STATISTICS

Illustration – Direct Method

C.I	Freq f	Mid-Value X	fX
4-6	6	5	30
6-8	12	7	84
8-10	17	9	153
10-12	10	11	110
12-14	5	13	65
Total	50 = Σf		442 = Σfx

$$\mu = \frac{\Sigma fx}{\Sigma f}$$

$$= 442/50$$

$$= 8.84 \text{ Ans.}$$

Illustration – Assumed Mean Method

C.I	Freq. f	Mid Values (x)	d =(x-A)	fd
10-15	2	12.5	-10	-20
15-20	7	17.5	-5	-35
20-25	9	22.5 = A	0	0
25-30	8	27.5	5	40
30-35	6	32.5	10	60
35-40	4	37.5	15	60
	$\Sigma f = 36$			$\Sigma fd = 105$

$$\mu = A + \frac{\Sigma\,fd}{\Sigma f}$$

$$= 22.5 + \frac{105}{36}$$

$$= 22.5 + 2.916$$

$$= 25.416 \textbf{ Ans.}$$

Illustration - Step Deviation Method

C.I	Freq.(f)	MidValues (x)	$d = \dfrac{(x-A)}{i}$ $(i=5)$	fd
10-15	200	12.5	-2	-400
15-20	700	17.5	-1	-700
20-25	900	22.5 = A	0	0
25-30	800	27.5	1	800
30-35	600	32.5	2	1200
35-40	400	37.5	3	1200
	$\Sigma f = 3600$			$\Sigma fd = 2100$

$$\mu = A + \frac{\Sigma fd}{\Sigma f} \times i$$

$$= 22.5 + \frac{2100}{3600} \times 5$$

$$= 22.5 + 2.916$$

$$= 25.416 \textbf{ Ans.}$$

Calculation of Median-Illustration (Grouped Freq. Distribution)

C.I	Freq.(f)	Cum. Freq
10-15	200	200
15-20	700	900
20-25	900	1800
25-30	800	2600
30-35	600	3200
35-40	400	3600
	$\Sigma f=$ 3600	

$N/2 = 3600/2 = 1800$

Cum.freq. just greater than 1800 is 2600. Hence median class is 25-30.

Hence $L_1 = 25$

$L_2 = 30$

$C = 1800$

$f = 800$

$$Md = 25 + \frac{1800 - 1800}{800} (30 - 25)$$

$= 25$ **Ans.**

Mode – Continuous Frequency Distribution

1. Look for the class-interval with maximum frequency. This is the modal class.

2. Note down the following:

   L_1 = lower limit of the modal class.

   i = width of class-interval

   f_0 = frequency of class preceding the modal class.

   f_1 = frequency of modal class.

   f_2 = frequency of class succeeding the modal class.

Mode: Formula for Continuous Frequency Distribution

$$\text{Mode} = L1 + \frac{h(f1 - f0)}{2f1 - f0 - f2}$$

Empirical Relationship between Mean, Median & Mode

Mode = 3 Median – 2 Mean

Calculation of Missing Frequencies when median is known :
Illustration : Median = 50

Expenditure	No. of Families	Cumulative Freq.
0-20	14	14
20-40	$? = f_1$	$14 + f_1$
40-60	27	$41 + f_1$
60-80	$? = f_2$	$41 + f_1 + f_2$
80-100	15	$56 + f1 + f2$
	$N = 100$	

Calculation of Missing Frequencies when median is known : Illustration

Here median = 50 $\qquad$ $L_1 = 40$

N = 100 $\qquad$ $L_2 = 60$

N/2 = 50 $\qquad$ f = 27

Hence median class 40-60 $\qquad$ C = 14 + f1

$$Md = L_1 + \frac{N/2 - C}{f} (L_2 - L_1)$$

$$50 = 40 + \frac{50 - (14 + f_1)}{27}(60 - 40)$$

$$10 = \frac{720 - 20 f_1}{27}$$

$f_1 = 450/20 = 22.5 = 23$ families approx.

N = 56 + f_1 + f_2

100 = 56 + 23 + f_2

f_2 = 21 **Ans. f_1 = 23 and f_2 = 21**

OGIVES

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Daily income (in Rs)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Daily Income (in Rs)	Daily Income (in Rs) (Upper Limit)	Number of Workers	Cumulative Frequency
100 - 120	Less than 120	12	12
120 - 140	Less than 140	14	12 + 14 = 26
140 - 160	Less than 160	8	26 + 8 = 34
160 - 180	Less than 180	6	34 + 6 = 40
180 – 200	Less than 200	10	40 + 10 = 50

LESS THAN TYPE OGIVE

To represent data graphically

1. Mark the upper limits of class intervals on x-axis and corresponding cumulative frequency on y-axis choosing suitable scale.

2. Plot the points with co-ordinares with abscissa as upper limits and ordinates as cumulative frequencies.

3. Join the points by a free hand smooth curve.

4. The curve we get as called cumulative frequency curve or less than ogive.

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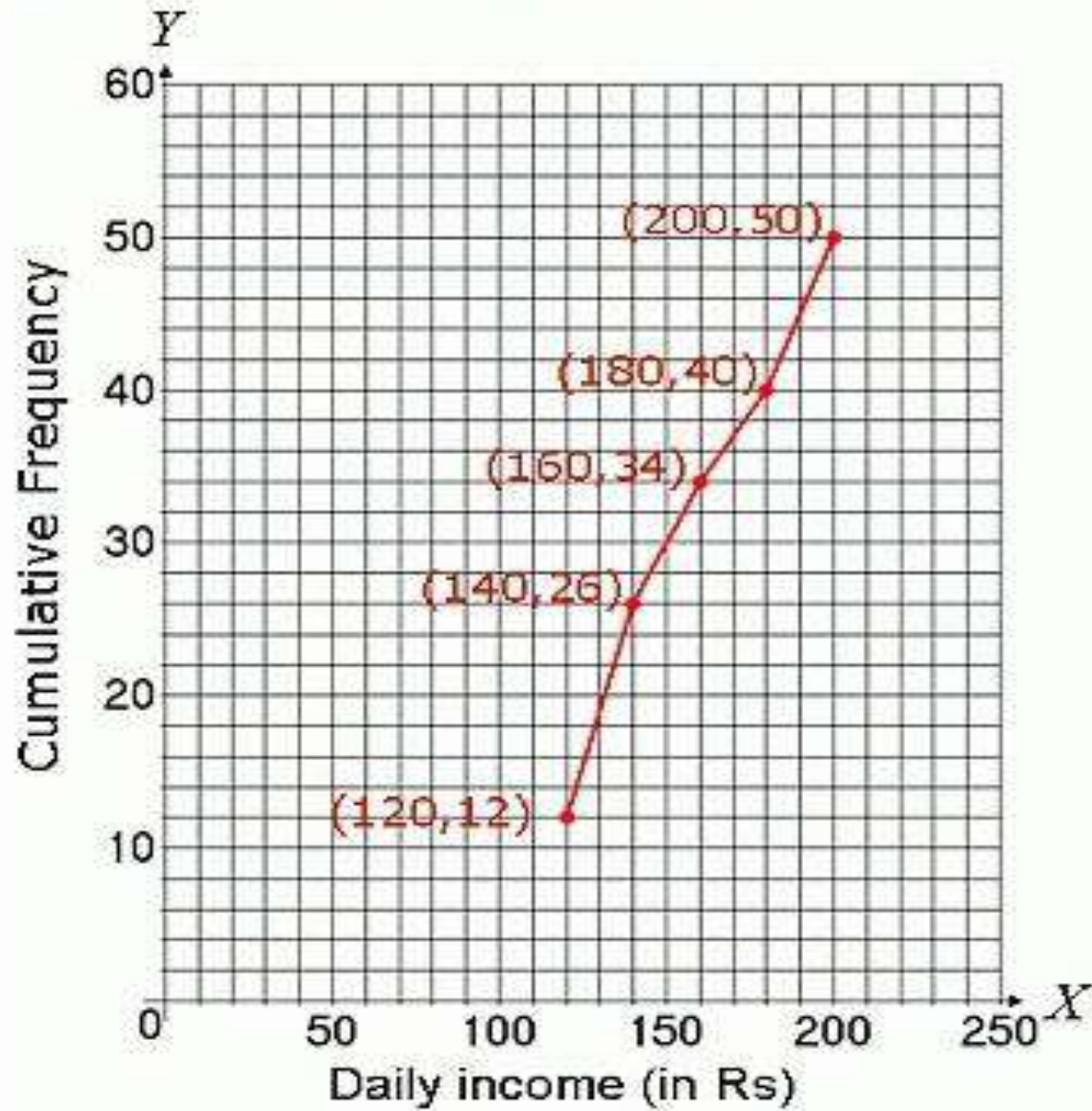
Now we can see the 'more than' cumulative frequency distribution

Daily Income (in Rs)	Daily Income (in Rs) (Lower Limit)	Number of Workers	Cumulative Frequency
100 - 120	More than or equal to 100	12	50
120 - 140	More than or equal to 120	14	50 - 12 = 38
140 - 160	More than or equal to 140	8	38 - 14 = 24
160 - 180	More than or equal to 160	6	24 - 8 = 16
180 - 200	More than or equal to 180	10	16 - 6 = 10

MORE THAN TYPE OGIVE

To represent data graphically

1. Mark the lower limits of class intervals on x-axis and corresponding cumulative frequency on y-axis choosing suitable scale.

2. Plot the points with co-ordinares with abscissa as lower limits and ordinates as cumulative frequencies.

3. Join the points by a free hand smooth curve.

4. The curve we get as called cumulative frequency curve or more than ogive.
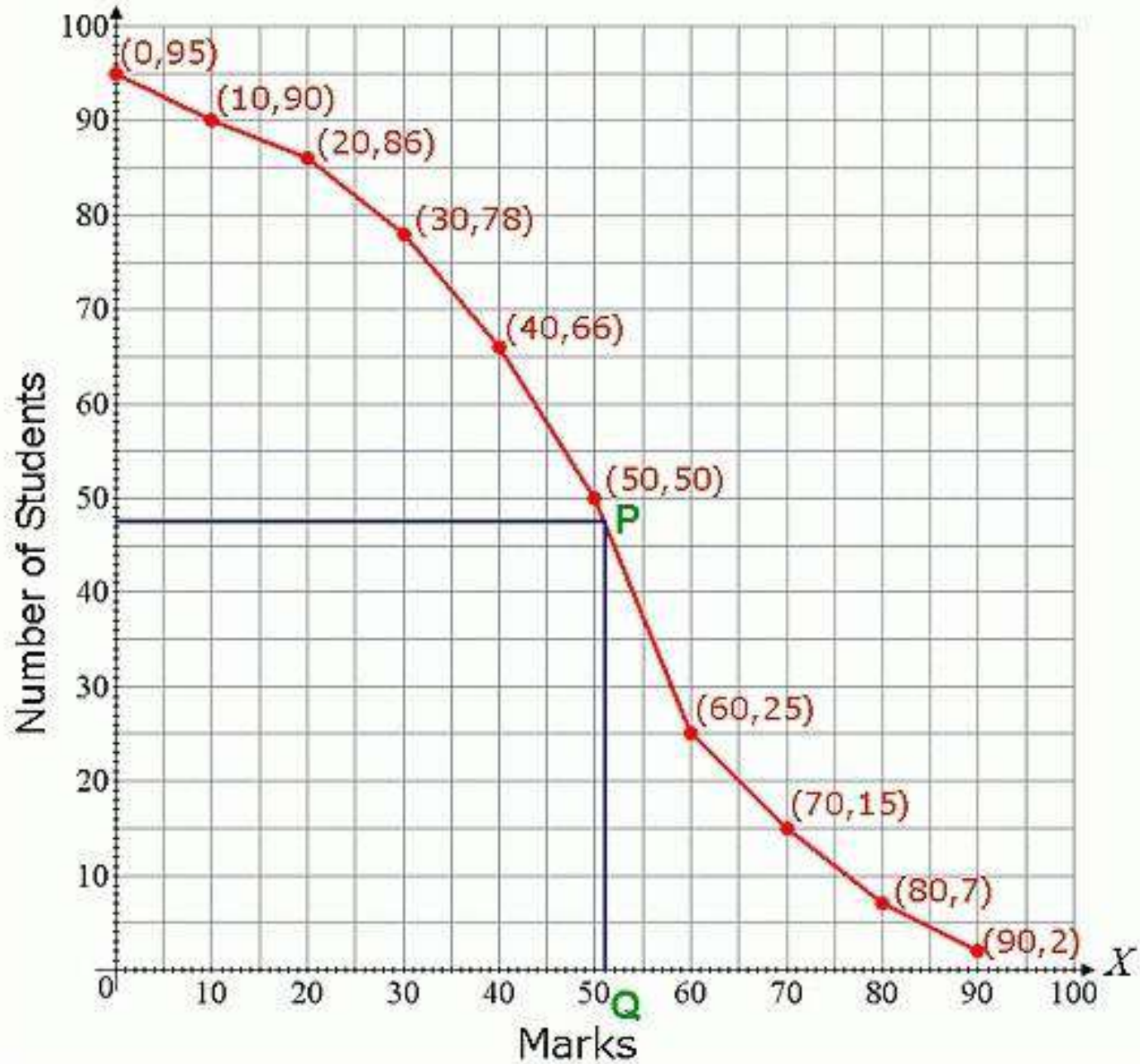
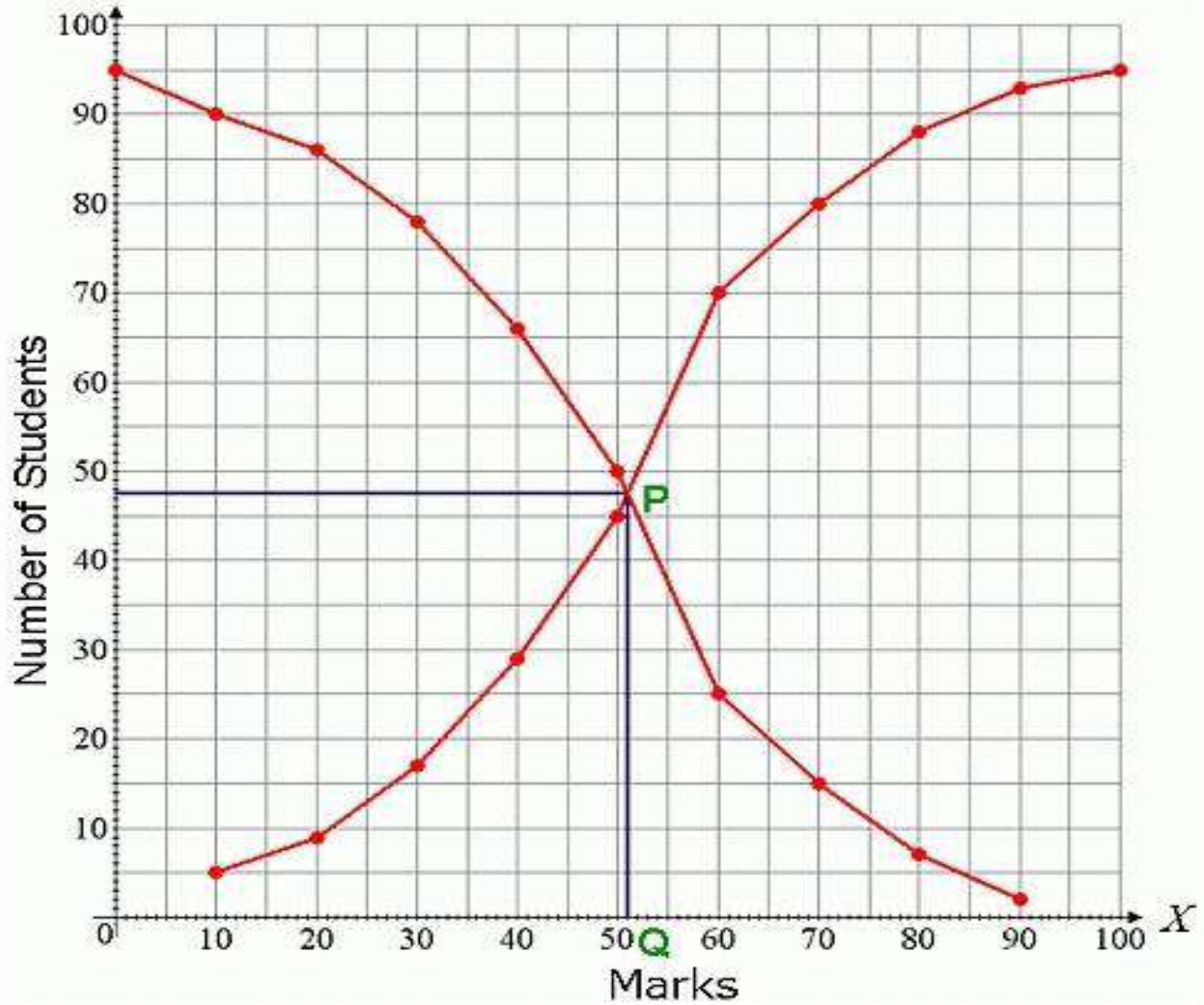The Aryabhatta Academy
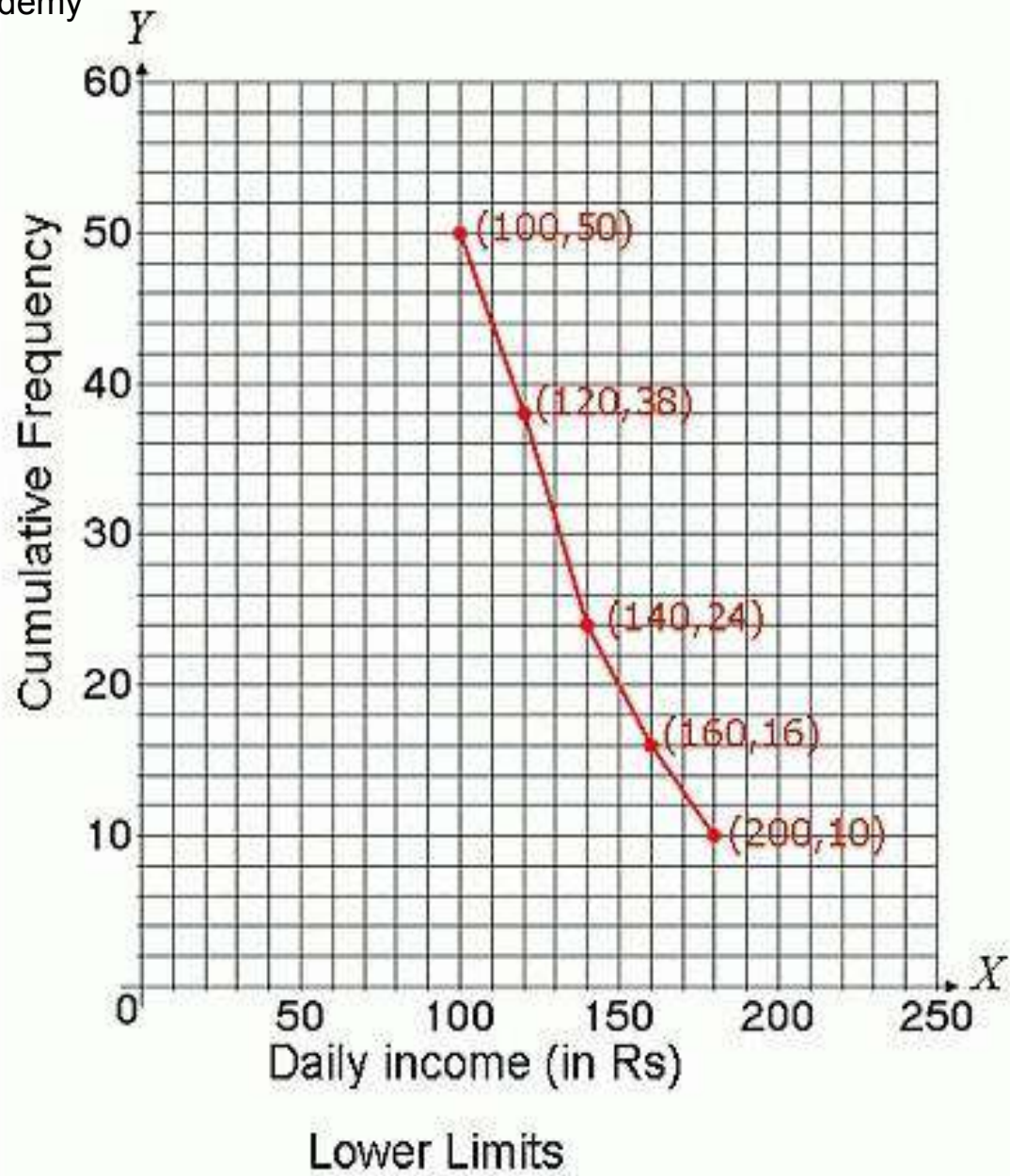
Relation between median and Ogive

1. In an ogive actual limits are marked on x-axis and cumulative frequencies on y axis.

2. The middle value l = N/2 is marked on y-axis.

3. From the marked point a line parallel to x-axis is drawn till it cuts the curve.

4. At that point drop a perpendicular. The point where perpendicular meets the x-axis is median

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Class	Less than c.f.
10	5
20	9
30	17
40	29
50	45
60	70
70	80
80	88
90	93
100	95

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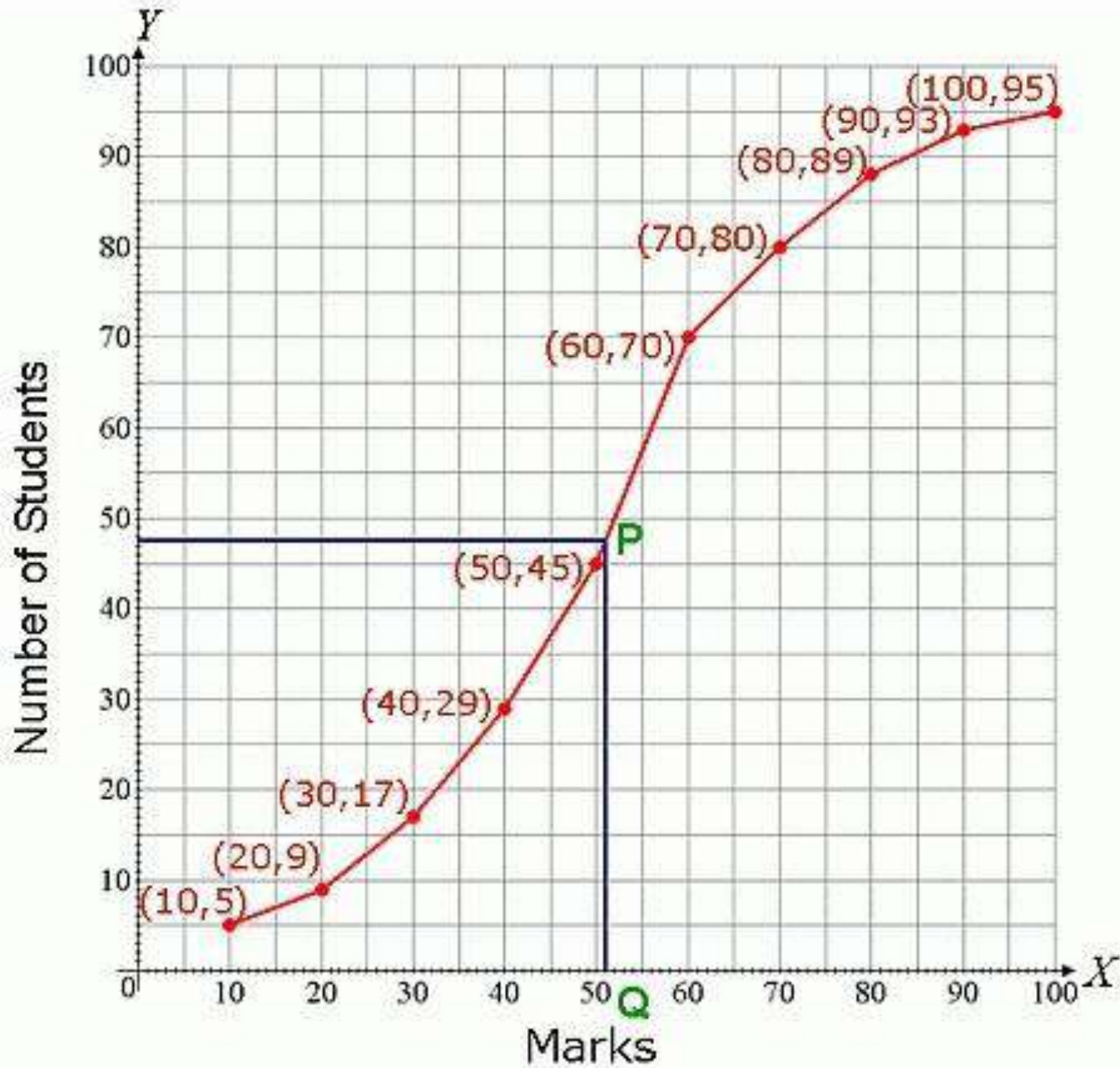
Class	Greater than c.f.
0	95
10	90
20	86
30	78
40	66
50	50
60	25
70	15
80	7
90	2

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CONCEPT MAP