Chapter 24. Measures Of Central Tendency

Ex 24.1

Answer 1.

The first 12 even numbers are:

$2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24$

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$n = 12$

$$\Rightarrow \bar{X} = \frac{2+4+6+8+10+12+14+16+18+20+22+24}{12}$$

$$\Rightarrow \bar{X} = \frac{156}{12}$$

$$\Rightarrow \bar{X} = 13$$

Therefore, Mean of first 12 even numbers = 13.

Answer 2.

The first 10 prime numbers are:

$2, 3, 5, 7, 11, 13, 17, 19, 23, 29$

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$n = 10$

$$\Rightarrow \bar{X} = \frac{2+3+5+7+11+13+17+19+23+29}{10}$$

$$\Rightarrow \bar{X} = \frac{129}{10}$$

$$\Rightarrow \bar{X} = 12.9$$

Therefore, Mean of first 10 prime numbers = 12.9

Answer 3.

The numbers are:

$7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17$

$$\bar{X} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$n = 11$

$$\Rightarrow \bar{X} = \frac{7 + 8 + 9 + 10 + 11 + 12 + 13 + 14 + 15 + 16 + 17}{11}$$

$$\Rightarrow \bar{X} = \frac{132}{11}$$

$$\Rightarrow \bar{X} = 12$$

Therefore, Mean of numbers from 7 to 17 = 12

Answer 4.

numbers are:

5, 7, 9, 11, 13, 15, 17, 19

$$\bar{X} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$n = 8$

$$\Rightarrow \bar{X} = \frac{5 + 7 + 9 + 11 + 13 + 15 + 17 + 19}{8}$$

$$\Rightarrow \bar{X} = \frac{96}{8}$$

$$\Rightarrow \bar{X} = 12$$

Therefore, Mean of odd numbers from 5 to 20 = 12

If numbers are multiplied by 4, the numbers are:

20, 28, 36, 44, 52, 60, 68, 76

$$\bar{X} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$n = 8$

$$\Rightarrow \bar{X} = \frac{20 + 28 + 36 + 44 + 52 + 60 + 68 + 76}{8}$$

$$\Rightarrow \bar{X} = \frac{384}{8}$$

$$\Rightarrow \bar{X} = 48$$

refore, Mean of odd numbers from 5 to 20 when multiplied by 4= 48

Answer 5.

ıe numbers are:

$32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46$

$$\bar{X} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$n = 15$

$$\Rightarrow \bar{X} = \frac{32+33+34+35+36+37+38+39+40+41+42+43+44+45+46}{15}$$

$$\Rightarrow \bar{X} = \frac{585}{15}$$

$$\Rightarrow \bar{X} = 39$$

Therefore, Mean of natural numbers from 32 to 46 = 39

If numbers are diminished by 5, the numbers are:

$27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41$

$$\bar{X} = \frac{x_1 + x_2 + x_3 + ... + x_n}{n}$$

$n = 15$

$$\Rightarrow \bar{X} = \frac{27+28+29+30+31+32+33+34+35+36+37+38+39+40+41}{15}$$

$$\Rightarrow \bar{X} = \frac{510}{15}$$

$$\Rightarrow \bar{X} = 34$$

ıerefore, Mean of odd numbers from 5 to 20 when diminished by 5= 34

Answer 6.

Numbers are = 8, 14, 20, x, 12

Mean = 13

n = 5

$$\overline{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$$\Rightarrow 13 = \frac{8+14+20+x+12}{5}$$

$$\Rightarrow 13 = \frac{54+x}{5}$$

$$\Rightarrow 54 + x = 65$$

$$\Rightarrow x = 11$$

The value of x = 11

Answer 7.

Numbers are = 11, 14, p, 26, 10, 12, 18, 6

Mean = 15

n = 8

$$\overline{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$$\Rightarrow 15 = \frac{11+14+p+26+10+12+18+6}{8}$$

$$\Rightarrow 15 = \frac{97+p}{8}$$

$$\Rightarrow 97 + p = 120$$

$$\Rightarrow p = 23$$

The value of p = 23

Answer 8.

Mean monthly salary of 10 people = Rs 8,670

$n=10$

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$$Rs.8,670 = \frac{\sum X_n}{10}$$

$$\Rightarrow \sum X_n = Rs.86,700$$

Salary of new person = Rs 9000

$$\sum X_n = Rs.(86,700 + 9,000)$$

$$\sum X_n = Rs.95,700$$

$n=11$

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$$\Rightarrow \bar{X} = \frac{Rs.95,700}{11}$$

$$\Rightarrow \bar{X} = Rs.8,700$$

The new mean monthly income = Rs 8,700

Answer 9.

The heights are:

142 cm, 158 cm, 152 cm, 143 cm, 139 cm, 144 cm, 146 cm, 148 cm, 151 cm

$n = 9$

$$\bar{X} = \frac{X_1 + X_2 + X_3 + ... + X_n}{n}$$

$$\bar{X} = \frac{142 + 158 + 152 + 143 + 139 + 144 + 146 + 148 + 151}{9}$$

$$\bar{X} = \frac{1323}{9}$$

$$\bar{X} = 147cm$$

The mean height = 147 cm

Answer 10.

(i)

Class	0-10	10-20	20-30	30-40	40-50
Frequency	4	7	6	3	5

Class Interval	x_i	f_i	f_ix_i
0-10	5	4	20
10-20	15	7	105
20-30	25	6	150
30-40	35	3	105
40-50	45	5	225
Total		25	605

$$\bar{x} = \frac{\sum f_ix_i}{\sum f}$$

$$\bar{x} = \frac{605}{25}$$

$$\bar{x} = 24.2$$

$\therefore$ Mean = 24.2

(ii)

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	7	10	12	8	5

Class Interval	x_i	f_i	f_ix_i
0-10	5	4	20
10-20	15	4	60
20-30	25	7	175
30-40	35	10	350
40-50	45	12	540
50-60	55	8	440
60-70	65	5	325
Total		50	1910

$$\bar{x} = \frac{\sum f_ix_i}{\sum f}$$

$$\bar{x} = \frac{1910}{50}$$

$$\bar{x} = 38.2$$

$\therefore$ Mean = 38.2

(iii)

Class	0-6	6-12	12-18	18-24	24-30
Frequency	7	5	10	12	6

Class Interval	x_i	f_i	f_ix_i
0-6	3	7	21
6-12	9	5	45
12-18	15	10	150
18-24	21	12	252
24-30	27	6	162
Total		40	630

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

$$\bar{x} = \frac{630}{40}$$

$$\bar{x} = 15.75$$

$\therefore$ Mean = 15.75

(iv)

Class	25-35	35-45	45-55	55-65	65-75
Frequency	6	10	8	12	4

Class Interval	x_i	f_i	f_ix_i
25-35	30	6	180
35-45	40	10	400
45-55	50	8	400
55-65	60	12	720
65-75	70	4	280
Total		40	1980

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

$$\bar{x} = \frac{1980}{40}$$

$$\bar{x} = 49.5$$

$\therefore$ Mean = 49.5

(v)

Class	50-60	60-70	70-80	80-90	90-100
Frequency	8	6	12	11	13

Class Interval	x_i	f_i	f_ix_i
50-60	55	8	440
60-70	65	6	390
70-80	75	12	900
80-90	85	11	935

90-100	95	13	1235
Total		50	3900

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

$$\bar{x} = \frac{3900}{50}$$

$$\bar{x} = 78$$

∴ Mean = 78

(vi)

Class	1-10	11-20	21-30	31-40	41-50
Frequency	9	12	15	10	14

Class Interval	x_i	f_i	$f_i x_i$
1-10	5.5	9	49.5
11-20	15.5	12	186
21-30	25.5	15	382.5
31-40	35.5	10	355
41-50	45.5	14	637
Total		60	1610

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

$$\bar{x} = \frac{1610}{60}$$

$$\bar{x} = 26.83$$

∴ Mean = 26.83

(vii)

Class	101-110	111-120	121-130	131-140	141-150	151-160
Frequency	11	16	20	30	14	9

Class Interval	x_i	f_i	$f_i x_i$
101-110	105.5	11	1160.5
111-120	115.5	16	1848
121-130	125.5	20	2510
131-140	135.5	30	4065
141-150	145.5	14	2037
151-160	155.5	9	1399.5
Total		100	13020

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

$$\bar{x} = \frac{13020}{100}$$

$$\bar{x} = 130.2$$

∴ Mean = 130.2

Answer 11.

Class Interval	x_i	f_i	$f_i x_i$
0-10	5	7	35
10-20	15	x	15x
20-30	25	15	375
30-40	35	y	35y
40-50	45	10	450
Total		50	860+15x+35y

$\sum f_i = x_1 + x_2 + ... + x_n$

$50 = 7 + x + 15 + y + 10$

$\Rightarrow x + y + 32 = 50$

$\Rightarrow x + y = 18$.....(i)

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

$$25.8 = \frac{860 + 15x + 35y}{50}$$

$\Rightarrow 15x + 35y + 860 = 1290$

$\Rightarrow 15x + 35y = 430$

$\Rightarrow 3x + 7y = 86$.....(ii)

Multiplying (i) by 3 and subtracting from (ii)

$4y = 32$

$\Rightarrow y = 8$

Putting value of y in (i)

$x + 8 = 18$

$x = 10$

Therefore, x = 10 and y = 8

Answer 12.

Class Interval	x_i	f_i	A=25 d=x-A	f_id
0-10	5	9	-20	-180
10-20	15	12	-10	-120
20-30	A=25	15	0	0
30-40	35	10	10	100
40-50	45	14	20	280
Total		60		80

$$\bar{x} = A + \frac{\sum f_i d}{\sum f_i}$$

$$\bar{x} = 25 + \frac{80}{60}$$

$$\bar{x} = 25 + 1.33$$

$$\bar{x} = 26.33$$

$\therefore$ Mean = 26.33

Answer 13.

Class Interval	x_i	f_i	A=35.5 d=x-A	f_id
1-10	5.5	7	-30	-210
11-20	15.5	10	20	-200
21-30	25.5	14	-10	-140
31-40	A=35.5	17	0	0
41-50	45.5	15	10	150
51-60	55.5	11	20	220
61-70	65.5	6	30	180
Total		80		0

$$\bar{x} = A + \frac{\sum f_i d}{\sum f_i}$$

$$\bar{x} = 35.5 + \frac{0}{80}$$

$$\bar{x} = 35.5 + 0$$

$$\bar{x} = 35.5$$

$\therefore$ Mean = 35.5

Answer 14.

Class Interval	x_i	f_i	A=125 $u=\frac{x-A}{h_i}$	f_iu
100-110	105	15	-2	-30
110-120	115	18	-1	-18
120-130	A=125	32	0	0
130-140	135	25	1	25
140-150	145	10	2	20
Total		100		-3

A=125 and $h_i = 10$

$$\bar{x} = A + h \times \frac{\sum f_i u}{\sum f_i}$$

$$\bar{x} = 125 + 10 \times \frac{-3}{100}$$

$$\bar{x} = 125 - 0.3$$

$$\bar{x} = 124.70$$

$\therefore$ Mean = 124.70

Answer 15.

Class Interval	x_i	f_i	A=70 $u=\frac{x-A}{h_i}$	f_iu
0-20	10	12	-3	-36
20-40	30	24	-2	-48
40-60	50	52	-1	-52
60-80	A=70	88	0	0
80-100	90	66	1	66
100-120	110	42	2	84
120-140	130	16	3	48
Total		300		62

A=70 and $h_i = 20$

$$\bar{x} = A + h \times \frac{\sum f_i u}{\sum f_i}$$

$$\bar{x} = 70 + 20 \times \frac{62}{300}$$

$$\bar{x} = 70 + 4.13$$

$$\bar{x} = 74.13$$

$\therefore$ Mean = 74.13

Ex 24.2

Answer 1.

Arranging the given data in descending order:

45 kg, 45 kg, 44 kg, 43 kg, 42 kg, 41 kg, 40 kg, 39 kg, 37 kg, 36 kg, 36 kg

The middle term is 41 kg which is 6^{th} term

Therefore, Median of weights = 41 kg.

Answer 2.

Arranging the given data in descending order:

98, 96, 91, 88, 86, 84, 79, 75, 72, 68

The middle term are 86 and 84 which are 5^{th} and 6^{th} terms

$$\text{median} = \frac{86+84}{2} = \frac{170}{2} = 85$$

Therefore, Median of marks = 85.

Answer 3.

The first 15 whole numbers are:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Arranging the given data in descending order:

14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 0

The middle term is 7 which is 8^{th} term

Therefore, Median of numbers = 7.

Answer 4.

The prime numbers between 20 and 50 are:

23, 29, 31, 37, 41, 43, 47

Arranging the given data in descending order:

47, 43, 41, 37, 31, 29, 23

The middle term is 37 which is 4^{th} term

Therefore, Median of numbers = 37.

Answer 5.

1, 8, 15, 5, 9, 4, 19, 6, 18

ranging the given data in descending order:

19, 18, 15, 11, 9, 8, 6, 5, 4

The middle term is 9 which is 5^{th} term

Therefore, Median of numbers = 9.

5, 34, 31, 23, 22, 26, 35, 29, 20, 32

ranging the given data in descending order:

35, 34, 32, 31, 29, 26, 25, 23, 22, 20

The middle terms are 29 and 26 which are 5^{th} and 6^{th} terms

$$\text{median} = \frac{29+26}{2} = \frac{55}{2} = 27.5$$

Therefore, Median of numbers = 27.5

3x, x+5, x+7, x+9, x+11, x+13

ranging the given data in descending order:

x+13, x+11, x+9, x+7, x+5, 3x

The middle terms are x+9 and x+7 which are 3rd and 4^{th} terms

$$\text{median} = \frac{x+9+x+7}{2} = \frac{2x+16}{2} = x+8$$

Therefore, Median = x+8.

Answer 6.

(i)

Weight(kg)	36	38	40	42	44
No. of students	11	26	29	24	10

Weight (kg)	No. of students (f)	Cumulative frequency
36	11	11
38	26	37
40	29	66
42	24	90
44	10	100

No. of terms = 100

The mean of 50^{th} and 51^{st} term is the median

50^{th} and 51^{st} terms lay under 40 and 40

$$\text{median} = \frac{40+40}{2} = 40$$

Hence, Median = 40

(ii)

Salary (in Rs)	3500	4000	4500	5000	5500	6000
No. of people	9	17	23	15	6	5

Salary (in Rs)	No. of students (f)	Cumulative frequency
3500	9	9
4000	17	26
4500	23	49
5000	15	64
5500	6	70
6000	5	75

No. of terms = 75

$$\text{median} = \frac{75+1}{2} = 38^{th}\text{ term}$$

38^{th} term lies under 4500

Hence, Median = 4500

Answer 7.

Height (in cm)	Frequency (f)	Cumulative frequency
138	6	6
139	11	17
140	16	33
141	10	43
142	7	50

No. of terms = 50

The mean of 25^{th} and 26^{th} term is the median

25^{th} and 26^{th} terms lay under 140 and 140

$$\text{median} = \frac{140 + 140}{2} = 140$$

Hence, Median = 140

$$\text{Upper Quartile } (Q_3) = \frac{n \times 3}{4} = \frac{50 \times 3}{4} = 37.5^{th}\text{ term} = 141$$

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{50}{4} = 12.5^{th}\text{ term} = 139$$

Upper Quartile = 141 and Lower Quartile = 139

Answer 8.

(i)

Shoe size	5	6	7	8	9	10	11
Frequency	8	1	7	14	11	5	4

Shoe size	Frequency (f)	Cumulative frequency
5	8	8
6	1	9
7	7	16
8	14	30
9	11	41
10	5	46
11	4	50

No. of terms = 50

Lower Quartile $(Q_1) = \frac{n}{4} = \frac{50}{4} = 12.5^{th}$ term $= 7$

Upper Quartile $(Q_3) = \frac{n \times 3}{4} = \frac{50 \times 3}{4} = 37.5^{th}$ term $= 9$

Interquartile range $= Q_3 - Q_1 = 9 - 7 = 2$

Semi-interquartile range $= \frac{Q_3 - Q_1}{2} = \frac{9-7}{2} = 1$

Hence, Lower quartile = 7, upper quartile = 9, interquartile range = 2, semi- interquartile range = 1

(ii)

Marks	25	30	35	40	45	50
No. of students	6	15	12	10	18	9

Marks	No. of students (f)	Cumulative frequency
25	6	6
30	15	21
35	12	33
40	10	43
45	18	61
50	9	70

No. of terms = 70

Lower Quartile $(Q_1) = \frac{n}{4} = \frac{70}{4} = 17.5^{th}$ term $= 30$

Upper Quartile $(Q_3) = \frac{n \times 3}{4} = \frac{70 \times 3}{4} = 52.5^{th}$ term $= 45$

Interquartile range $= Q_3 - Q_1 = 45 - 30 = 15$

Semi-interquartile range $= \frac{Q_3 - Q_1}{2} = \frac{45-30}{2} = 7.5$

Hence, Lower quartile = 30, upper quartile = 45, interquartile range = 15, semi-interquartile range = 7.5

(iii)

Variate	10	11	12	13	14	15	16	17	18	19	20
Frequency	1	2	3	1	2	4	2	1	1	2	1

Variate	Frequency (f)	Cumulative frequency
10	1	1
11	2	3
12	3	6
13	1	7
14	2	9
15	4	13
16	2	15
17	1	16
18	1	17
19	2	19
20	1	20

No. of terms = 20

$n = 20$

Lower Quartile $(Q_1) = \frac{n}{4} = \frac{20}{4} = 5^{th}$ term $= 12$

Upper Quartile $(Q_3) = \frac{n \times 3}{4} = \frac{20 \times 3}{4} = 15^{th}$ term $= 16$

Interquartile range $= Q_3 - Q_1 = 16 - 12 = 4$

Semi-interquartile range $= \frac{Q_3 - Q_1}{2} = \frac{16 - 12}{2} = 2$

Hence, Lower quartile = 12, upper quartile = 16, interquartile range = 4, semi-interquartile range = 2

Answer 9.

(i)

Class Interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	12	21	18	15	7	3

We first construct the cumulative frequency table of the given distribution.

Class Interval	Frequency (f)	Cumulative Frequency
0-10	4	4
10-20	12	16
20-30	21	37
30-40	18	55
40-50	15	70
50-60	7	77
60-70	3	80

Take a graph paper and draw both the axes.

On the x –axis, take a scale of 1cm=10 to represent the class intervals.

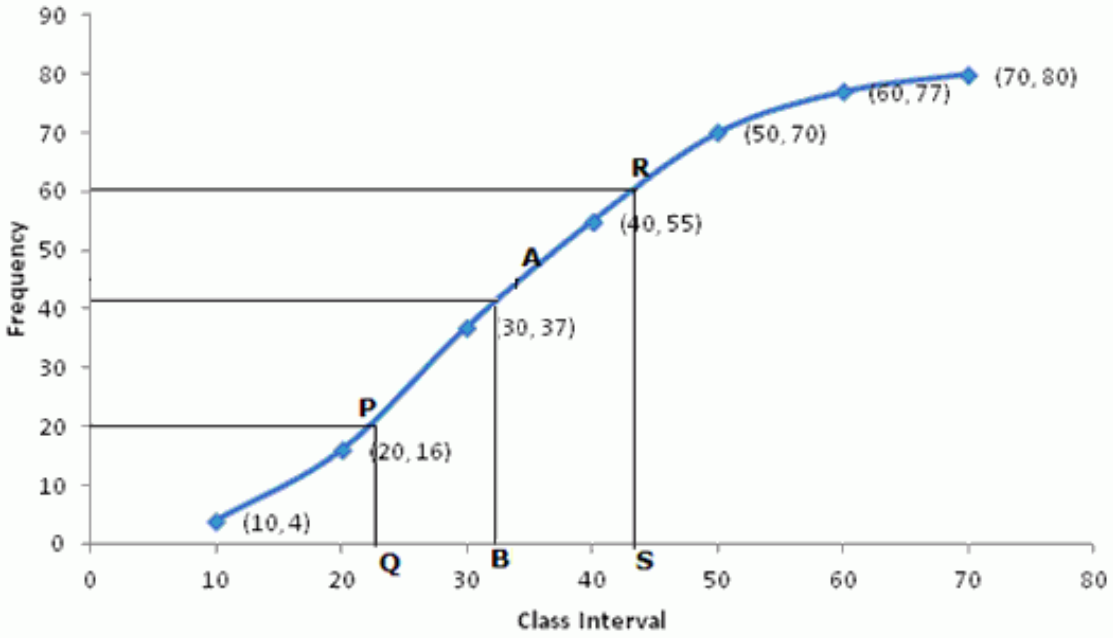
On the y – axis , take a scale of 1cm=10 to represent the frequency.

Now, plot the points (10,4) ,(20,16) ,(30,37) ,(40,55) ,(50,70) ,(60,77) ,(70,80)

Join them by a smooth curve to get the ogive.

No. of terms =n= 80

$$\therefore \text{Median} = \frac{40+41}{2} = 40.5^{th}\text{ term}$$



Through mark of 40.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 32.

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{80}{4} = 20^{th}\text{ term}$$

Through mark of 20 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 23.

$$\text{Upper Quartile } (Q_3) = \frac{n \times 3}{4} = \frac{80 \times 3}{4} = 60^{th}\text{ term}$$

Through mark of 60 on y-axis draw a line parallel to x-axis which meets the curve at R. From R, draw a perpendicular to x-axis which meets it at S.

The value of S is the upper quartile which is 43.5.

(ii)

Marks	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of boys	10	12	14	12	9	7	6

Marks	No. of boys (f)	Cumulative Frequency
30-40	10	10
40-50	12	22
50-60	14	36
60-70	12	48

70-80	9	57
80-90	7	64
90-100	6	70

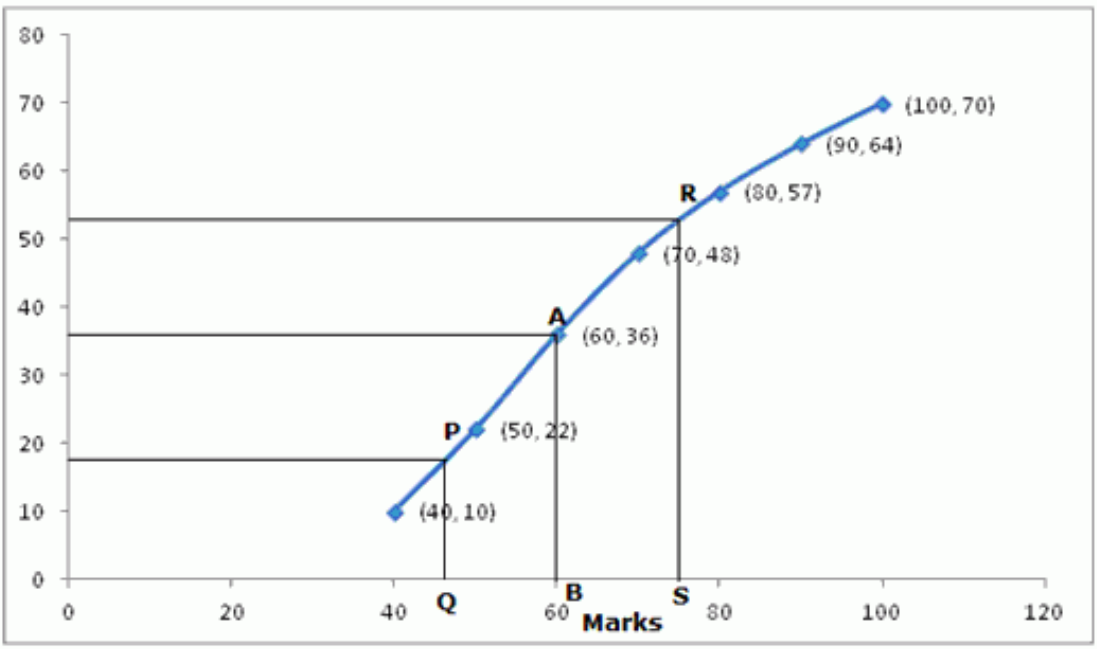
Take a graph paper and draw both the axes.

On the x –axis, take a scale of 1cm=20 to represent the marks.

On the y – axis , take a scale of 1cm=10 to represent the number of boys.

Now, plot the points (40,10) ,(50,22) ,(60,36) ,(70,48) ,(80,57) ,(90,64) ,(100,70)

Join them by a smooth curve to get the ogive.



No. of terms = 70

$$\therefore \text{Median} = \frac{35+36}{2} = 35.5^{th}\text{term}$$

Through mark of 35.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 60.

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{70}{4} = 17.5^{th}\text{term}$$

Through mark of 17.5 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 47.5.

$$\text{Upper Quartile } (Q_3) = \frac{n\times 3}{4} = \frac{70\times 3}{4} = 52.5^{th}\text{term}$$

Through mark of 52.5 on y-axis draw a line parallel to x-axis which meets the curve at R. From R, draw a perpendicular to x-axis which meets it at S.

The value of S is the upper quartile which is 74.5.

(iii)

Marks (less than)	10	20	30	40	50	60	70	80
No. of students	5	15	30	54	72	86	94	100

Given data is a less than cumulative data, so draw the ogive as it is.

Marks (less than)	No. of students (f)
10	5
20	15
30	30
40	54
50	72
60	86
70	94
80	100

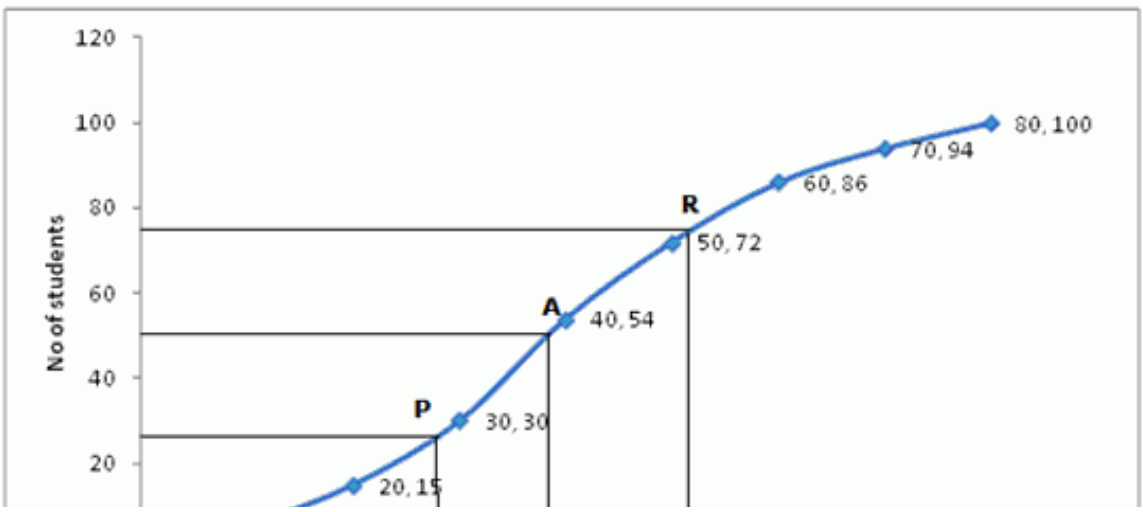
Take a graph paper and draw both the axes.

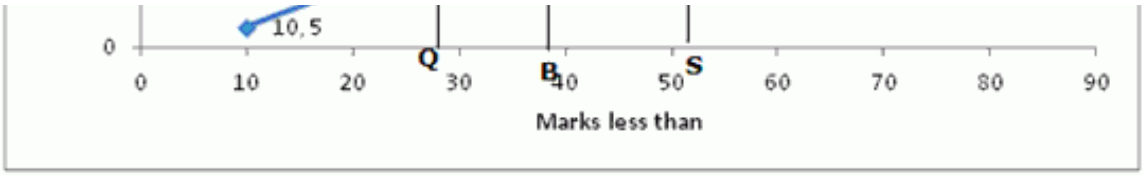
On the x –axis , take a scale of 1cm=10 to represent marks less than.

On the y – axis , take a scale of 1cm=20 to represent the number of students.

Now, plot the points (10,5) ,(20,15) ,(30,30) ,(40,54) ,(50,72) ,(60,86) ,(70,94),(80,100).

Join them by a smooth curve to get the ogive.





No. of terms = 100

$$\therefore \text{Median} = \frac{50+51}{2} = 50.5^{th}\text{term}$$

Through mark of 50.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 38.

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{100}{4} = 25^{th}\text{term}$$

Through mark of 25 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 28.

$$\text{Upper Quartile } (Q_3) = \frac{n\times 3}{4} = \frac{100\times 3}{4} = 75^{th}\text{term}$$

Through mark of 75 on y-axis draw a line parallel to x-axis which meets the curve at R. From R, draw a perpendicular to x-axis which meets it at S.

The value of S is the upper quartile which is 51.

(iv)

Age(in yrs)	Under 10	Under 20	Under 30	Under 40	Under 50	Under 60
No. of males	6	10	25	32	43	50

Given data is cumulative data, so draw the ogive as it is.

Age (in yrs) under	No. of males (f)
10	6
20	10
30	25
40	32
50	43

60	50

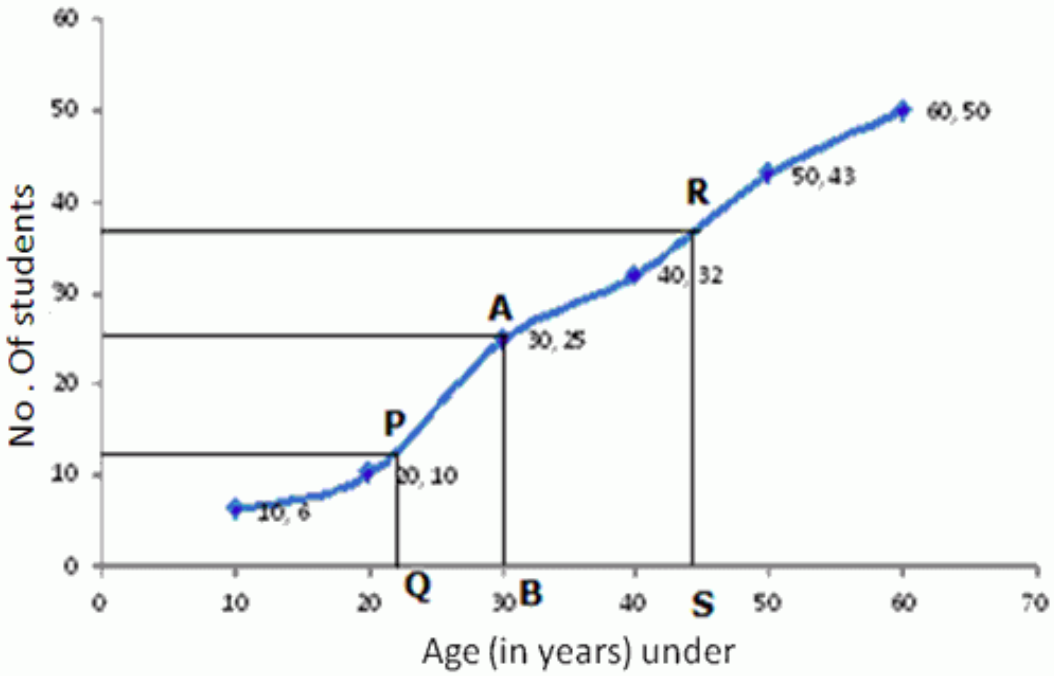
Take a graph paper and draw both the axes.

On the x –axis , take a scale of 1cm=10 to represent the Age (in yrs) under.

On the y – axis , take a scale of 1cm=10 to represent the no. of males.

Now, plot the points (10,6) ,(20,10) ,(30,25) ,(40,32) ,(50,43) ,(60,5) .

Join them by a smooth curve to get the ogive.



No. of terms = 50

$$\therefore \text{Median} = \frac{25+26}{2} = 25.5^{th}\text{term}$$

Through mark of 25.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 30.

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{50}{4} = 12.5^{th}\text{term}$$

Through mark of 12.5 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 22.

$$\text{Upper Quartile } (Q_3) = \frac{n \times 3}{4} = \frac{50 \times 3}{4} = 37.5^{th}\text{term}$$

Through mark of 37.5 on y-axis draw a line parallel to x-axis which meets the curve at R. From R, draw a perpendicular to x-axis which meets it at S.

The value of S is the upper quartile which is 44.

(v)

Marks (more than)	90	80	70	60	50	40	30	20	10	0
No. of students	6	13	22	34	48	60	70	78	80	80

Given data is cumulative data, so draw the ogive as it is.

Marks (more than)	No. of students (f)
0	80
10	80
20	78
30	70
40	60
50	48
60	34
70	22
80	13
90	6

Take a graph paper and draw both the axes.

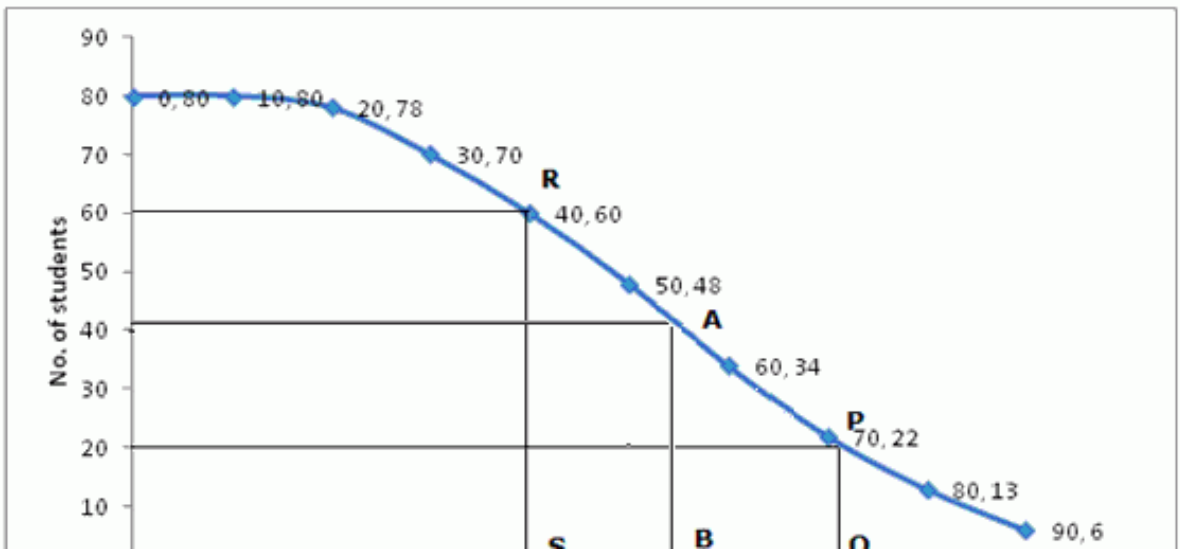
On the x –axis , take a scale of 1cm=10 to represent the marks(more than).

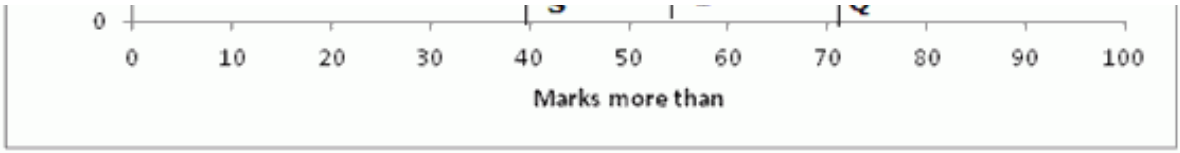
On the y – axis , take a scale of 1cm=10 to represent the no. of students.

Now, plot the points (0,80) ,(10,80) ,(20,78) ,(30,70) ,(40,60) ,(50,48) ,

(60,34) ,(70,22) ,(80,13) ,(90,6) .

Join them by a smooth curve to get the ogive.





No. of terms = 80

$$\therefore \text{Median} = \frac{40+41}{2} = 40.5^{th}\text{ term}$$

Through mark of 40.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 55.

$$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{80}{4} = 20^{th}\text{ term}$$

Through mark of 20 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 71.

$$\text{Upper Quartile } (Q_3) = \frac{n\times 3}{4} = \frac{80\times 3}{4} = 60^{th}\text{ term}$$

Through mark of 60 on y-axis draw a line parallel to x-axis which meets the curve at R. From R, draw a perpendicular to x-axis which meets it at S.

The value of S is the upper quartile which is 40.

Answer 10.

We construct cumulative frequency table of the given distribution:

Marks	No. of students (f)	Cumulative Frequency
0-10	5	5
10-20	10	15
20-30	11	26
30-40	20	46
40-50	27	73
50-60	38	111
60-70	40	151
70-80	29	180
80-90	14	194
90-100	6	200

Take a graph paper and draw both the axes.

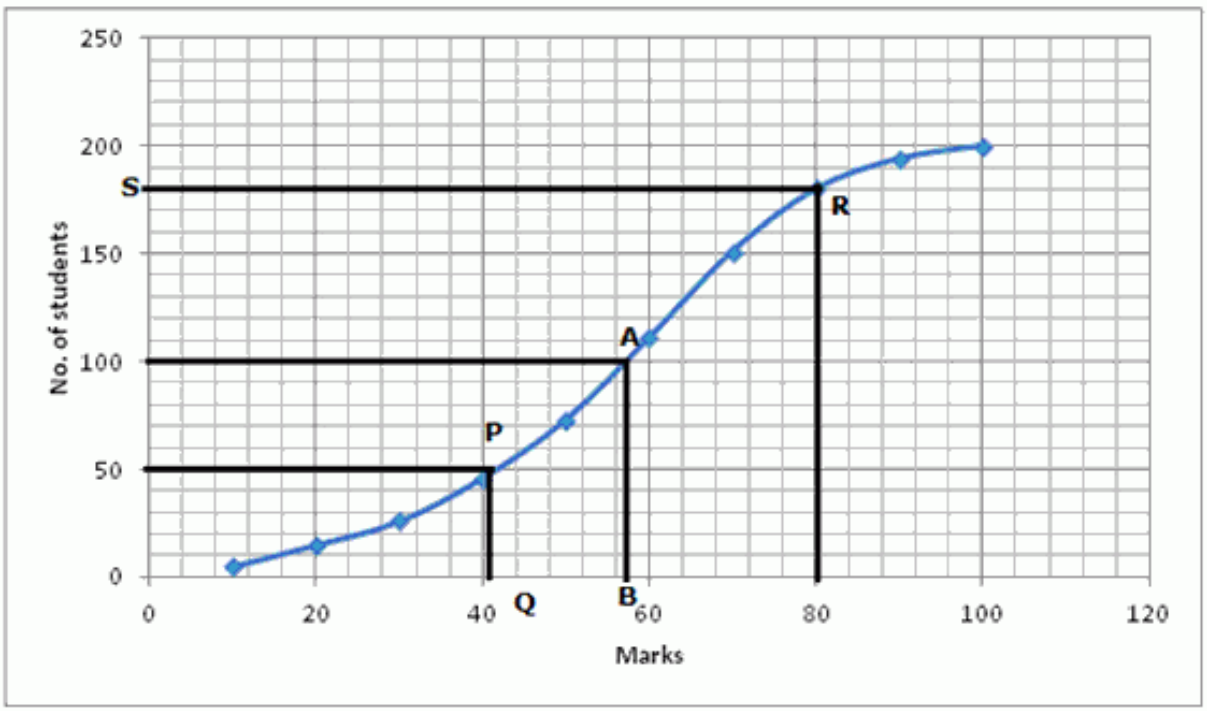
On the x –axis , take a scale of 1cm=20 to represent the marks.

On the y – axis , take a scale of 1cm=50 to represent the no. of students.

Now, plot the points (10,5) ,(20,15) ,(30,26) ,(40,46) ,(50,73) ,(60,111) ,

(70,151) ,(80,180) ,(90,194) ,(100,200) .

Join them by a smooth curve to get the ogive.



(i) No. of terms = 200

$$\therefore \text{Median} = \frac{100 + 101}{2} = 100.5^{th}\text{ term}$$

Through mark of 100.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 58.5.

(ii) $$\text{Lower Quartile } (Q_1) = \frac{n}{4} = \frac{200}{4} = 50^{th}\text{ term}$$

Through mark of 50 on y-axis draw a line parallel to x-axis which meets the curve at P. From P, draw a perpendicular to x-axis which meets it at Q.

The value of Q is the lower quartile which is 41.

(iii) From marks = 80 draw a line parallel to y-axis and meet the curve at R. From R, Draw a perpendicular on y-axis which meets it at S. The difference of the value obtained when subtracted from 200 gives the number of students who scored more than 80%

who scored more than 80 %.

⇨ 200 – 180 = 20

20 students scored more than 80%

Answer 11.

We construct cumulative frequency table of the given distribution:

Marks	No. of students (f)	Cumulative Frequency
9.5-19.5	7	7
19.5-29.5	11	18
29.5-39.5	20	38
39.5-49.5	46	84
49.5-59.5	57	141
59.5-69.5	37	178
69.5-79.5	15	193
79.5-89.5	7	200

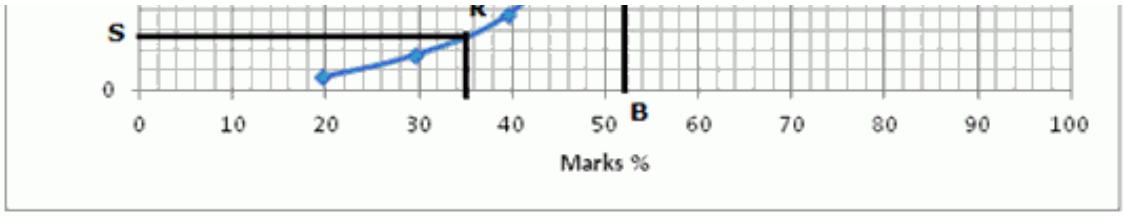
Take a graph paper and draw both the axes.

On the x –axis , take a scale of 1cm=10 to represent the marks.

On the y – axis , take a scale of 1cm=50 to represent the no. of students.

Now, plot the points (19.5,7) ,(29.5,18) ,(39.5,38) ,(49.5,84) ,(59.5,141) ,(69.5,178) ,(79.5,193) ,(89.5,200).

Join them by a smooth curve to get the ogive.



(i) No. of terms = 200

$$\therefore \text{Median} = \frac{100 + 101}{2} = 100.5^{th}\text{ term}$$

Through mark of 100.5 on y-axis draw a line parallel to x-axis which meets the curve at A. From A, draw a perpendicular to x-axis which meets it at B.

The value of B is the median which is 52.

(ii) From marks % = 35 draw a line parallel to y-axis and meet the curve at R. From R, Draw a perpendicular on y-axis which meets it at S. The difference of the value obtained when subtracted from 200 gives the number of students who scored more than 35%.

⇨ 200 – 23 = 172

172 students scored more than 35%

Ex 24.3

Answer 1.

(i) 6, 7, 1, 8, 6, 5, 9, 4, 6, 7, 1, 3, 2, 6, 7, 8

Mode = 6 because it occurs 4 times.

(ii) 21, 22, 28, 23, 24, 21 26, 22, 29, 27, 21, 21, 26, 24, 23

Mode = 21 because it occurs 4 times.

(iii) 3, 4, 5, 7, 6, 3, 5, 4, 3, 5, 6, 4, 7, 5, 4, 5, 4, 3, 4, 5, 7, 6, 5, 6, 6, 7

Mode = 5 because it occurs 7 times.

(Iv) 15, 17, 16, 17, 10, 12, 14, 16, 19, 12, 16, 15, 16

Mode = 16 because it occurs 4 times.

(v) 20, 20, 30, 30, 30, 30, 35, 40, 40, 45, 45, 45, 50, 55, 60, 60, 60, 65, 70, 70, 70

Mode = 30 because it occurs 4 times.

Answer 2.

(i)

Variate	20	21	22	23	24	25	26
Frequency	21	20	26	35	22	13	10

Mode = 23 because it occurs maximum number of times i.e. 35

(ii)

Pocket money per week in Rs	25	50	75	100	125	150
No. of students	4	7	13	18	6	2

Mode = 100 because it occurs maximum number of times i.e. 18

(iii)

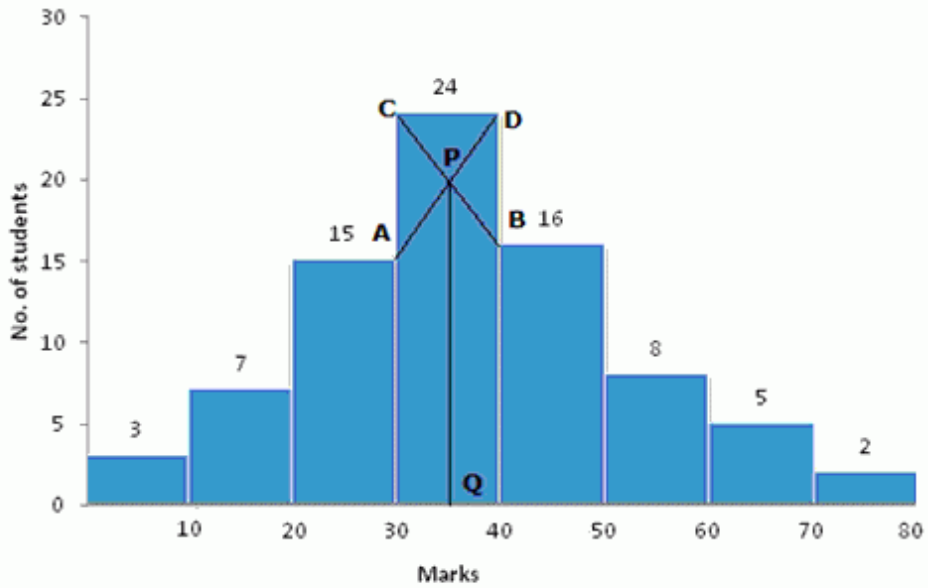
Hrs. Spent daily in studies	3	3.5	4	4.5	5	5.5	6	6.5
No. of students	8	7	3	5	10	6	3	4

Mode = 5 because it occurs maximum number of times i.e. 10

Answer 3.

(i)

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	3	7	15	24	16	8	5	2



(a) Take 1cm = 1 unit and plot marks on x-axis and no. of students on y-axis.

(b) Draw a bar graph for the given data.

(c) From the histogram it is clear that class 30-40 has highest frequency i.e. 24

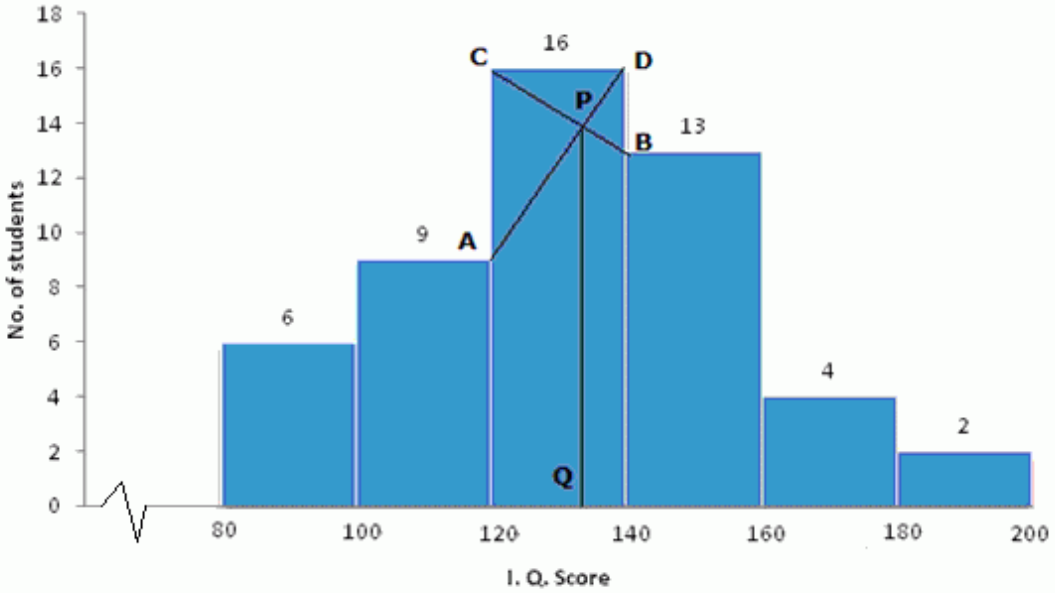
(d) Join the ends of the corresponding frequencies which meet at P and drop a perpendicular on the x-axis from P to Q. Q is the mode

perpendicular on the x-axis from P to Q. Q is the mode.

Therefore, Mode = 35

(ii)

I.Q. Score	80-100	100-120	120-140	140-160	160-180	180-200
No. of students	6	9	16	13	4	2



(a) Take 1cm = 1 unit and plot I. Q. Score on x-axis and no. of students on y-axis.

(b) Draw a bar graph for the given data.

(c) From the histogram it is clear that class 120-140 has highest frequency i.e. 16

(d) Join the ends of the corresponding frequencies which meet at P and drop a perpendicular on the x-axis from P to Q. Q is the mode.

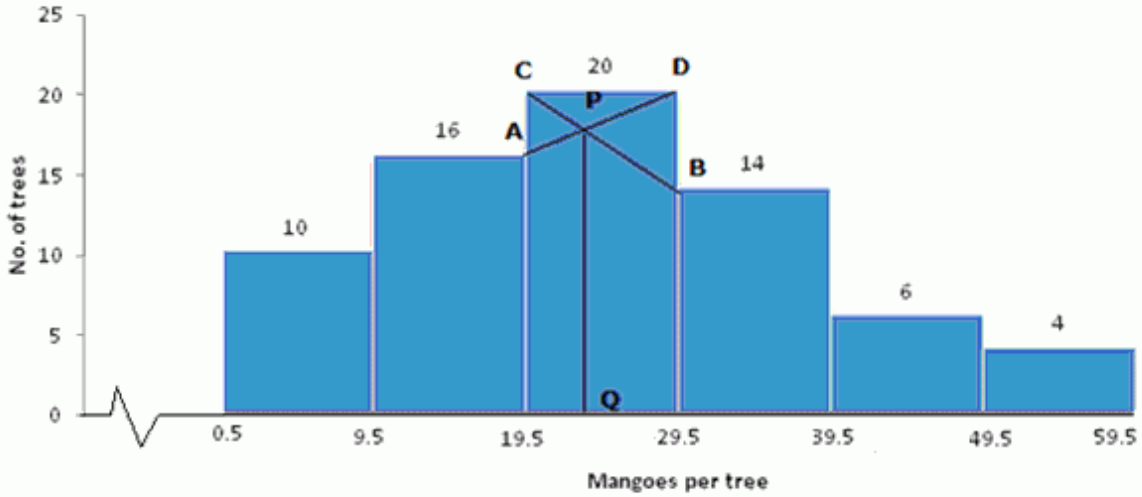
Therefore, Mode = 134

(iii)

Mangoes per tree	0-9	10-19	20-29	30-39	40-49	50-59
No. of trees	10	16	20	14	6	4

Mangoes per tree	No. of trees
0.5-9.5	10
9.5-19.5	16
19.5-29.5	20

29.5-39.5	14
39.5-49.5	6
49.5-59.5	4



(a) Take 1cm = 1 unit and plot mangoes on x-axis and no. of trees on y-axis.

(b) Draw a bar graph for the given data.

(c) From the histogram it is clear that class 19.5-29.5 has highest frequency i.e. 20

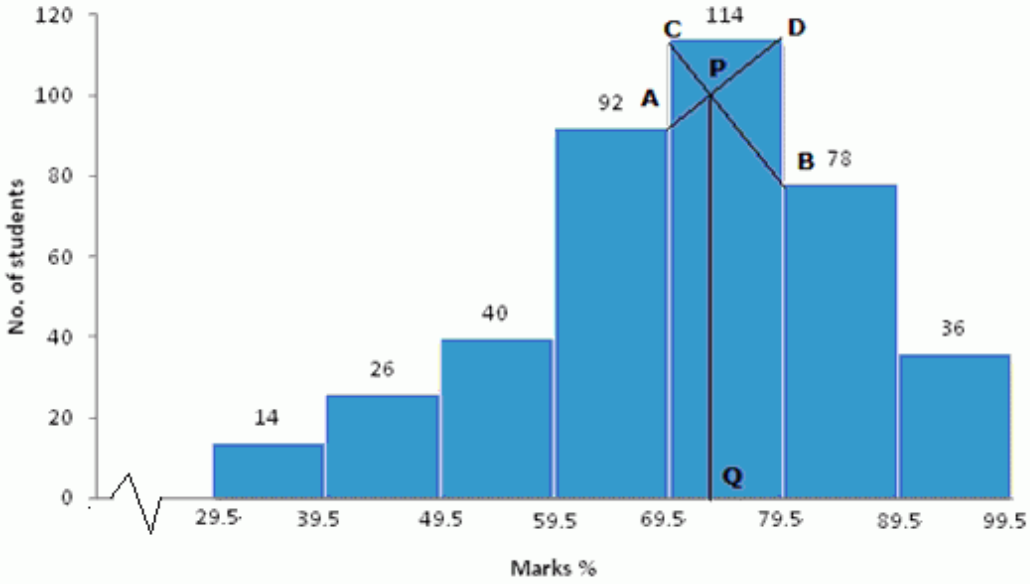
(d) Join the ends of the corresponding frequencies which meet at P and drop a perpendicular on the x-axis from P to Q. Q is the mode.

Therefore, Mode = 23.5

(iv)

Marks %	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	14	26	40	92	114	78	36

Marks %	No. of students
29.5-39.5	14
39.5-49.5	26
49.5-59.5	40
59.5-69.5	92
69.5-79.5	114
79.5-89.5	78
89.5-99.5	36



(a) Take 1 cm = 1 unit and plot marks % on x-axis and no. of students on y-axis.

(b) Draw a bar graph for the given data.

(c) From the histogram it is clear that class 69.5-79.5 has highest frequency i.e. 114

(d) Join the ends of the corresponding frequencies which meet at P and drop a perpendicular on the x-axis from P to Q. Q is the mode.

Therefore, Mode = 73