40$	

Median: $\left(\frac{N}{2}\right)^{th}$ term $= \left(\frac{40}{2}\right)^{th}$ term $= 20^{th}$term

Since 20^{th}term lies in **class interval** $144.5 - 153.5$

$\therefore$ **Median Class Interval** $=$ **144. 5 − 153. 5**

$\Rightarrow$ L $= 144.5, cf = 17, f = 12$ and $i = 9$

$$\therefore \text{ Median} = L + \left(\frac{\frac{N}{2} - cf}{f}\right) \times i$$

$$= 144.5 + \left(\frac{\frac{40}{2} - 17}{12}\right) \times 9 = 144.5 + \left(\frac{20-17}{12}\right) \times 9$$

$$= 144.5 + \frac{3}{12} \times 9 = 144.5 + 2.25 = 146.75$$

Hence Median value is 146.75

3. If median of following 100 terms is 525 then find x and y.

C.I.	**0-100**	**100-200**	**200-300**	**300-400**	**400-500**	**500-600**	**600-700**	**700-800**	**800-900**	**900-1000**
f	**2**	**5**	x	**12**	**17**	**20**	y	**9**	**7**	**4**

Sol:-

C.I.	Frequency(f)	cf
0-100	2	2
100-200	5	7
200-300	x	$7+x$
300-400	12	$19 + x$

400-500	17	$36+x$
500-600	**20**	$\mathbf{56+x}$
600-700	y	$56+x+y$
700-800	9	$65+x+y$
800-900	7	$72+x+y$
900-1000	4	$76+x+y$
Total	$\Sigma f=100$	

Given Total (N) $=\Sigma f=100$

$\Rightarrow\ 76+x+y=100 \quad \Rightarrow\ x+y=100-76=24$ ..... i)

and Median $=525$

$\therefore$ **Median Class is** $500-600$

$\Rightarrow$ L $=500, f=20, cf=36+x$ and $i=100$

$\therefore$ Median $=\mathrm{L}+\left(\frac{\frac{\mathrm{N}}{2}-cf}{f}\right)\times i$

$\Rightarrow \quad 525=500+\left(\frac{\frac{100}{2}-(36+x)}{20}\right)\times 100$

$\Rightarrow \quad 525-500=\left(\frac{50-36-\boldsymbol{x}}{20}\right)\times 100$

$\Rightarrow \quad 25=(14-x)\times 5=70-5x$

$\Rightarrow \quad 5x=70-25=45 \quad \Rightarrow\ x=\frac{45}{5}=9$

Put value of x in i), we get

i) $\Rightarrow \quad y=24-9=15$

$=144.5+\frac{3}{12}\times 9=144.5+2.25=146.75$

Hence $\boldsymbol{x=9, y=15}$

RELATIONSHIP AMONG MEAN, MEDIAN AND MODE

Mode $=$ 3 Median $-$ 2 Mean

This formula gives us relationship between values of mean, median and mode. This is known as **Empirical Formula**.

4. If Mean $=$ 100 and Mode $=$ 70, find Median

Sol:- We know Mode $=3$ Median -2 Mean

$\Rightarrow \quad 70=3$ Median -2×100

$\Rightarrow\ 70+200=3$ Median $\quad \Rightarrow$ Median $=\frac{290}{3}=96.67$ (app)

5. If Mode $=$ 400 and Median $=$ 500, find Mean.

Sol:- We know Mode $=3$ Median -2 Mean

$\Rightarrow \quad 400=3\times 500-2\times$ Mean

$\Rightarrow\ 400=1500-2\times$ Mean $\quad \Rightarrow\ 2\times$ Mean $=1500-400=1100$

$\Rightarrow$ Mean $= \frac{1100}{2} = 550$

EXERCISE

1. If Mean $= 120$ and Mode $= 75$, find Median
2. If Median $= 250$ and Mode $= 115$, find Median
3. If Median $= 100$ and Mean $= 70$, find Mode
4. Ex 14.3, Q 2,3