Statistics

Very Short Answer Type Questions (1 mark each)

Q. 1. Find the class-marks of the classes 10 – 25 and 35 – 55. [CBSE OD, Set 1, 2020]

Ans. We know,

$$\text{Class mark} = \frac{\text{Lower limit} + \text{Upper limit}}{2}$$

$$\therefore \quad \text{Class mark of } 10 - 25 = \frac{10+25}{2}$$

$$= \frac{35}{2}$$

$$= 17.5$$

$$\text{and} \quad \text{class mark of } 35 - 55 = \frac{35+55}{2}$$

$$= \frac{90}{2}$$

$$= 45 \quad \textbf{Ans.}$$

Q. 2. Find the class marks of the classes 20 – 50 and 35 – 60. [CBSE OD, Set 3, 2020]

Ans. We know,

$$\text{Class mark} = \frac{\text{Lower limit} + \text{Upper limit}}{2}$$

$\therefore$ Class mark of $20 - 50$

$$= \frac{20+50}{2} = \frac{70}{2} = 35$$

$$\text{and, class mark of } 35 - 60 = \frac{35+60}{2} = \frac{95}{2}$$

$$= 47.5$$

Q. 3. If the mean of the first n natural number is 15, then find n. [CBSE Delhi, Set 1, 2020]

Ans. First n natural numbers are 1, 2, 3, ... n.

$$\therefore \quad \text{Sum of numbers} = \frac{n(n+1)}{2}$$

$$\text{Given,} \quad \text{Mean} = 15$$

$$\Rightarrow \quad \frac{\text{Sum of numbers}}{n} = 15$$

$$\Rightarrow \quad \frac{n(n+1)}{2} \times \frac{1}{n} = 15$$

$$\Rightarrow \quad n + 1 = 30$$

$$n = 29 \quad \textbf{Ans.}$$

Q. 4. If empirical relationship between mean, median and mode is expressed as mean = k(3 median − mode), then find the value of k. [CBSE Term 1, 2016]

Ans. Given, mean = k(3 median − mode)

As we know, mode = 3 median − 2 mean

$\therefore$ mean = k[3 median − (3 median − 2 mean)]

$\Rightarrow$ mean = k[3 median − 3 median + 2 mean]

$\Rightarrow$ mean = 2 k mean

$\Rightarrow$ $2k$ mean − mean = 0

$\Rightarrow$ mean $[2k - 1] = 0$

$\Rightarrow$ $2k - 1 = 0$

$\Rightarrow$ $2k = 1$

$\therefore$ $k = 1/2$

Q. 5. From the following frequency distribution, find the median class:

Cost of Living Index	Number of weeks
1400–1550	8
1550–1700	15
1700–1850	21
1850–2000	8

[CBSE Term 1, Set 1, 2015]

Ans.

Cost of Living Index	No. of Weeks (f)	$c.f.$
1400–1550	8	8
1550–1700	15	23
1700–1850	21	44
1850–2000	8	52
	$\Sigma f = 52$	

Here, $n = 52$

$$\Rightarrow \quad \frac{n}{2} = \frac{52}{2} = 26,$$

26 will lie in the class interval 1700–1850.

$\therefore$ Median class is 1700–1850.

Short Answer Type Questions-I (2 marks each)

Q. 1. Compute the mode for the following frequency distribution :

Size of items (in cm)	Frequency
0 – 4	5
4 – 8	7
8 – 12	9
12 – 16	17
16 – 20	12
20 – 24	10
24 – 28	6

[CBSE OD, Set 1, 2020]

Ans. Here, the maximum frequency is 17 which lies in the class interval 12 – 16.

$\therefore$ Modal class = 12 – 16

So, $l = 12, f_1 = 17, f_0 = 9, f_2 = 12$ and $h = 4$

We know, Mode $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$= 12 + \left(\frac{17 - 9}{34 - 9 - 12}\right) \times 4$

$= 12 + \left(\frac{8}{34 - 21}\right) \times 4$

$= 12 + \left(\frac{8}{13}\right) \times 4$

$= 12 + \frac{32}{13}$

$= 12 + 2.46$

$= 14.46$ **Ans.**

Q. 2. Find the mode of the following frequency distribution :

Class	Frequency
15 – 20	3
20 – 25	8
25 – 30	9
30 – 35	10
35 – 40	3
40 – 45	2

[CBSE OD, Set 3, 2020]

Ans. Here, the maximum frequency is 10 which lies in the class interval 30 – 35.

$\therefore$ Modal class = 30 – 35.

So, $l = 30, f_1 = 10, f_0 = 9, f_2 = 3$ and $h = 5$.

We know, Mode $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$= 30 + \left(\frac{10 - 9}{20 - 9 - 3}\right) \times 5$

$= 30 + \left(\frac{1}{20 - 12}\right) \times 5$

$= 30 + \left(\frac{1}{8}\right) \times 5$

$= 30 + \frac{5}{8}$

$= 30 + 0.625$

$= 30.625$ **Ans.**

Q. 3. Find the mean of the following distribution :

Class	Frequency
3 – 5	5
5 – 7	10
7 – 9	10
9 – 11	7
11 – 13	8

[CBSE Delhi, Set 1, 2020]

Ans.

Class	Frequency (f_i)	Class Mark (x_i)	Product ($f_i \times x_i$)
3 – 5	5	4	20
5 – 7	10	6	60
7 – 9	10	8	80
9 – 11	7	10	70
11 – 13	8	12	96
	$\sum_{i=1}^{n} f_i = 40$		$\sum_{i=1}^{n} f_i x_i = 326$

Mean $(\bar{x}) = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$

$= \frac{326}{40} = 8.15$ **Ans**

Q. 4. Find the mode of the following data :

Class	Frequency
0 – 20	6
20 – 40	8
40 – 60	10
60 – 80	12
80 – 100	6

100 – 120	**5**
120 – 140	**3**

[CBSE Delhi, Set 1, 2020]

Ans.

Class	Frequency
0 – 20	6
20 – 40	8
40 – 60	10
60 – 80	12
80 – 100	6
100 – 120	5
120 – 140	3

Maximum frequency = 12

$\therefore$ Modal class = 60 – 80

So, $l = 60, f_1 = 12, f_0 = 10, f_2 = 6, h = 20.$

We know that,

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$\therefore \quad \text{Mode} = 60 + \left(\frac{12 - 10}{2(12) - 10 - 6}\right) \times 20$$

$$= 60 + \frac{2}{24 - 16} \times 20$$

$$= 60 + \frac{2}{8} \times 20$$

$$= 60 + 5 = 65$$ **Ans.**

Q. 5. Find the mode of the following frequency distribution:

Class Interval:	25–30	30–35	35–40	40–45	45–50	50–55
Frequency:	25	34	50	42	38	14

[CBSE OD, Set 1, 2019]

Ans.

Class Interval	Frequency
25–30	25
30–35	34
35–40	50
40–45	42
45–50	38
50–55	14

Here, maximum frequency is 50.

So, 35 – 40 will be the modal class.

$l = 35, f_0 = 34, f_1 = 50, f_2 = 42$ and $h = 5$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 35 + \left(\frac{50 - 34}{2 \times 50 - 34 - 42}\right) \times 5$$

$$= 35 + \left(\frac{16}{100 - 76}\right) \times 5$$

$$= 35 + \frac{16}{24} \times 5$$

$$= 35 + \frac{80}{24}$$

$$= 35 + 3.33$$

$$= 38.33$$

Q. 6. Given below is a cumulative frequency distribution table. Corresponding to it, make an ordinary frequency distribution table.

x	cf
More than or equal to 0	45
More than or equal to 10	38
More than or equal to 20	29
More than or equal to 30	17
More than or equal to 40	11
More than or equal to 50	6

[CBSE Term 1, 2016]

Ans.

C.I.	Frequency
0–10	7 (45–38)
10–20	9 (38–29)
20–30	12 (29–17)
30–40	6 (17–11)
40–50	5 (11–6)
50–60	6 (6–0)

Q. 7. Show that the mode of the series obtained by combining the two series S_1 and S_2 given below is different from that of S_1 and S_2 taken separately:

S_1: 3, 5, 8, 8, 9, 12, 13, 9, 9

S_2: 7, 4, 7, 8, 7, 8, 13

[CBSE Term 1, Set 1, 2015]

Ans. Mode of S_1 series = 9

Mode of S_2 series = 7

After combining S_1 and S_2, the new series will be

= 3, 5, 8, 8, 9, 12, 13, 9, 9, 7, 4, 7, 8, 7, 8, 13.

Mode of combined series = 8 (maximum times)

Mode of (S_1, S_2) is different from mode of S_1 and mode of S_2 separately.

Hence Proved.

Short Answer Type Questions-II (3 marks each)

Q. 1. The marks obtained by 100 students in an examination are given below:

Marks	Number of Students
30–35	14
35–40	16
40–45	28
45–50	23
50–55	18
55–60	8
60–65	3

Find the mean marks of the students.
[CBSE OD, Set 1, 2019]

Ans.

Class Interval (Marks)	No. of Students (f_i)	x_i	$f_i x_i$
30–35	14	32.5	455
35–40	16	37.5	600
40–45	28	42.5	1190
45–50	23	47.5	1092.5
50–55	18	52.5	945
55–60	8	57.5	460
60–65	3	62.5	187.5
	$\Sigma f_i = 110$		$\Sigma f_i x_i = 4930$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$
$$= \frac{4930}{110}$$
$$= 44.81$$

Q. 2. Find the mode of the following frequency distribution.

Class	Frequency
0–10	8
10–20	10
20–30	10
30–40	16
40–50	12
50–60	6
60–70	7

[CBSE Delhi, Set 1, 2019]

Ans. The given frequency distribution table is

Class	Frequency
0–10	8
10–20	10
20–30	10
30–40	16
40–50	12
50–60	6
60–70	7

Here, the maximum class frequency is 16

$\therefore$ Modal class = 30 – 40

$\therefore$ lower limit (l) of modal class = 30

Class size (h) = 10

Frequency (f_1) of the modal class = 16

Frequency (f_0) of preceding class = 10

Frequency (f_2) of succeeding class = 12

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$
$$= 30 + \left(\frac{16 - 10}{32 - 10 - 12}\right) \times 10$$
$$= 30 + \frac{6}{32 - 22} \times 10$$
$$= 30 + \frac{6}{10} \times 10$$
$$= 30 + 6 = 36$$

Hence, Mode = 36.

Q 3. The arithmetic mean of the following frequency distribution is 53. Find the value of k. [CBSE Delhi, Set 2, 2019]

Class	Frequency
0 – 20	12
20 – 40	15
40 – 60	32
60 – 80	k
80 – 100	13

Ans. Given, Median = 53

Class	Frequency f_i	Mid-value x_i	$f_i x_i$
0 – 20	12	10	120
20 – 40	15	30	450
40 – 60	32	50	1600
60 – 80	k	70	$70k$
80 – 100	13	90	1170
	$72 + k$		$3340 + 70k$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

$$53 = \frac{3340 + 70k}{72 + k}$$

$$53\,(72 + k) = 3340 + 70k$$

$$3816 + 53k = 3340 + 70k$$

$$\Rightarrow \quad k = 28$$

Hence $k = 28$.

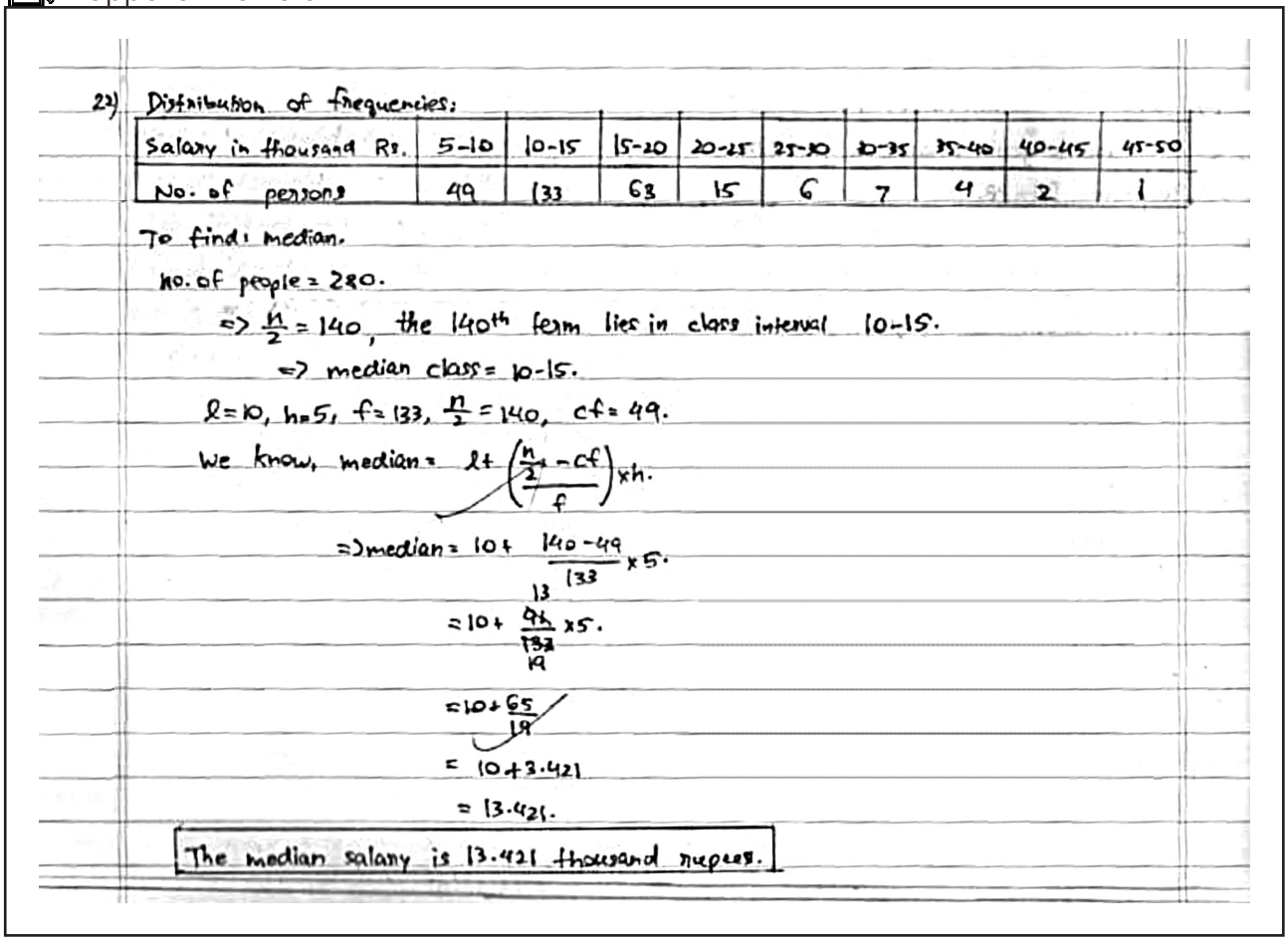
Q. 4. The table below shows the salaries of 280 persons:

Salary (In thousand ₹)	No. of Persons
5–10	49
10–15	133
15–20	63
20–25	15
25–30	6
30–35	7
35–40	4
40–45	2
45–50	1

Calculate the median salary of the data.
[CBSE, 2018]

Ans.

Topper's Answers



22) Distribution of frequencies:

Salary in thousand Rs.	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	49	133	63	15	6	7	4	2	1

To find: median.

No. of people = 280.

$\Rightarrow \frac{n}{2} = 140$, the 140th term lies in class interval 10-15.

$\Rightarrow$ median class = 10-15.

$l = 10,\ h = 5,\ f = 133,\ \frac{n}{2} = 140,\ cf = 49.$

We know, median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h.$

$\Rightarrow$ median = $10 + \frac{140 - 49}{133} \times 5.$

$= 10 + \frac{91}{\frac{133}{19}} \times 5.$

$= 10 + \frac{65}{19}$

$= 10 + 3.421$

$= 13.421.$

The median salary is 13.421 thousand rupees.

Salary	No. of Persons	Cummulative frequency (*c.f.*)
5–10	49	49
10–15	133	182
15–20	63	245
20–25	15	260
25–30	6	266
30–35	7	273
35–40	4	277
40–45	2	279
45–50	1	280
Total	280	

$$\frac{N}{2} = \frac{280}{2} = 140$$

The cumulative frequency just greater than 140 is 182.

$\therefore$ Median class is 10 – 15.

$\Rightarrow l = 10, h = 5, N = 280,\ c.f. = 49$ and $f = 133$

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

$$= 10 + \left(\frac{140 - 49}{133}\right) \times 5$$

$$= 10 + \frac{91 \times 5}{133}$$

$$= 10 + \frac{455}{133}$$

$$= 10 + 3.42$$

$$= 13.42$$

Q. 5. For the month of February, a class teacher of Class IX has the following absentee record for 30 students. Find the mean number of days, a student was absent.

Number of Days of Absent	0–4	4–8	8–12	12–16	16–20	20–24
Number of Students	18	3	6	2	0	1

[CBSE Term 1, 2016]

Ans.

C.I.	f_i	x_i (mid-value)	$d = x_i - A$	$f_i \times d_i$
0–4	18	2	–12	–216
4–8	3	6	–8	–24
8–12	6	10	–4	–24
12–16	2	$A = 14$	0	00
16–20	0	18	4	00
20–24	1	22	8	08
	$\Sigma f_i = 30$			$\Sigma f_i d_i = -256$

$$\text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 14 + \left(\frac{-256}{30}\right)$$

$$= 14 - 8.53$$

$$= 5.47$$

Q. 6. Find the missing frequency (x) of the following distribution, if mode is 34.5:

Marks Obtained	0–10	10–20	20–30	30–40	40–50
Number of Students	4	8	10	x	8

[CBSE Term 1, 2016]

Ans.

C.I.	Frequency
0–10	4
10–20	$8 = f_0$

20–30	$10 = f_1$
30–40	$x = f_2$
40–50	8

Given, mode = 34.5

$\because$ 34.5 lies in the class interval 30–40

$\therefore$ Modal class = 30–40

$\therefore$ $l = 20, f_1 = x, f_0 = 8, f_2 = x$ and $h = 10$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$\Rightarrow \quad 34.5 = 20 + \left(\frac{10 - 8}{20 - 8 - x}\right) \times 10$$

$$\Rightarrow \quad 14.5 = \left(\frac{2}{12 - x}\right) \times 10$$

$$\Rightarrow \quad 20 = 14.5\,(12 - x)$$

$$\Rightarrow \quad \frac{20}{14.5} = (12 - x)$$

$$\Rightarrow \quad x = \frac{308}{29}$$

$$\Rightarrow \quad x = 10.62$$ **Ans.**

Hence, the missing frequency (x) is 19.

Q. 7. Find the mean of the following distribution by Assumed Mean Method:

Class Interval	Frequency
10–20	8
20–30	7
30–40	12
40–50	23
50–60	11
60–70	13
70–80	8
80–90	6
90–100	12

[CBSE Term 1, Set 1, 2015]

Ans.

Class Interval	Frequency (f_i)	x_i	$d_i = x_i - 55$	$f_i d_i$
10–20	8	15	–40	–320
20–30	7	25	–30	–210
30–40	12	35	–20	–240
40–50	23	45	–10	–230
50–60	11	55	0	0
60–70	13	65	10	130
70–80	8	75	20	160
80–90	6	85	30	180
90–100	12	95	40	480
	$\Sigma f_i = 100$			$\Sigma f_i d_i = -50$

Let $A = 55$

$$\text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i} = 55 + \left(\frac{-50}{100}\right)$$

$$= 55 - \frac{50}{100} = 55 - 0.5 = 54.5$$

Q. 8. The average score of boys in the examination of a school is 71 and that of the girls is 73. The average score of the school in the examination is 71.8. Find the ratio of number of boys to the number of girls who appeared in the examination.

[CBSE Term 1, Set 1, 2015]

Ans. Let the number of boys = n_1

and number of girls = n_2

Average boys' score = $71 = \overline{X}_1$ (Let)

Average girls' score = $73 = \overline{X}_2$ (Let)

$$\text{Combined mean} = \frac{n_1\overline{X}_1 + n_2\overline{X}_2}{n_1 + n_2}$$

$$71.8 = \frac{n_1(71) + n_2(73)}{n_1 + n_2}$$

$$\Rightarrow \quad 71n_1 + 73n_2 = 71.8n_1 + 71.8n_2$$

$$\Rightarrow \quad 71n_1 - 71.8n_1 = 71.8n_2 - 73n_2$$

$$\Rightarrow \quad -0.8n_1 = -1.2n_2$$

$$\Rightarrow \quad \frac{n_1}{n_2} = \frac{1.2}{0.8} \Rightarrow \frac{n_1}{n_2} = \frac{3}{2}$$

$$\Rightarrow \quad n_1 : n_2 = 3 : 2$$

$\therefore$ No. of boys : No. of girls = 3 : 2.

Long Answer Type Questions (4 marks each)

Q. 1. The mean of the following frequency distribution is 18. The frequency f in the class interval 19 – 21 is missing. Determine f.

Class Interval	Frequency
11 – 13	**3**
13 – 15	**6**
15 – 17	**9**
17 – 19	**13**

19 – 21	f
21 – 23	**5**
23 – 25	**4**

[CBSE OD, Set 1, 2020]

Ans.

Class Interval	Frequency f_i	Class-mark x_i	f_ix_i
11 – 13	3	12	36
13 – 15	6	14	84
15 – 17	9	16	144
17 – 19	13	18	234
19 – 21	f	20	$20f$
21 – 23	5	22	110
23 – 25	4	24	96
	$\Sigma f_i = 40 + f$		Σf_ix_i $= 704 + 20f$

We know, $\text{Mean} = \dfrac{\Sigma f_i x_i}{\Sigma f_i}$

$$\Rightarrow \quad 18 = \frac{704 + 20f}{40 + f}$$

$$\Rightarrow \quad 720 + 18f = 704 + 20f$$

$$\Rightarrow \quad 720 - 704 = 20f - 18f$$

$$\Rightarrow \quad 16 = 2f$$

$$\Rightarrow \quad f = 8$$

So, missing frequency of class inteval 19 – 21 is 8. **Ans.**

Q. 2. The following table gives production yield per hectare of wheat of 100 farms of a village

Production Yield	No. of farms
40 – 45	**4**
45 – 50	**6**
50 – 55	**16**
55 – 60	**20**
60 – 65	**30**
65 – 70	**24**

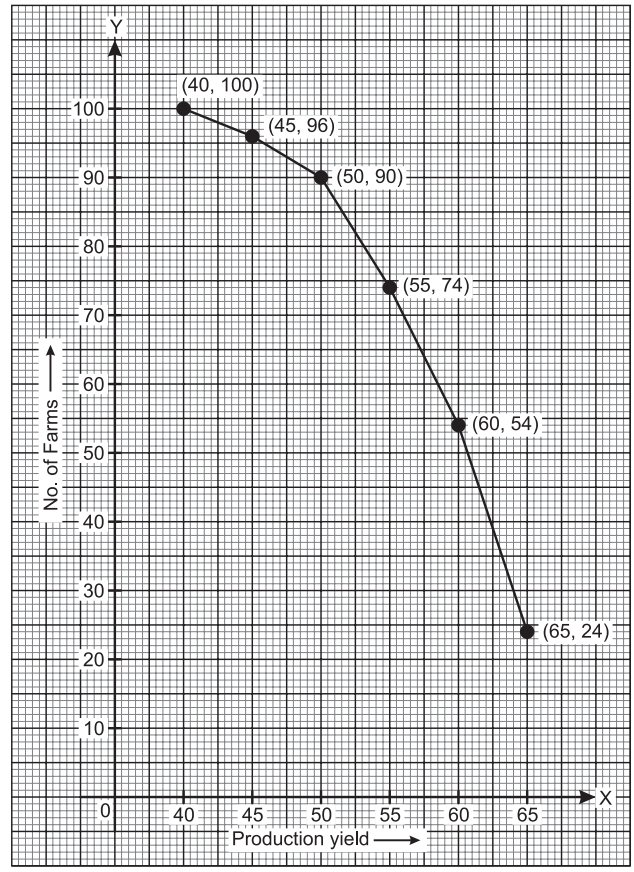
Change the distribution of a 'more than' type distribution and draw its graph.

[CBSE OD, Set 1, 2020]

Ans. More than type distribution :

Production yield	No. of farms
More than 65	24
More than 60	54
More than 55	74
More than 50	90
More than 45	96
More than 40	100

On a graph paper, we plot the points A(40, 100), B(45, 96), C(50, 90), D(55, 74), E(60, 54) and F(65, 24).



Q. 3. The median of the following data is 525. Find the values of x and y, if total frequency is 100 : [CBSE Delhi, Set 1, 2020]

Ans.

Class	Frequency	*c.f.*
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	$56 + x$
600 – 700	y	$56 + x + y$

700 – 800	9	$65 + x + y$
800 – 900	7	$72 + x + y$
900 – 1000	4	$76 + x + y$
	$\Sigma f_i = 76 + x + y$	

$\because$ Median = 525

$\therefore$ Median class = 500 – 600

$\therefore l = 500, h = 100, c.f. = 36 + x, f = 20, \frac{n}{2} = 50$

We know that

$$\text{Median} = l + \left[\frac{\frac{n}{2} - c.f.}{f}\right] \times h$$

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

$$\Rightarrow \quad 525 = 500 + \left[\frac{50 - 36 - x}{20}\right] \times 100$$

$$\Rightarrow \quad 525 - 500 = \left(\frac{14 - x}{1}\right) \times 5$$

$$\Rightarrow \quad 25 = 70 - 5x$$

$$\Rightarrow \quad 5x = 45$$

$$\Rightarrow \quad x = 9$$

Also, $x + y + 76 = 100$

$$\Rightarrow \quad 9 + y + 76 = 100$$

$$\Rightarrow \quad y + 85 = 100$$

$$\Rightarrow \quad y = 15$$

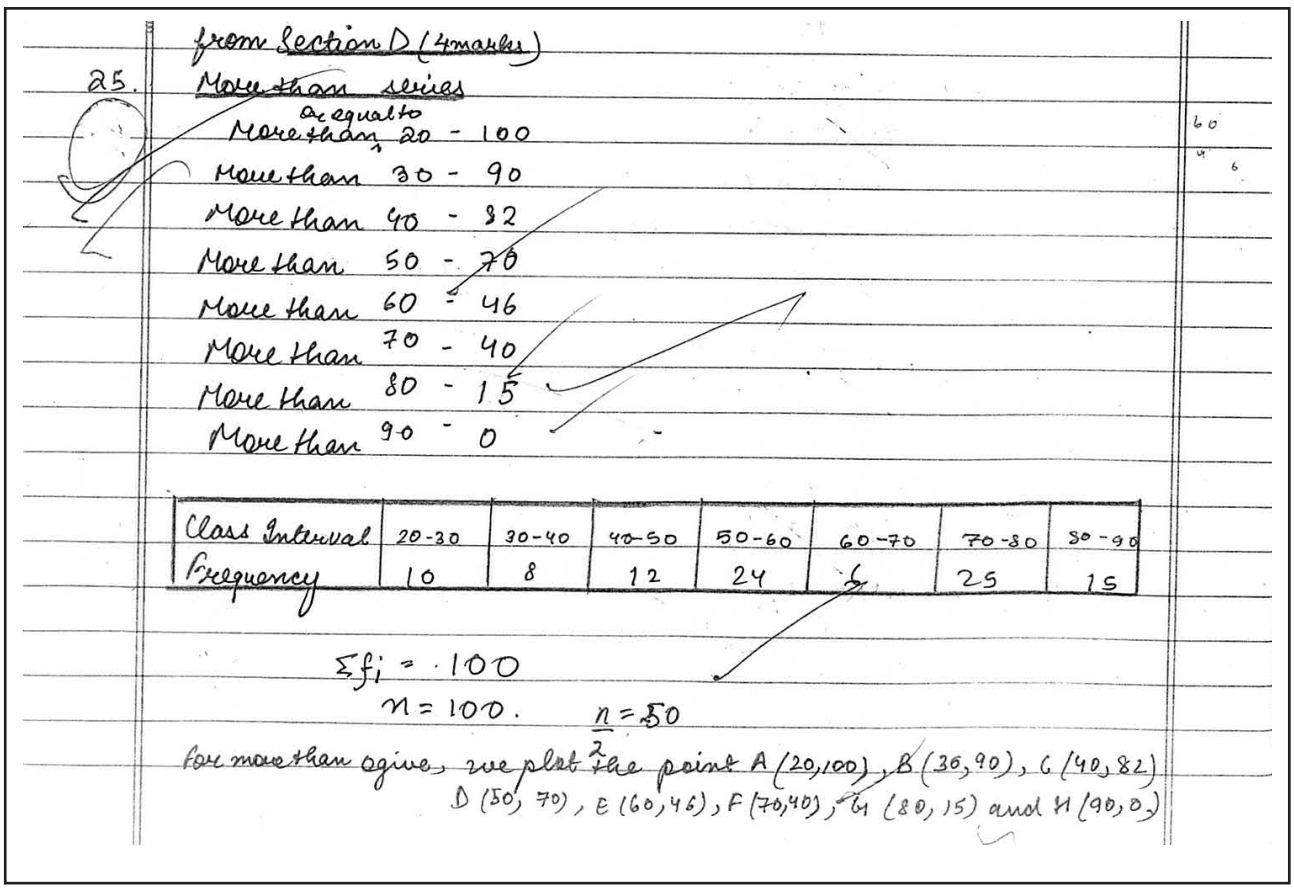
$\therefore x = 9$ and $y = 15$. **Ans.**

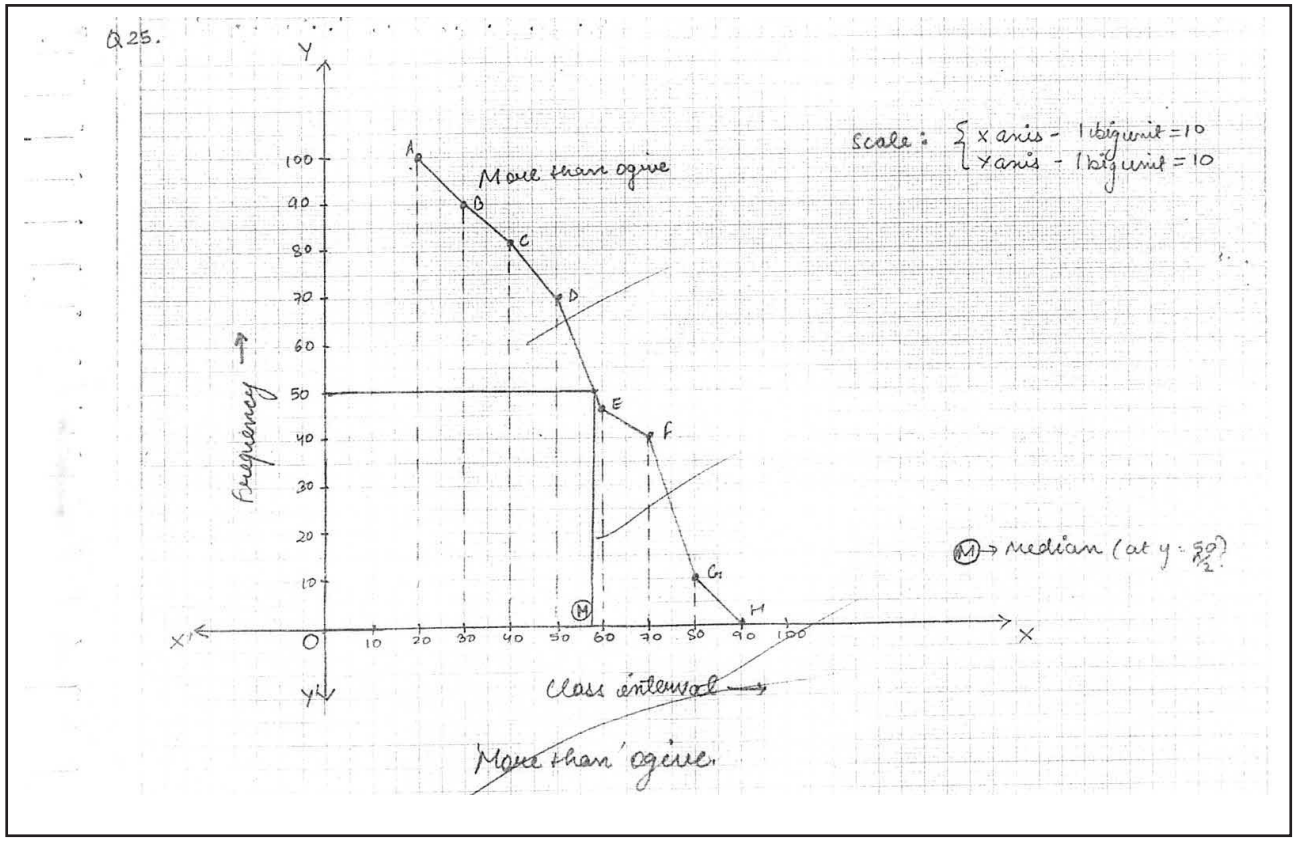
Q. 4. Change the following distribution to a 'more than type' distribution. Hence draw the 'more than type' ogive for this distribution.

Class interval :	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency :	10	8	12	24	6	25	15

[CBSE, 2019]

Topper's Answers





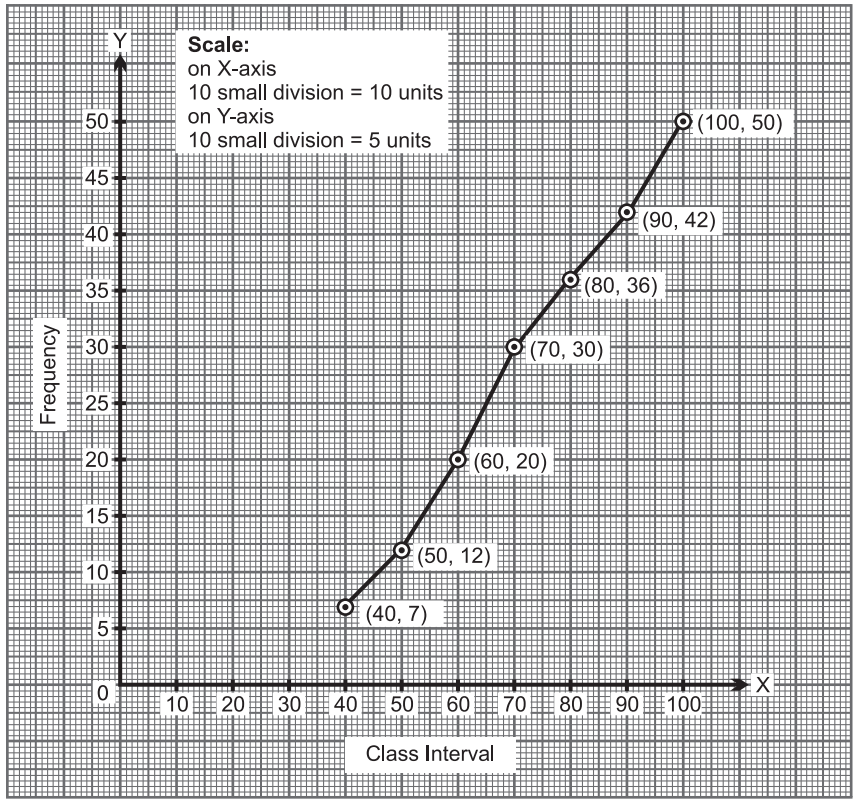
Q. 5. Change the following data into 'less than type' distribution and draw its ogive:

Class Interval	Frequency
30–40	7
40–50	5
50–60	8
60–70	10
70–80	6
80–90	6
90–100	8

[CBSE OD, Set 1, 2019]

Ans.

Class Interval	Frequency
less than 40	7
less than 50	12
less than 60	20
less than 70	30
less than 80	36
less than 90	42
less than 100	50



Q. 6. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	Frequency
0–10	f_1
10–20	5
20–30	9
30–40	12
40–50	f_2
50–60	3
60–70	2
Total	40

[CBSE Delhi, Set 1, 2019]

Ans. Median = 32.5

Class	Frequency	Cumulative Frequency
0–10	f_1	f_1
10–20	5	$f_1 + 5$
20–30	9	$f_1 + 14$
30–40	12	$f_1 + 26$
40–50	f_2	$f_1 + f_2 + 26$
50–60	3	$f_1 + f_2 + 29$
60–70	2	$f_1 + f_2 + 31$

Total frequency $= 40$

$\therefore \quad f_1 + f_2 + 31 = 40$

or $\quad f_1 + f_2 = 9 \quad$ ...(i)

Also $\quad \dfrac{n}{2} = \dfrac{40}{2} = 20$

Median $= 32.5$ (given)

which lies in the class interval (30 – 40)

$\therefore$ Median class = 30 – 40

So, $l = 30, f = 12, C.f. = f_1 + 14, h = 10$

So, $\quad \text{Median} = l + \left[\dfrac{\frac{n}{2} - C.f.}{f}\right] \times h$

$$32.5 = 30 + \left[\frac{20 - (f_1 + 14)}{12}\right] \times 10$$

$$32.5 = 30 + \left(\frac{6 - f_1}{6}\right) \times 5$$

or $\quad 2.5 = \dfrac{5}{6}(6 - f_1)$

or $\quad \dfrac{2.5 \times 6}{5} = 6 - f_1$

or $\quad 6 - f_1 = 3 \Rightarrow f_1 = 3$

From equation (i), we get

$$f_2 = 6$$

$\therefore \quad f_1 = 3, \ f_2 = 6$

Q. 7. The marks obtained by 100 students of a class in an examination are given below.

Marks	No. of Students
0–5	2
5–10	5
10–15	6
15–20	8
20–25	10
25–30	25
30–35	20
35–40	18
40–45	4
45–50	2

Draw 'a less than' type cumulative frequency curves (ogive). Hence find median.

[CBSE Delhi, Set 1, 2019]

Ans.

Marks	Cumulative Frequency
less than 5	2
less than 10	7
less than 15	13
less than 20	21
less than 25	31
less than 30	56
less than 35	76
less than 40	94
less than 45	98
less than 50	100

To draw a less than ogive, we mark the upper class limits of the class intervals on the x-axis and their *c.f.* on the y-axis by taking a convenient scale.

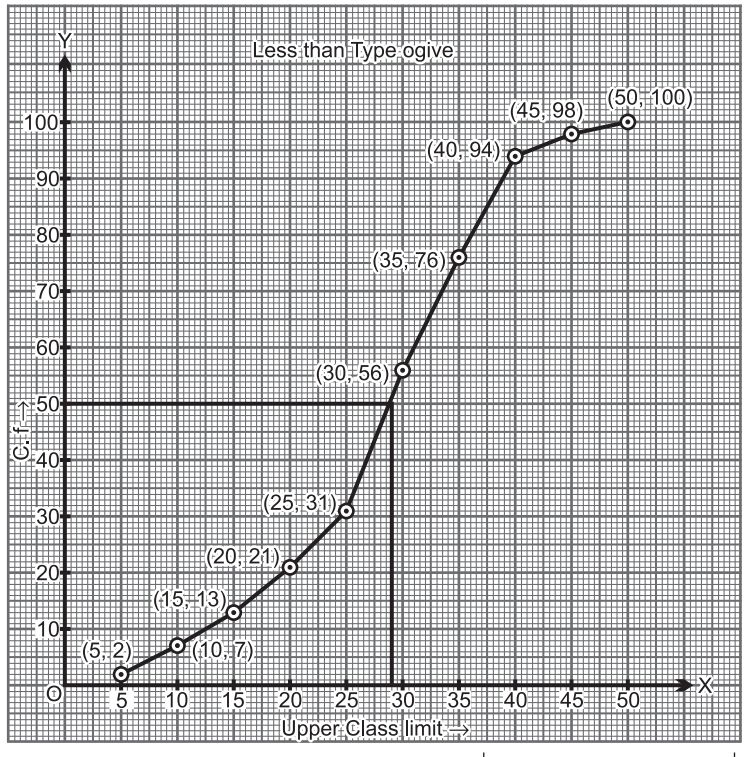
Here, $n = 100$

$$\frac{n}{2} = 50,$$

To get median from graph, from a point $\frac{n}{2}$ *ie.,* 50 draw a line parallel to x-axis. Now, from a point, where this line meet the curve, draw another line parallel to y -axis.

The point where this perpendicular meet on x-axis will be the median.

$\therefore$ Median = 29



Q. 8. The following distribution gives the daily income of 50 workers of a factory.

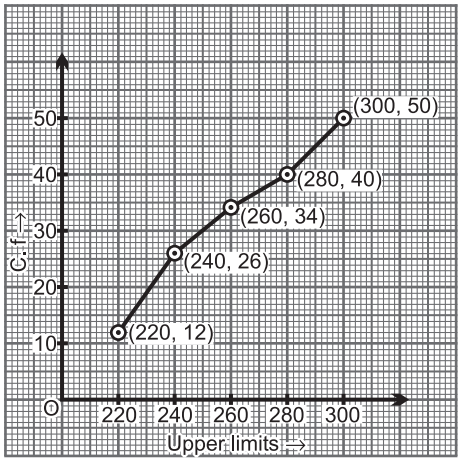
Daily Income (in ₹)	Number of Workers
200–220	12
220–240	14
240–260	8
260–280	6
280–300	10

Convert the distribution above to a 'less than type' cumulative frequency distribution and draw its ogive.

[CBSE Delhi, Set 3, 2019]

Ans. Less than type frequency distribution table:

Daily Income	Cumulative Frequency
less than 220	12
less than 240	26
less than 260	34
less than 280	40
less than 300	50



Q. 9. The table below shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure of food.

Daily Expenditure (in ₹):	Number of Households
100–150	4
150–200	5
200–250	12
250–300	2
300–350	2

[CBSE Delhi, Set 3, 2019]

Ans.

Daily Expenditure	No. of Households (f_i)	Mid-value (x_i)	$f_i x_i$
100–150	4	125	500
150–200	5	175	875
200–250	12	225	2700
250–300	2	275	550
300–350	2	325	650
	$\Sigma f_i = 25$		$\Sigma f_i x_i = 5275$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{5275}{25} = 211$$

Hence, Mean = 211

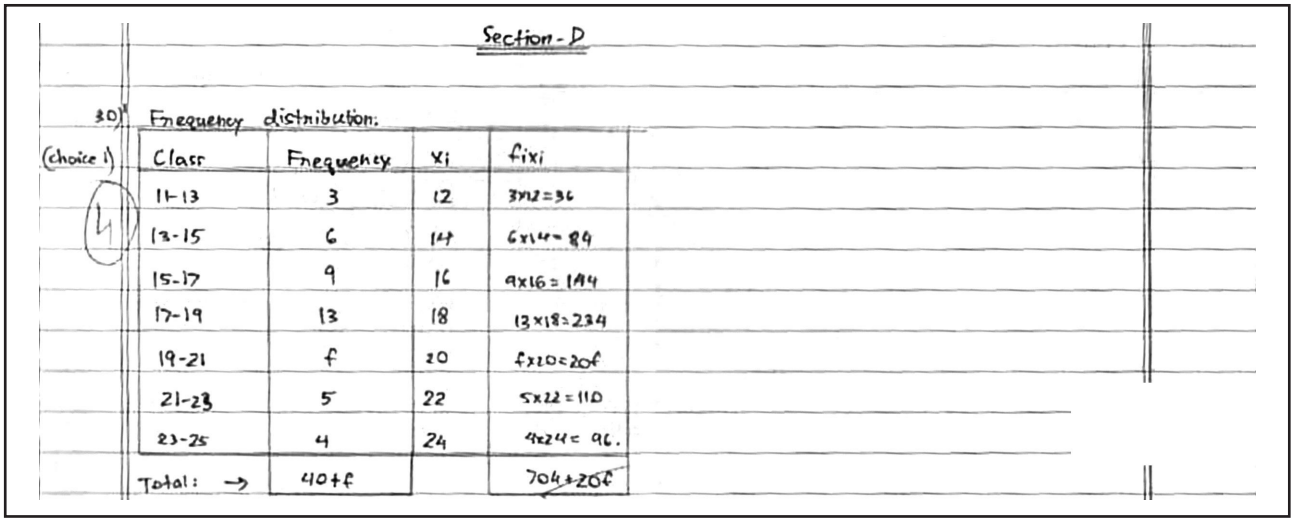
Q. 10. The mean of the following distribution is 18. Find the frequency *f* of the class 19–21.

Class	11–13	13–15	15–17	17–19	19–21	21–23	23–24
Frequency	3	6	9	13	*f*	5	4

[CBSE, 2018]

Ans.

Topper's Answers



Section - D

30) Frequency distribution:

(choice i)

Class	Frequency	x_i	$f_i x_i$
11-13	3	12	3×12=36
13-15	6	14	6×14=84
15-17	9	16	9×16=144
17-19	13	18	13×18=234
19-21	f	20	f×20=20f
21-23	5	22	5×22=110
23-25	4	24	4×24=96.
Total: →	40+f		704+20f

Given, mean = 18. To find: Value of f.

We know,

mean $(\bar{x}) = \frac{\sum f_i x_i}{\sum f_i}$

$\Rightarrow 18 = \frac{704+20f}{40+f}$

$720 + 18f = 704 + 20f$.

$720 - 704 = 20f - 18f$

$16 = 2f$

$\Rightarrow f = 8$.

The value of f is 8

C.I.	Mid-value x_i	f_i	$f_i x_i$
11–13	12	3	36
13–15	14	6	84
15–17	16	9	144
17–19	18	13	234
19–21	20	f	$20f$
21–23	22	5	110
23–25	24	4	96
Total		$\Sigma f_i = 40 + f$	$\Sigma f_i x_i = 704 + 20f$

Now, Mean = 18 (Given)

$$\Rightarrow \frac{\Sigma f_i x_i}{\Sigma f_i} = 18$$

$$\therefore \frac{704 + 20f}{40 + f} = 18$$

$$\Rightarrow 704 + 20f = 18(40 + f)$$

$$\Rightarrow 704 + 20f = 720 + 18f$$

$$\Rightarrow 20f - 18f = 720 - 704$$

$$\Rightarrow 2f = 16$$

$$\Rightarrow f = 8$$

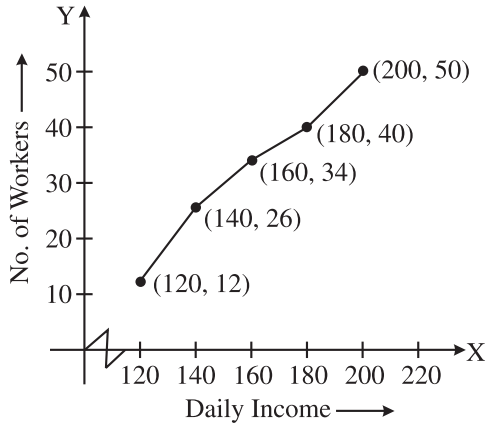
Q. 11. The following distribution given the daily income of 50 workers of a factory:

Daily Income (in ₹)	100–120	120–140	140–160	160–180	180–200
Number of Workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive. **[CBSE, 2018]**

Ans. Less than type cumulative frequency distribution:

Daily Income	Cumulative Frequency
Less than 120	12
Less than 140	26
Less than 160	34
Less than 180	40
Less than 200	50



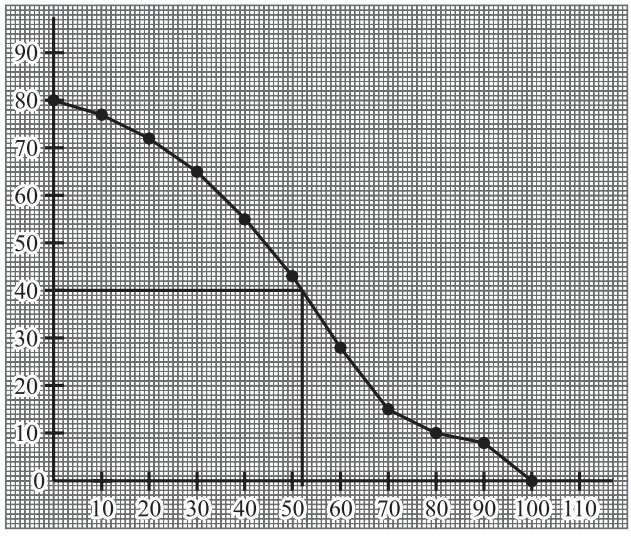
Q. 12. Following table shows marks (out of 100) of students in a class test:

Marks	No. of Students
More than or equal to 0	80
More than or equal to 10	77
More than or equal to 20	72
More than or equal to 30	65
More than or equal to 40	55
More than or equal to 50	43
More than or equal to 60	28
More than or equal to 70	16
More than or equal to 80	10
More than or equal to 90	8
More than or equal to 100	0

Draw a 'more than type' ogive. From the curve, find the median. Also, check the value of the median by actual calculation. **[CBSE Term 1, 2016]**

Ans.

More than type	C.I.	No. of Students	Frequency	*c.f.*
More than or equal to 0	0–10	80	3	3
More than or equal to 10	10–20	77	5	8
More than or equal to 20	20–30	72	7	15
More than or equal to 30	30–40	65	10	25
More than or equal to 40	40–50	55	12	37
More than or equal to 50	50–60	43	15	52
More than or equal to 60	60–70	28	12	64
More than or equal to 70	70–80	16	06	70
More than or equal to 80	80–90	10	02	72
More than or equal to 90	90–100	8	08	80
More than or equal to 100	100–110	0	00	



Median will be 52

Median by actual calculation:

$$N = 80 \text{ (even)}$$

$$\frac{N}{2} = \frac{80}{2}$$

$$= 40$$

So median class will be 50–60

So, $l = 50, h = 10, f = 15, c.f. = 37,$

$$\text{Median} = l + \left[h \times \frac{\left(\frac{N}{2} - c.f. \right)}{f} \right]$$

$$= 50 + \left[10 \frac{(40 - 37)}{15} \right]$$

$$= 50 + 10 \times \frac{3}{15}$$

$$= 50 + 2$$

$$= 52$$ **Hence Verified.**

Q. 13. From the following data find the median age of 100 residents of a colony who took part in Swachch Bharat Abhiyan:

Age (in yrs.) More than or equal to	No. of Residents
0	50
10	46
20	40
30	20
40	10
50	3

[CBSE Term 1, 2016]

Ans. First convert the given table into C.I. Table.

C.I.	Frequency	c.f.
0–10	4	4
10–20	6	10
20–30	20	30
30–40	10	40
40–50	7	47
50–60	3	50

$$\frac{N}{2} = \frac{50}{2} = 25$$

$\therefore$ Median class 20–30

So, $l = 20, f = 20, c.f. = 10$ and $h = 10$.

$$\text{Median} = l = \left[h \frac{\left(\frac{N}{2} - c.f. \right)}{f} \right]$$

$$= 20 + \left[10 \frac{(25 - 10)}{20} \right]$$

$$= 20 + \frac{15}{2} = 27.5$$

Q. 14. The following table gives the daily income of 50 workers of a factory. Draw both types ("less than type" and "greater than type") ogives.

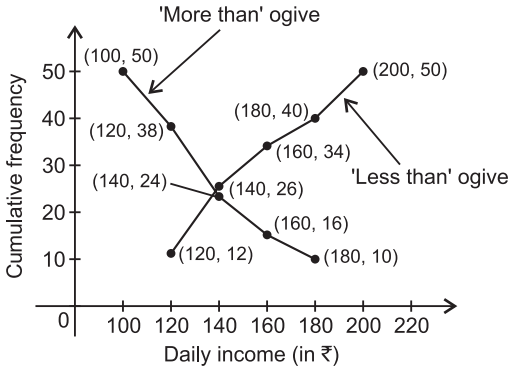
Daily Income (in ₹)	No. of Workers
100–120	12
120–140	14
140–160	8
160–180	6
180–200	10

[CBSE Term 1, Set 1, 2015]

Ans.

Less than ogive **More than ogive**

Daily Income (in ₹)	No. of workers (*c.f.*)	Daily Income (in ₹)	No. of workers (*c.f.*)
Less than 120	12	More than 100	50
Less than 140	26	More than 120	38
Less than 160	34	More than 140	24
Less than 180	40	More than 160	16
Less than 200	50	More than 180	10



Q. 15. In a class test, marks obtained by 120 students are given in the following frequency distribution. If it is given that mean is 59, find the missing frequencies x and y.

Marks	No. of Students
0–10	1
10–20	3
20–30	7
30–40	10
40–50	15
50–60	x
60–70	9
70–80	27
80–90	18
90–100	y

[CBSE Term 1, Set 1, 2015]

Ans.

Marks	No. of students f_i	X_i	$d_i = \frac{X_i - 55}{10}$	$f_i d_i$
0–10	1	5	–5	–5
10–20	3	15	–4	–12
20–30	7	25	–3	–21
30–40	10	35	–2	–20
40–50	15	45	–1	–15
50–60	x	A = 55	0	0
60–70	9	65	1	9
70–80	27	75	2	54
80–90	18	85	3	54
90–100	y	95	4	$4y$
	$\Sigma f_i = 90+x+y$			$\Sigma f_i d_i = 44 + 4y$

$$\Sigma f_i = 90 + x + y$$

But $\Sigma f_i = 120$ [Given]

$\therefore \quad 90 + x + y = 120$

$$x = 120 - 90 - y = 30 - y \quad ...(i)$$

$$\text{Mean} = A + \frac{\Sigma f_i d_i}{\Sigma f_i} \times h$$

$$\Rightarrow \quad 59 = 55 + \left(\frac{44 + 4y}{120} \times 10 \right)$$

[A = 55, $h = 10$, $\Sigma f_i = 120$]

$$\Rightarrow \quad 59 - 55 = \frac{4(11 + y)}{12}$$

$$\Rightarrow \quad 4 \times 3 = 11 + y$$

$$\Rightarrow \quad y = 12 - 11 = 1$$

From eq. (i), $x = 30 - 1 = 29$

$\therefore \quad x = 29, y = 1$