NCERT SOLUTIONS

Statistics

Ex - 14.1

Q1. A survery was conducted by a group of students as a part of their environment awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality. Find the mean number of plants per house.

Number of Plants	0-2	2-4	4-6	6-8	8-10	10-12	12-14
Number of houses	1	2	1	5	6	2	3

Which method did you use for finding the mean, and why?

Sol. Let us find mean of the data by direct method because the figures are small.

(Number of plants) Class	(Number of houses) Frequency (f_i)	Class marks (x_i)	$f_i \times x_i$
0-2	1	1	1
2-4	2	3	6
4-6	1	5	5
6-8	5	7	35
8-10	6	9	54
10-12	2	11	22
12-14	3	13	39
Total	n = 20		162

We have, $n = \Sigma f_i = 20$ and $\Sigma f_i x_i = 162$.

Then mean of the data is

$$\bar{x} = \frac{1}{n} \times \Sigma f_i x_i = \frac{1}{20} \times 162 = 8.1$$

Hence, the required mean of the data is 8.1 plants.

Q2. Consider the following distribution of daily wages of 50 workers of a factory.

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

Find the mean daily wages of the workers of the factory by using an appropriate method.

Sol.

Daily wages (In Rs.)	No. of workers (f_i)	Class marks (x_i)	f_ix_i
100–120	12	110	1320
120–140	14	130	1820
140–160	8	150	1200
160–180	6	170	1020
180–200	10	190	1900
Total	n = 50		7260

We have $\Sigma f_i = 50$ and $\Sigma f_i x_i = 7260$

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{7260}{50} = 145.2$$

Q3. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs. 18. Find the missing frequency f.

Daily pocket Allowance (in Rs.)	Number of children
11-13	7
13-15	6
15-17	9
17-19	13
19-21	f
21-23	5
23-25	4

Sol. We may prepare the table as given below :

Daily pocket allowance (in Rs.)	Number of children (f_i)	Class mark (x_i)	$d_i = x_i - 18$	$f_i \times d_i$
11-13	7	12	– 6	– 42
13-15	6	14	– 4	– 24
15-17	9	16	– 2	– 18
17-19	13	18 = a	0	0
19-21	f	20	2	2f
21-23	5	22	4	20
23-25	4	24	6	24
	$\Sigma f_i = 44 + f$			2f – 40

It is given that mean = 18.

From the table, we have

$$a = 18,\ n = 44 + f \text{ and } \Sigma f_i d_i = 2f - 40$$

Now, $\quad \text{mean} = a + \frac{1}{n} \times \Sigma f_i d_i$

Then substituting the values as given above, we have

$$18 = 18 + \frac{1}{(44+f)} \times (2f - 40)$$

$$\Rightarrow \quad 0 = \frac{2f-40}{44+f} \Rightarrow f = 20.$$

Q4. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute were recorded and summarised as follows. Find the mean heart beats per minute for these women, choosing a suitable method.

Number of heart beats per minute	Number of women
65-68	2
68-71	4
71-74	3
74-77	8
77-80	7
80-83	4
83-86	2

Sol.

No. of heart beats per min	No. of women (f_i)	Class marks (x_i)	f_ix_i
65–68	2	66.5	133
68–71	4	69.5	278
71–74	3	72.5	217.5
74–77	8	75.5	604
77–80	7	78.5	549.5
80–83	4	81.5	326
83–86	2	84.5	169
Total	n = 30		2277

$$\text{Mean} = \frac{\sum f_ix_i}{\sum f_i} = \frac{2277}{30} = 75.9.$$

Q5. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying number of mangoes. The following was the distribution of mangoes according to the number of boxes.

No. of mangoes	50-52	53-55	56-58	59-61	62-64
No. of boxes	15	110	135	115	25

Find the mean number of mangoes kept in a packing box. Which method of finding the mean did you choose?

Sol.

Number of mangoes	Number of boxes f_i	Class mark x_i	$u_i = \frac{x_i - 57}{3}$	$f_i \times u_i$
50-52	15	51	– 2	– 30
53-55	110	54	– 1	– 110
56-58	135	57	0	0
59-61	115	60	1	115
62-64	25	63	2	50
Total	n = 400			25

$a = 57$, $h = 2$, $n = 400$ and $\Sigma f_iu_i = 25$.

By step deviation method,

$$\text{Mean} = a + h \times \frac{1}{n} \times \Sigma f_iu_i = 57 + 2 \times \frac{1}{400} \times 25 = 57.19$$

Q6. The table below shows the daily expenditure on food of 25 households in a locality.

Daily expenditure (in Rs.)	No. of households
100-150	4
150-200	5
200-250	12
250-300	2
300-350	2

Find the mean daily expenditure on food by a suitable method.

Sol.

Daily Exp. (in Rs.)	No. of house holds (f_i)	Class marks (x_i)	f_ix_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
Total	25		5275

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{5275}{25} = 211$$

Q7. To find out the concentration of SO_2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below :

Concentration of SO_2 (in ppm)	Frequency
0.00-0.04	4
0.04-0.08	9
0.08-0.12	9
0.12-0.16	2
0.16-0.20	4
0.20-0.24	2

Find the mean concentration of SO_2 in the air.

Sol.

Concentration of SO_2 (in ppm)	Frequency (f_i)	Class marks (x_i)	f_ix_i
0-0.04	4	0.02	0.08
0.04–0.08	9	0.06	0.54
0.08–0.12	9	0.10	0.90
0.12–0.16	2	0.14	0.28
0.16–0.20	4	0.18	0.72
0.20–0.24	2	0.22	0.44
Total	30		2.96

Mean $= \dfrac{\sum f_ix_i}{\sum f_i} = \dfrac{2.96}{30} = 0.098.$

Q8. A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent.

No. of days	0-6	6-10	10-14	14-20	20-28	28-38	38-40
No. of students	11	10	7	4	4	3	1

Sol.

No. of days	No. of students (f_i)	Class marks (x_i)	f_ix_i
0–6	11	3	33
6–10	10	8	80
10–14	7	12	84
14–20	4	17	68
20–28	4	24	96
28–38	3	33	99
38–40	1	39	39
Total	40		499

Mean $= \dfrac{\sum f_ix_i}{\sum f_i} = \dfrac{499}{40} = 12.475$

Q9. The following table gives the literacy rate (in percentage) of 35 cities. Find the mean literacy rate.

Literacy rate (in %)	45-55	55-65	65-75	75-85	85-95
No. of cities	3	10	11	8	3

Sol.

Literacy rate (in %)	No. of cities (f_i)	Class marks (x_i)	$f_i x_i$
45–55	3	50	150
55–65	10	60	600
65–75	11	70	770
75–85	8	80	640
85–95	3	90	270
Total	35		2430

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{2430}{35} = 69.43$$

Ex - 14.2

Q1. The following table shows the ages of the patients admitted in a hospital during a year :

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of patients	6	11	21	23	14	5

Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.

Sol. From the given data, we have the modal class 35-45.

{∵ It has largest frequency among the given classes of the data}

So, $\ell = 35$, $f_m = 23$, $f_1 = 21$, $f_2 = 14$ and $h = 10$.

$$\text{Mode} = \ell + \left\{\frac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h$$

$$= 35 + \left\{\frac{23-21}{46-21-14}\right\} \times 10 = 35 + \frac{20}{11} = 36.8 \text{ years}$$

Now, let us find the mean of the data :

Age (in years)	Number of patients f_i	Class mark x_i	$u_i = \frac{x_i - 30}{10}$	$f_i \times u_i$
5-15	6	10	– 2	– 12
15-25	11	20	– 1	– 11
25-35	21	30=a	0	0
35-45	23	40	1	23
45-55	14	50	2	28
55-65	5	60	3	15
Total	n = 80			43

$a = 30$, $h = 10$, $n = 80$ and $\Sigma f_i u_i = 43$

$$\text{Mean} = a + h \times \frac{1}{n} \times \Sigma f_i u_i = 30 + 10 \times \frac{1}{80} \times 43$$

$$= 30 + 5.37 = 35.37 \text{ years}$$

Thus, mode = 36.8 years and mean = 35.37 years.

So, we conclude that the maximum number of patients admitted in the hospital are of the age 36.8 years (approx), whereas on an average the age of a patient admitted to the hospital is 35.37 years.

Q2. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components :

Lifetimes (in hours)	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

Sol. Modal class of the given data is 60-80.

Here, ℓ = 60, f_m = 61, f_1 = 52, f_2 = 38 and h = 20.

Mode= $\ell + \left\{\dfrac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h$

$= 60 + \left\{\dfrac{61-52}{122-52-38}\right\} \times 20$

$= 60 + \dfrac{9 \times 20}{32} = 60 + \dfrac{45}{8}$

$= 60 + 5.625$

$= 65.625$ hours

Q3. The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure:

Expenditure (in Rs.)	No. of families
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	28
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	7

Sol.

Exp. (in Rs.)	No. of families (f_i)	Class marks (x_i)	f_ix_i
1000–1500	24	1250	30000
1500–2000	40	1750	70000
2000–2500	33	2250	74250
2500–3000	28	2750	77000
3000–3500	30	3250	97500
3500–4000	22	3750	82500
4000–4500	16	4250	68000
4500–5000	7	4750	33250
Total	200		5,32,500

Mean = $\dfrac{\sum f_ix_i}{\sum f_i} = \dfrac{532500}{200} = 2662.5$

Modal class = 1500 – 2000

Mode = $\ell + \left\{\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right\} \times h$

$= 1500 + \left\{\dfrac{40-24}{2\times 40 - 24 - 33}\right\} \times 500$

$= 1500 + \dfrac{16}{80-57} \times 500 = 1847.83.$

Q4. The following distribution gives the state-wise teacher-student ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret, the two measures.

No. of students per teacher	No. of states/ U.T.
15-20	3
20-25	8
25-30	9
30-35	10
35-40	3
40-45	0
45-50	0
50-55	2

Sol. Modal class is (30-35) and its frequency is 10.

So, $\ell = 30$, $f_m = 10$, $f_1 = 9$, $f_2 = 3$, $h = 5$.

$$\text{Mode} = \ell + \left\{\frac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h$$

$$= 30 + \left\{\frac{10-9}{20-9-3}\right\} \times 5 = 30 + \frac{5}{8} = 30.6$$

Number of students per teacher	Number of states/ U.T. f_i	Class mark x_i	$u_i = \frac{x_i - 32.5}{5}$	$f_i \times u_i$
15-20	3	17.5	– 3	– 9
20-25	8	22.5	– 2	– 16
25-30	9	27.5	– 1	– 9
30-35	10	32.5=a	0	0
35-40	3	37.5	1	3
40-45	0	42.5	2	0
45-50	0	47.5	3	0
50-55	2	52.5	4	8
	n = 35			– 23

$a = 32.5$, $h = 5$, $n = 35$ and $\Sigma f_i u_i = -23$.

By step-deviation method,

$$\text{Mean} = a + h \times \frac{1}{n} \times \Sigma f_i u_i$$

$$= 32.5 + 5 \times \frac{1}{35} \times (-23)$$

$$= 32.5 - \frac{23}{7} = 32.5 - 3.3 = 29.2$$

Hence, Mode = 30.6 and Mean = 29.2. We conclude that most states/U.T. have a student teacher ratio of 30.6 and on an average, the ratio is 29.2.

Q5. The given distribution shows the number of runs scored by some top batsmen of the world in one day international cricket matches :

Runs Secored	No. of batsman
3000-4000	4
4000-5000	18
5000-6000	9
6000-7000	7
7000-8000	6
8000-9000	3
9000-10000	1
10000-11000	1

Find the mode of the data.

Sol. Modal class = 4000 – 5000

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

$$= 4000 + \left\{\frac{18-4}{2\times18-4-9}\right\} \times 1000$$

$$= 4000 + \left\{\frac{14}{23}\right\} \times 1000$$

$$= 4608.69$$

Q6. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data.

No. of cars	Frequency
0-10	7
10-20	14
20-30	13
30-40	12
40-50	20
50-60	11
60-70	15
70-80	8

Sol. Modal class = 40 – 50

$$\text{Mode} = 40 + \left\{\frac{20-12}{2\times20-12-11}\right\} \times 10 = 40 + \left\{\frac{8}{40-23}\right\} \times 10$$

$= 40 + 4.706 = 44.706$

Ex - 14.3

Q1. The following frequency distribution gives the monthly consumption of electricity of 68 con sumers of a locality. Find the median, mean and mode of the data and compare them.

Monthly consumption (in units)	Number of consumers
65-85	4
85-105	5
105-125	13
125-145	20
145-165	14
165-185	8
185-205	4

Sol.(i)

Monthly consumption (in units)	Number of consumers f_i	Cumulative frequency
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
185-205	4	68
Total	n = 68	

$n = 68$ gives $\frac{n}{2} = 34$

So, we have the median class (125-145)

$\ell = 125$, $n = 68$, $f = 20$, $cf = 22$, $h = 20$

$$\text{Median} = \ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h$$

$$= 125 + \left\{\frac{34-22}{20}\right\} \times 20 = 137 \text{ units.}$$

(ii) Modal class is (125 – 145) having maximum frequency $f_m = 20$, $f_1 = 13$, $f_2 = 14$, $\ell = 125$ and $h = 20$

$$\text{Mode} = \ell + \left\{\frac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h$$

$$= 125 + \left\{\frac{20-13}{40-13-14}\right\} \times 20 = 125 + \frac{7 \times 20}{13}$$

$$= 125 + \frac{140}{13} = 125 + 10.76 = 135.76 \text{ units}$$

(iii) n = 68, a = 135, h = 20 and $\Sigma f_i u_i = 7$

Monthly consumption (in units)	Number of consumers f_i	Class mark x_i	$u_i = \frac{x_i - 135}{20}$	$f_i \times u_i$
65-85	4	75	– 3	– 12
85-105	5	95	– 2	– 10
105-125	13	115	– 1	– 13
125-145	20	135=a	0	0
145-165	14	155	1	14
165-185	8	175	2	16
185-205	4	195	3	12
Total	n = 68			7

n = 68, a = 135, h = 20 and $\Sigma f_i u_i = 7$

By step-deviation method.

$$\text{Mean} = a + h \times \frac{1}{n} \times \Sigma f_i u_i = 135 + 20 \times \frac{1}{68} \times 7$$

$$= 135 + \frac{35}{17} = 135 + 2.05 = 137.05 \text{ units}$$

Q2. If the median of the distribution given below is 28.5, find the values of x and y.

Class interval	Frequency	Cumulative frequency
0-10	5	5
10-20	x	5+x
20-30	20	25+x
30-40	15	40+x
40-50	y	40+x+y
50-60	5	45+x+y
Total	60	

Sol. Median = 28.5 lies in the class-interval (20-30).

Then median class is (20-30).

So, we have $\ell = 20$, f = 20, cf = 5 + x, h = 10, n = 60

$$\text{Median} = \ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h = 28.5 \quad 28.5 = 20 + \left\{\frac{30-(5+x)}{20}\right\} \times 10$$

$$\Rightarrow 8.5 = \frac{25-x}{2} \Rightarrow 17 = 25 - x \Rightarrow x = 8$$

Find the given table, we have

i.e., x + y + 45 = 60 or x + y = 15

$\Rightarrow$ y = 15 – x = 15 – 8 = 7, i.e., y = 7

Q3. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are only given to persons having age 18 years onwards but less than 60 year.

Age (in years)	No. of policy holders
Below 20	2
Below 25	6
Below 30	24
Below 35	45
Below 40	78
Below 45	89
Below 50	92
Below 55	98
Below 60	100

Sol.

	Age (in years)	Number of policy holders f_i	Cumulative frequency
	Below 20	2 = 2	2
	20-25	(6–2) = 4	6
	25-30	(24–6) =18	24
	30-35	(45–24) = 21	45
median class	35-40	(78-45) = 33	78
	40-45	(89–78) = 11	89
	45-50	(92–89) = 3	92
	50-55	(98–92) = 6	98
	55-60	(100–98) = 2	100
	Total	n = 100	

Here, $\ell = 35$, n = 100, f = 33, cf = 45, h = 5

$$\text{Median} = \ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h$$

$$= 35 + \left\{\frac{50-45}{33}\right\} \times 5$$

$$= 35 + \frac{25}{33}$$

$$= 35 + 0.76$$

$$= 35.76 \text{ years.}$$

Q4.

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

The length of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table. Find the median length of the leaves.

Sol. The given series is in inclusive form. We may prepare the table in exclusive form and prepare the cumulative frequency table as given below :

Length (in mm)	No. of leaves (f_i)	Cumulative frequency
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
	N = 40	

Here, N = 40

$\therefore \quad \frac{N}{2} = 20$

The cumulative frequency just greater than 20 is 29 and the corresponding class is 144.5-153.5.

So, the median class is 144.5-153.5.

$\therefore \quad \ell = 144.5, N = 40, C = 17, f = 12$ and $h = 9$

Therefore, median $= \ell + \left\{\frac{\frac{N}{2} - C}{f}\right\} \times h$

$= 144.5 + \frac{(20-17)}{12} \times 9 = 144.5 + \frac{3 \times 9}{12}$

$= 144.5 + 2.25 = 146.75$

Hence, median length of leaves is 146.75 mm.

Q5. The following table gives the distribution of the life time of 400 neon lamps :

Life Time (in hours)	No. of lamps
1500-2000	14
2000-2500	56
2500-3000	60
3000-3500	85
3500-4000	74
4000-4500	62
4500-5000	48

Find the median life time of a lamp.

Sol .

Life time (in hrs.)	No. of lamps (f_i)	Cf
1500–2000	14	14
2000–2500	56	70
2500–3000	60	130
3000–3500	85	215
3500–4000	74	289
4000–4500	62	351
4500–5000	48	399

$$\frac{N}{2} = \frac{399}{2} = 199.5$$

Median class = 3000 – 3500

$$\text{Median} = \ell + \left\{\frac{\frac{N}{2} - C}{f}\right\} \times h$$

$$= 3000 + \left\{\frac{199.5 - 130}{85}\right\} \times 500 = 3408.82$$

Hence, median life time of a lamp 3408.82 hrs.

Q6. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows:

No. of letters	No. of Surnames
1-4	6
4-7	30
7-10	40
10-13	16
13-16	4
16-19	4

Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also, find the modal size of the surnames.

Sol.

	Number of letters	Number of surnames f_i	Cumulative frequency	
	1-4	6	6=6	
	4-7	30	6+30=36	
Median class	7-10	40	36+40=76	$50 = \frac{n}{2}$
	10-13	16	76+16=92	
	13-16	4	92+4=96	
	16-19	4	96+4=100	
	Total	n = 100		

(i) Here,

$\ell = 7$, $n = 100$, $f = 40$, $cf = 36$, $h = 3$

$$\text{Median} = \ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h$$

$$= 7 + \left\{\frac{50-36}{40}\right\} \times 3 = 7 + \frac{21}{20} = 8.05$$

(ii) Modal class is (7 – 10).

$\ell = 7$, $f_m = 40$, $f_1 = 30$, $f_2 = 16$, $h = 3$

$$\text{Mode} = \ell + \left\{\frac{f_m - f_1}{2f_m - f_1 - f_2}\right\} \times h$$

$$= 7 + \left\{\frac{40-30}{80-30-16}\right\} \times 3 = 7 + \frac{30}{34} = 7.88$$

(iii) Here, $a = 8.5$, $h = 3$, $n = 100$ and $\Sigma f_iu_i = -6$.

Number of letters	f_i	Class mark x_i	$u_i = \frac{x_i - 8.5}{3}$	$f_i \times u_i$
1-4	6	2.5	– 2	– 12
4-7	30	5.5	– 1	– 30
7-10	40	8.5=a	0	0
10-13	16	11.5	1	16
13-16	4	14.5	2	8
16-19	4	17.5	3	12
Total	n = 100			– 6

$$\text{Mean} = a + h \times \frac{1}{n} \times \Sigma f_iu_i = 8.5 + 3 \times \frac{1}{100} \times (-6) = 8.5 - \frac{18}{100} = 8.5 - 0.18 = 8.32$$

Q7. The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

Weight (in kg)	No. of students
40-45	2
45-50	3
50-55	8
55-60	6
60-65	6
65-70	3
70-75	2

Sol.

Weight (in kg)	No. of students	Cumulative frequency
40-45	2	2
45-50	3	5
50-55	8	13
55-60	6	19
60-65	6	25
65-70	3	28
70-75	2	30

$\frac{N}{2} = \frac{30}{2} = 15$

Median class = 55 – 60

$$\text{Median} = \ell + \left\{\frac{\frac{N}{2} - C}{f}\right\} \times h$$

$$= 55 + \left\{\frac{15-13}{6}\right\} \times 5$$

$$= 56.67$$

Ex - 14.4

Q1. The following distribution gives the daily income of 50 workers of a factory.

Daily income (in Rs.)	No. of workers
100-120	12
120-140	14
140-160	8
160-180	6
180-200	10

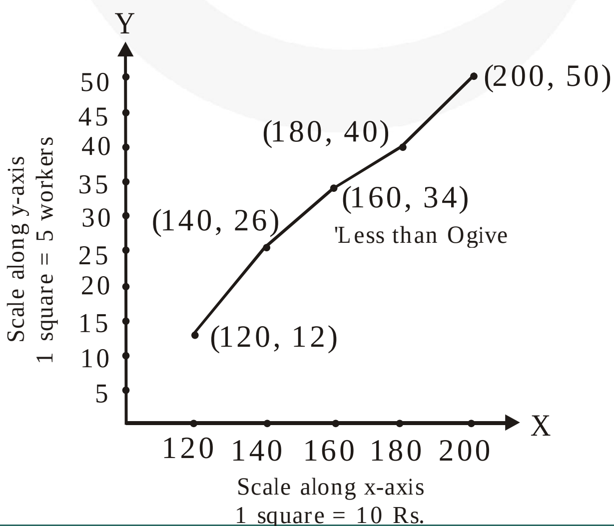
Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

Sol.

Daily income (in Rs.)	Number of workers (Frequency) f_i	Cumulative frequency less than type	
100-120	12	Less than 120	12=12
120-140	14	Less than 140	(12+14)=26
140-160	8	Less than 160	(26+8)=34
160-180	6	Less than 180	(34+6)=40
180-200	10	Less than 200	(40+10)=50
Total	n = 50		

n = 50 gives n/2 = 25

On the graph, we will plot the points (120, 12), (140, 26), (160, 34), (180, 40), (200, 50).



Q2. During the medial check up of 35 students of a class, their weights were recorded as follows

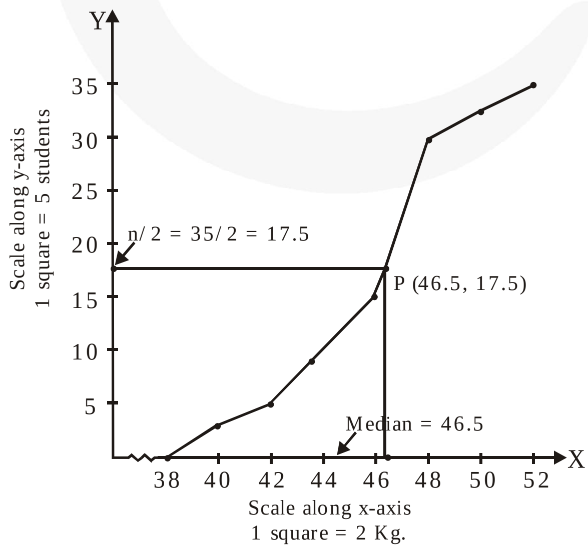
Weight (in kg)	No. of students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

Draw a less than type ogive for the given data. Hence obtain the median weight from the graph and verify the result by using the formula.

Sol.

	Weight in kg	Number of students (Frequency) f_i	Cumulative frequency less than type		
	36-38	0=0	Less than 38	0	
	38-40	(3–0)=3	Less than 40	3	
	40-42	(5–3)=2	Less than 42	5	
	42-44	(9–5)=4	Less than 44	9	
	44-46	(14–9)=5	Less than 46	14	
median class	46-48	(25–14)=14	Less than 48	28	$\frac{35}{2}=\frac{n}{2}$
	48-50	(32–28)=4	Less than 50	32	
	50-52	(35–32)=3	Less than 52	35	
	Total	n = 35			

To draw the 'less than' type ogive, we plot the points (38, 0), (40, 3), (42, 5), (44, 9), (46, 14), (48, 28), (50, 32) and (52, 35) on the graph.



Median from the graph = 46.5 kg.

median class is (46-48). (See in the table)

We have ℓ = 46, f = 14, cf = 14, n = 35 and h = 2.

$$\text{Median} = \ell + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h$$

$$= 46 + \left\{\frac{\frac{35}{2} - 14}{14}\right\} \times 2 = 46 + \frac{1}{2} = 46.5 \text{ kg}$$

Hence, the median is same as we have noticed from the graph

Q3. The following table gives production yield per hectare of wheat of 100 farms of a village.

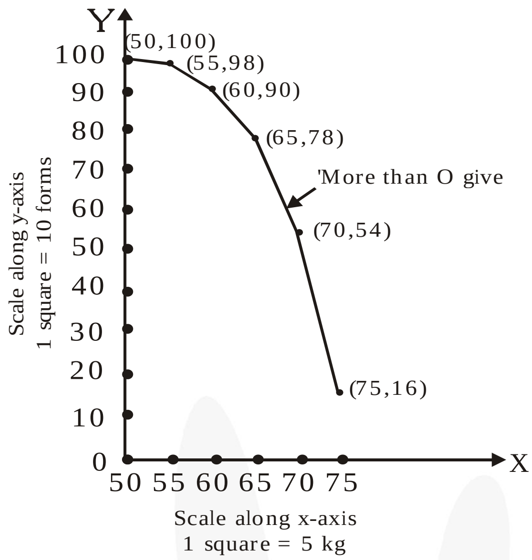
Production yield (in kg/ ha)	50-55	55-60	60-65	65-70	70-75	75-80
No. of farms	2	8	12	24	38	16

Change the distribution to a more than type distribution and draw its ogive.

Sol.

Production yield (in kg/ ha)	Number of farms (Frequency) f_i	Cumulative frequency less than type	
50-55	2	50 or more than 50	100=100
55-60	8	55 or more than 55	(100–2)=98
60-65	12	60 or more than 60	(98–8)=90
65-70	24	65 or more than 65	(90–12)=78
70-75	38	70 or more than 70	(78–24)=54
75-80	16	75 or more than 75	(54–38)=16
	n = 100		

Now, we will draw the ogive by plotting the points (50,100), (55,98), (60,90), (65,78), (70,54) and (75,16). Join these points by a freehand to get an ogive of 'more than' type.


Y
X
(50,100)
(55,98)
(60,90)
(65,78)
(70,54)
(75,16)
'More than O give
100
90
80
70
60
50
40
30
20
10
0
50 55 60 65 70 75
Scale along y-axis
1 square = 10 forms
Scale along x-axis
1 square = 5 kg