

Chapter 20 Statistics

STATISTICS

Exercise 19.1

Sol.1 Given observations

8, 6, 10, 12, 1, 3, 4, 4

∴ Mean = $\frac{\text{Sum of observations}}{\text{Total No. of observations}}$

$$= \frac{8+6+10+12+1+3+4+4}{8}$$

8

$$= \frac{48}{8} = 6 //$$

Sol.2 No. of people = 5

They replied hours = 10, 7, 13, 20, 15

Mean = $\frac{\text{Sum of observations}}{\text{Total No. of observations}}$

$$= \frac{10+7+13+20+15}{5}$$

5

$$= \frac{65}{5} = 13$$

∴ 13 hours were spent in their social work.

Sol-3 Given six consecutive years

1620, 2060, 2540, 3250, 3500, 3710

$$\begin{aligned} \text{Mean} &= \frac{\text{Sum of the consecutive years}}{\text{Total no. of consecutive years}} \\ &= \frac{1620 + 2060 + 2540 + 3250 + 3500 + 3710}{6} \\ &= \frac{16680}{6} = 2780 // \end{aligned}$$

Sol-4 The first twelve natural numbers are

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.

$$\begin{aligned} \therefore \text{Mean} &= \frac{\text{Sum of the twelve natural numbers}}{\text{total number of twelve natural numbers}} \\ &= \frac{1+2+3+4+5+6+7+8+9+10+11+12}{12} \\ &= \frac{78}{12} = 6.5 \end{aligned}$$

Sol-5 The first six prime numbers are

(i) 2, 3, 5, 7, 11, 13

$$\begin{aligned} \text{Mean} &= \frac{\text{Sum of the prime numbers}}{\text{Total no. of prime numbers}} \\ &= \frac{2+3+5+7+11+13}{6} \\ &= \frac{41}{6} = 6.8333 \end{aligned}$$

5(ii) The first seven odd prime numbers are.

3, 5, 7, 11, 13, 17, 19

$$\begin{aligned} \therefore \text{Mean} &= \frac{3+5+7+11+13+17+19}{7} \\ &= \frac{75}{7} = 10\frac{5}{7} \end{aligned}$$

6(i) Given marks of a student are

81, 72, 90, 90, 85, 86, 70, 93, 71

$$\begin{aligned} \text{Mean} &= \frac{81+72+90+90+85+86+70+93+71}{9} \\ &= \frac{738}{9} = 82 \end{aligned}$$

6(ii) The mean of age of three students is 15 years

Their ratios are 4:5:6

Let vijay's age is $4x$

Rahul age is $5x$

Rakhi age is $6x$.

$$\frac{4x+5x+6x}{3} = 15$$

$$\frac{(4+5+6)x}{3} = 15$$

$$\frac{15x}{3} = 15$$

$$15x = 45$$

$$x = 45/15 = 3$$

$$\begin{aligned}\text{vijay age} &= 4x \\ &= 4 \times 3 = 12\end{aligned}$$

$$\begin{aligned}\text{Rahul age} &= 5x \\ &= 5 \times 3 = 15\end{aligned}$$

$$\begin{aligned}\text{Rakhi age} &= 6x \\ &= 6 \times 3 = 18\end{aligned}$$

\therefore vijay age = 12 years

Rahul age = 15 years

Rakhi age = 18 years

(71)
sol

The Mean of 5 numbers is 20
one observation is included then mean is 6

$$\begin{aligned}\text{Mean of 5 numbers} &= 20 \times 5 \\ &= 100\end{aligned}$$

Let excluded number is 'x'

The remaining numbers mean is 23.

$$\begin{aligned}5x - x &= 4x \\ &= 4 \times 23 \\ &= 92\end{aligned}$$

$$\therefore x = 100 - 92 = 8$$

\therefore Excluded number is "8"

8201 The Mean of 25 observations is 27
one observation is included then the mean is 26 of
observations

Then mean will remain same is "27"

$$\therefore \text{Mean} = 27$$

7201 Mean of 5 observations is 15 $= 15 \times 5 = 75$

Mean of first 3 observations = 14

$$14 \times 3 = 42$$

$$42 + d + e = 75$$

$$\begin{aligned} d + e &= 75 - 42 \\ &= 33 \end{aligned}$$

Mean of last 3 observations = 17

$$17 \times 3 = 51$$

$$a + b + f = 75$$

$$a + b = 75 - 51$$

$$= 24$$

$$\therefore a + b + d + e + f = 75$$

$$24 + 33 + f = 75$$

$$57 + f = 75$$

$$f = 75 - 57$$

$$= 18$$

\therefore third observation is 18

soln Mean of 8 variables = 10.5

Given Seven numbers are

3, 15, 7, 19, 2, 17, 8

$$\text{Mean} = \frac{3 + 15 + 7 + 19 + 2 + 17 + 8 + x}{8}$$

$$10.5 = \frac{71 + x}{8}$$

$$10.5 \times 8 = 71 + x$$

$$84 = 71 + x$$

$$x = 84 - 71$$

$$x = 13$$

11 The Mean weight of 8 students = 45.5 kg.

Mean weight of 8 students = $\frac{\text{sum of weights of 8 students}}{8}$

$$45.5 = \frac{\text{Sum of weights of 8 students}}{8}$$

$$\begin{aligned} \text{Sum of weights of 8 students} &= 45.5 \times 8 \\ &= 364 \text{ kgs} \end{aligned}$$

Two weights of 41.7 and 53.3 kgs are added

$$= 364 + 41.7 + 53.3$$

Sum of weights of 10 students = 459 kg

$$\begin{aligned} \text{Mean} &= \frac{\text{Sum of weights of 10 students}}{10} \\ &= \frac{459}{10} = 45.9 \text{ kgs.} \end{aligned}$$

12501 Mean of 9 observations = 35 7

$$\text{Mean of observations} = \frac{\text{Incorrect Sum of 9 observations}}{9}$$

$$35 \times 9 = \text{Incorrect Sum of 9 observations}$$

$$\text{Incorrect sum of 9 observations} = 315$$

one observation was detected as 81 was misread as 18

$$= 315 - 18 + 81$$

$$= 378$$

$$\begin{aligned} \text{Mean of 9 observations} &= \frac{378}{9} \\ &= 42 \end{aligned}$$

13. Given marks of 11 questions

7, 3, 4, 1, 5, 8, 2, 2, 5, 7, 6.

These numbers were arranged in ascending order

1, 2, 2, 3, 4, 5, 5, 6, 7, 7, 8

∴ Total no. of observations = 11

Median = $\frac{n+1}{2}$ th observation.

$$= \frac{11+1}{2} = \frac{12}{2} = 6\text{th observation.}$$

∴ Hence, Median = 5

1480 Given numbers

2, 3, 4, 3, 0, 5, 1, 1, 3, 2

$$\begin{aligned} \text{Mean} &= \frac{2+3+4+3+0+5+1+1+3+2}{10} \\ &= \frac{24}{10} = 2.4 \end{aligned}$$

∴ Mean = 2.4

Median.

The numbers were arranged in the form of ascending order

0, 1, 1, 2, 2, 3, 3, 3, 4, 5

$$\begin{aligned} \text{Median} &= \frac{n+1}{2} \text{th observation} \\ &= \frac{10+1}{2} \text{th observation} \\ &= \frac{11}{2} = 5.5 \text{th observation} \end{aligned}$$

∴ Median = 2.5

550 Given numbers -

24, 30, 28, 17, 22, 36, 30, 19, 32, 18, 20, 24

$$\begin{aligned} \text{Mean} &= \frac{24+30+28+17+22+36+30+19+32+18+20+24}{12} \\ &= \frac{300}{12} = 25 \end{aligned}$$

∴ Mean = 25

Median .

9

The numbers are arranged in ascending order

17, 18, 19, 20, 22, 24, ²⁴28, 30, 30, 32, 36.

$$\text{Median} = \frac{n+1}{2} \text{th observation}$$

$$= \frac{12+1}{2} \text{th observation}$$

$$= \frac{13}{2} \text{th observation} = 6.5 \text{th observation}$$

$$\text{Median} = 25_{11}$$

630

Given numbers

41, 39, 52, 48, 54, 62, 46, 52, 40, 96, 42, 40, 98, 60, 52

$$\text{Mean} = \frac{41+39+52+48+54+62+46+52+40+96+42+40+98+60+52}{15}$$

$$= \frac{822}{15} = 54.8$$

$$\therefore \text{Mean} = 54.8$$

Median

The numbers are arranged in the form of ascending order.

39, 40, 40, 41, 42, 46, 48, 52, 52, ⁵²54, 60, 62, 96, 98.

$$\text{Median} = \frac{n+1}{2} \text{th - observation}$$

$$= \frac{15+1}{2} = \frac{16}{2} = 8$$

$$\therefore \text{Median} = 8_{11}$$

17/10 The points scored by kabaddi team

(10)

7, 17, 2, 5, ~~27~~, 15, 8, 14, 10, 48, 10, 7, 24, 8, 28, 18

$$\begin{aligned}\text{Mean} &= \frac{7+17+2+5+27+15+8+14+10+48+10+7+24+8+28+18}{16} \\ &= \frac{248}{16} = 15.5\end{aligned}$$

$$\text{Mean} = 15.5$$

Median

The points are arranged in the form of ascending order.

2, 5, 7, 7, 8, ⁸10, 10, 14, 15, 17, 18, 24, 27, 28, 48.

$$\begin{aligned}\text{Median} &= \frac{n+1}{2} \text{th observation} \\ &= \frac{16+1}{2} \text{th observation} \\ &= 8.5\end{aligned}$$

$$\text{Median} = 18$$

18/10 Given numbers

17, 21, 23, 29, 39, 40, x , 50, 51, 54, 59, 67, 91, 93.

$$\text{Median} = \frac{\frac{n}{2} \text{th observation} + (\frac{n}{2} + 1) \text{th observation}}{2}$$

$$47.5 = \frac{7 \text{th observation} + 8 \text{th observation}}{2}$$

$$47.5 = \frac{x+50}{2}$$

$$95 = x+50$$

$$x = 95 - 50$$

$$= 45$$

19 | Given numbers

3, 6, 7, 10, $x + x + 4$, 19, 20, 25, 28

$$\text{Median} = \frac{n}{2} \text{th observation} + \frac{(n/2 + 1) \text{th observation}}{2}$$

$$13 = \frac{5 \text{th observation} + 6 \text{th observation}}{2}$$

$$13 = \frac{x + x + 4}{2}$$

$$13 \times 2 = 2x + 4$$

$$26 = 2x + 4$$

$$2x = 26 - 4$$

$$2x = 22$$

$$x = \frac{22}{2} = 11$$

Exercise - 19.2

(1)

Solution - 1 :-

- (i) discrete
- (ii) continuous
- (iii) discrete
- (iv) continuous
- (v) continuous.

Solution - 2 :-

Given data

13, 6, 10, 5, 11, 14, 2, 8, 15, 16, 9, 13, 17, 11, 19, 5, 7, 12, 20, 21, 18, 1, 8, 12, 18.

classes	0-4	5-9	10-14	15-19	20-24
frequency	2	7	8	6	2

Solution - 3

(i)

classes	1-10	11-20	21-30	31-40
frequency	8	7	6	6

(ii) Range = Maximum value - Minimum value.
 $= 40 - 2$
 $= 38$

(ii) third class of frequency table.

$$= \frac{21+30}{2}$$

$$= \frac{51}{2}$$

$$= 25.5$$

Solution -4:-

Variate :- A particular value of a variable is called variate.

Class Size :- The difference b/w the actual upper limit and the actual lower limit of a class is called its class size.

Class mark :- The class mark of a class is the value midway between its actual lower limit and actual upper limit.

Class limits :- In discrete distribution, the original class limits are called stated class limits.

True class limits :- In a continuous distribution, the class-limits are called true class limits (or) actual class limits.

Frequency of a class :- The number of times a variate occurs in a given data is called frequency of that variate.

Cummulative frequency of a class :-

The sum of frequencies of all the previous classes and that particular class is called the cummulative frequency of the class.

Solution - 5 :-

(i) frequency

(ii) size

(iii) 14

(iv) class mark.

(v) 6.5

Solution - 6 :-

(i)

classes	1-10	11-20.	21-30	31-40	41-50
frequency	7	8	7	10.	8.

(ii)

classes	0.5 - 10.5	10.5 - 20.5	20.5 - 30.5	30.5 - 40.5	40.5 - 50.5
frequency	7	8	7	10	8

(iii) lower limit = 20.5

upper limit = 30.5

(iv)
$$\frac{30.5 + 40.5}{2} = \frac{71}{2} = 35.5$$

Solution - 7 :-

(i) upper limit = 52 lower limit = 48.

(ii) upper limit = 52.5 lower limit = 47.5

(iii) 37.5 and 42.5

(iv) 45

(v) 5.

Solution - 8 :-

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
frequency	7	11	20	46	57	37	15	7
C. frequency	7	18	38	84	141	178	193	200

Solution - 9 :-

classes	0-10	10-20	20-30	30-40	40-50
frequency	5	5	7	10	8
C. frequency	5	10	17	27	35

No. of students obtaining ^{below} 20 marks = 10.

Solution - 10 3-

classes	Tally Marks	frequency	Cumulative frequency.
0-10		3	3
10-20		2	5
20-30		4	9
30-40		5	14
40-50	—	—	14
50-60		3	17
60-70		2	19
70-80		3	22
80-90		4	26
90-100		3	29

(ii) The class that has highest frequency is 30-40.

(iii) The students score less than 40 marks are 34

(iv) 13

Solution - 11 :-

class	0-4	4-7	7-10	10-13	13-16
frequency	7	31	137	73	52

No. of children in the age group of 10

$$10-13 = 73.$$

Solution - 12 :-

class	0-10	11-20	21-30	31-40	41-50	51-60
frequency	2	5	11	14	11	7

Solution - 13 :-

class	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110
frequency	2	1	4	4	9	5	3	4

Solution - 14 :-

classes	23.5-27.5	27.5-31.5	31.5-35.5	35.5-39.5	39.5-43.5
frequency	4	7	4	4	11

Solution - 158-

(i) class size = $134 - 124 = 10$.

lower limit = 119, upper limit = 129

(ii) class size = $30.5 - 23.5 = 7$

lower limit = 20. upper limit = 27

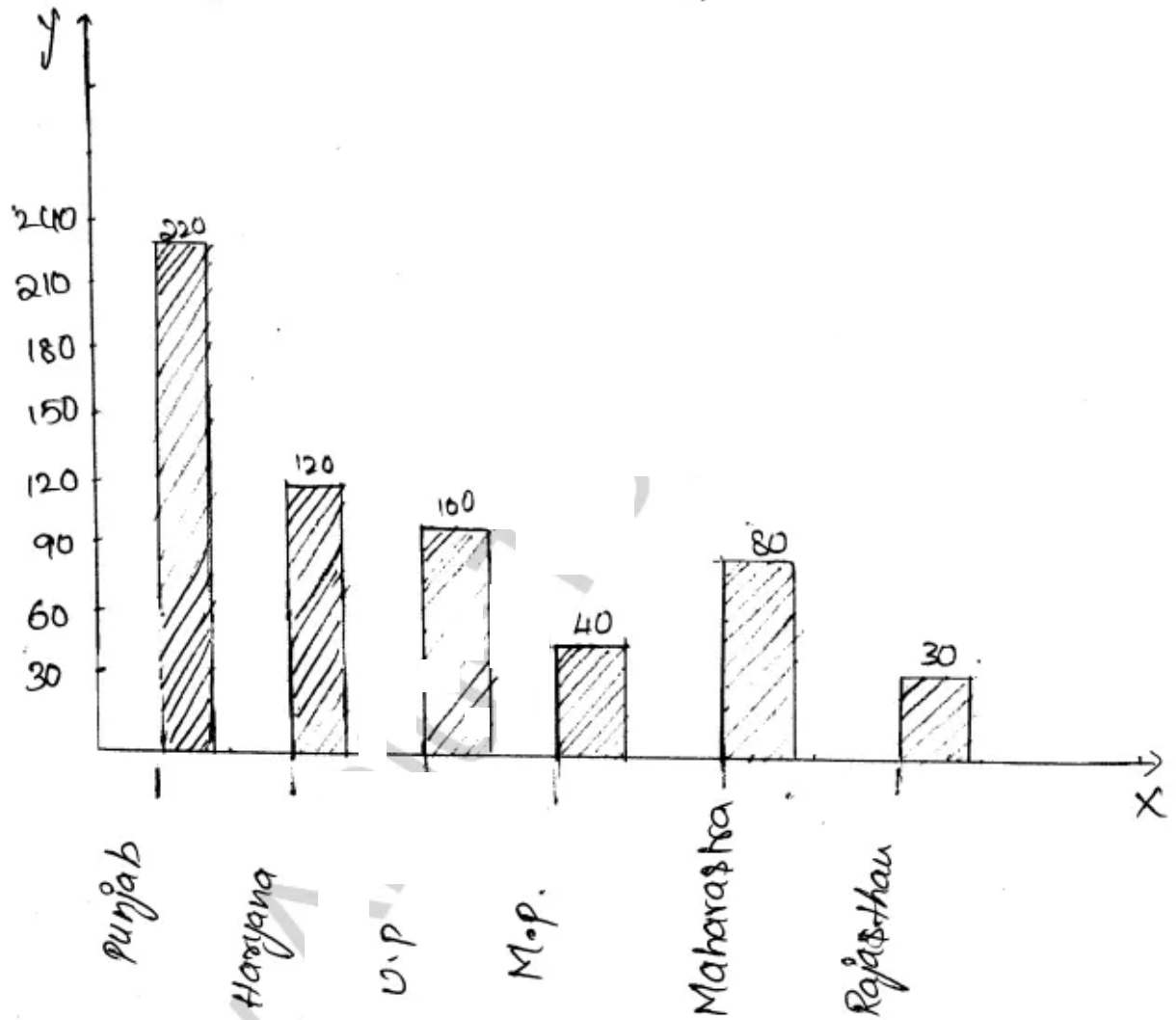
Exercise - 19.3.

①

Solution - 1 :-

The required bar graph is shown below.

Scale on y-axis 1cm = 30 units

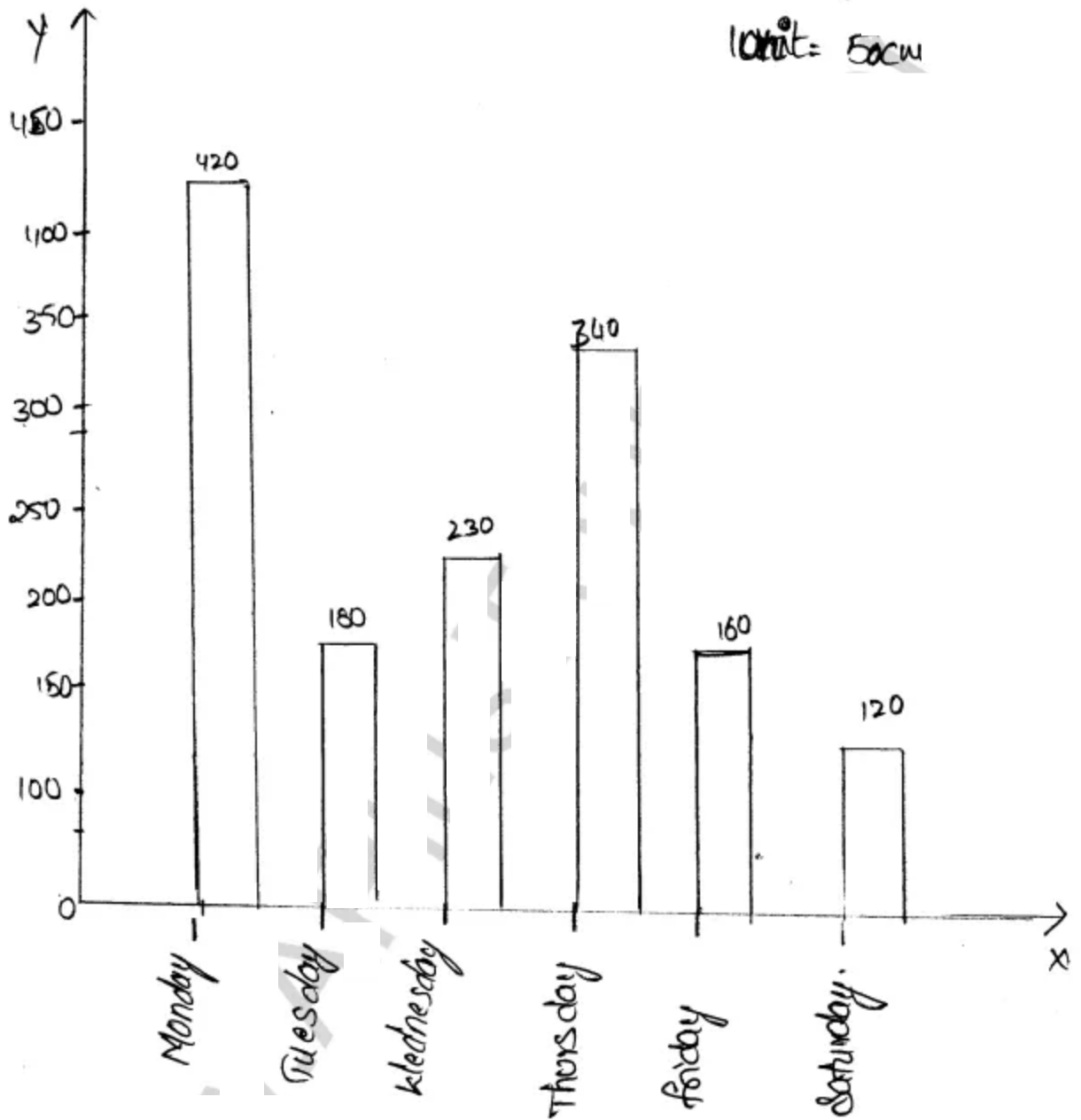


Solution - 2 :-

The bar graph required is shown below.

Scale on y-axis

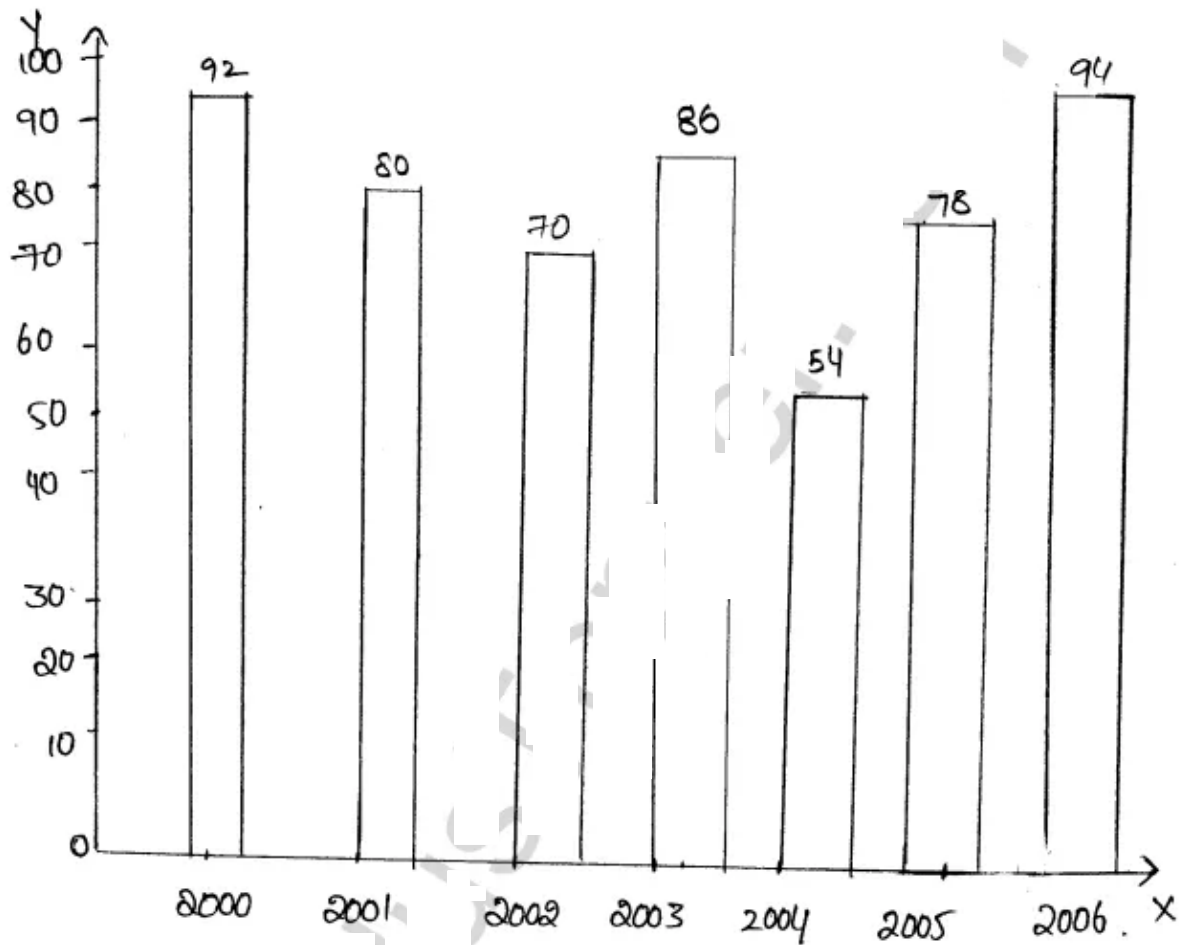
1 unit = 50 cm



Solution - 3 :-

(3)

The required bar graph is shown below



Scale on x axis $1\text{cm} = 1\text{unit}$

Scale on y axis $10\text{cm} = 1\text{unit}$

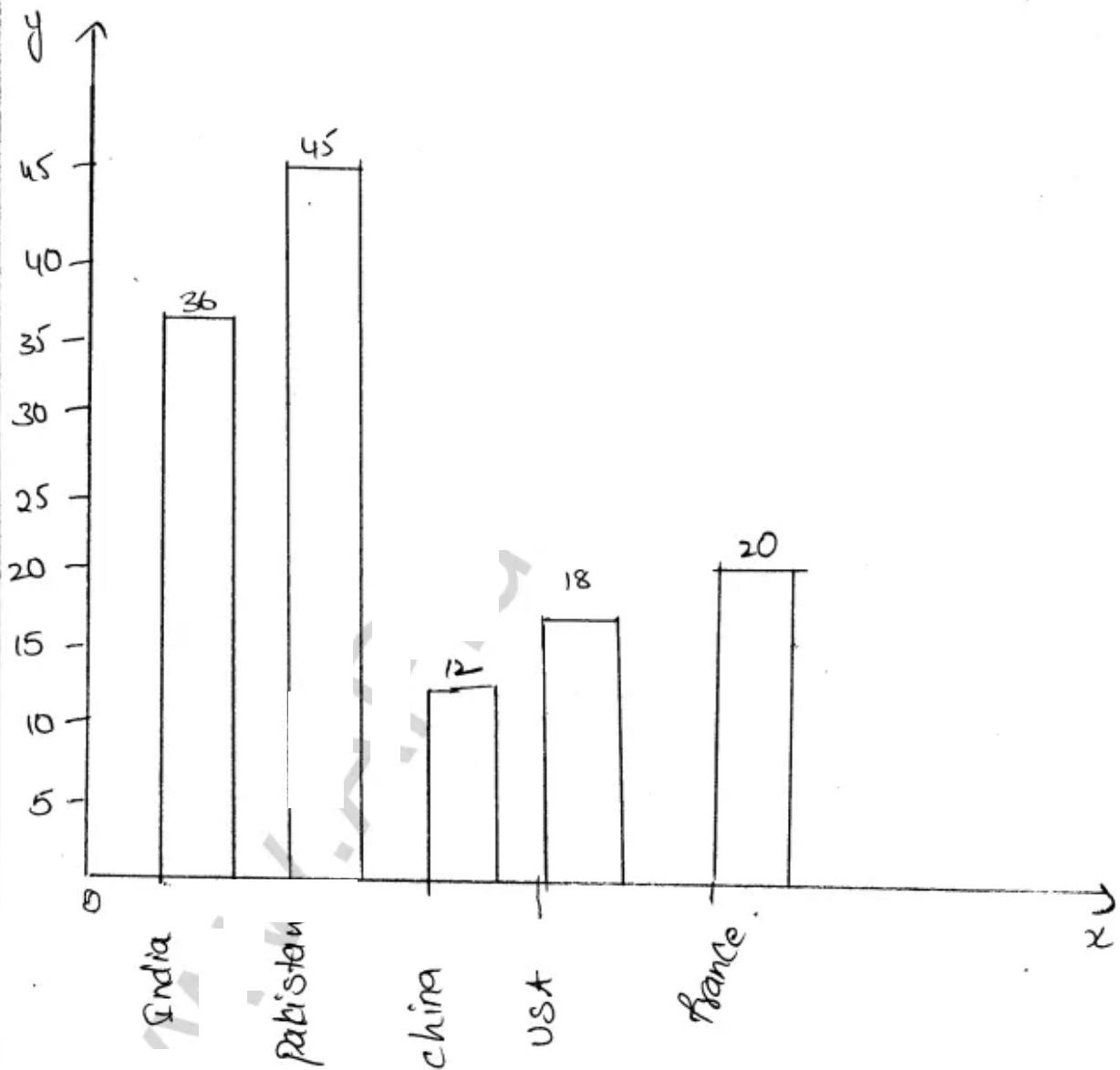
Solution - 4 :-

(4)

The required horizontal bar graph is shown below

Scale

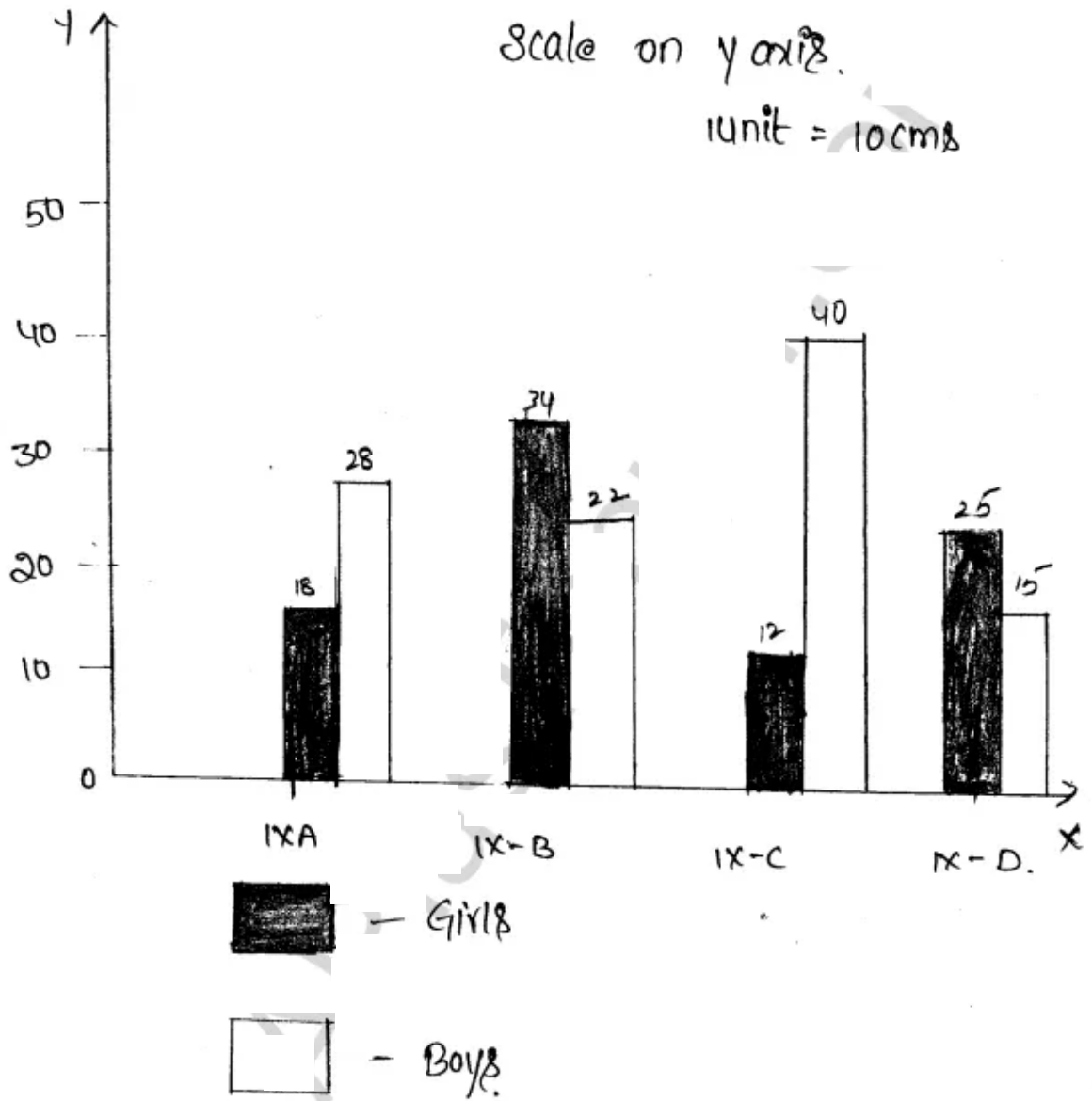
on y-axis unit = 5cm.



Solution - 5

5

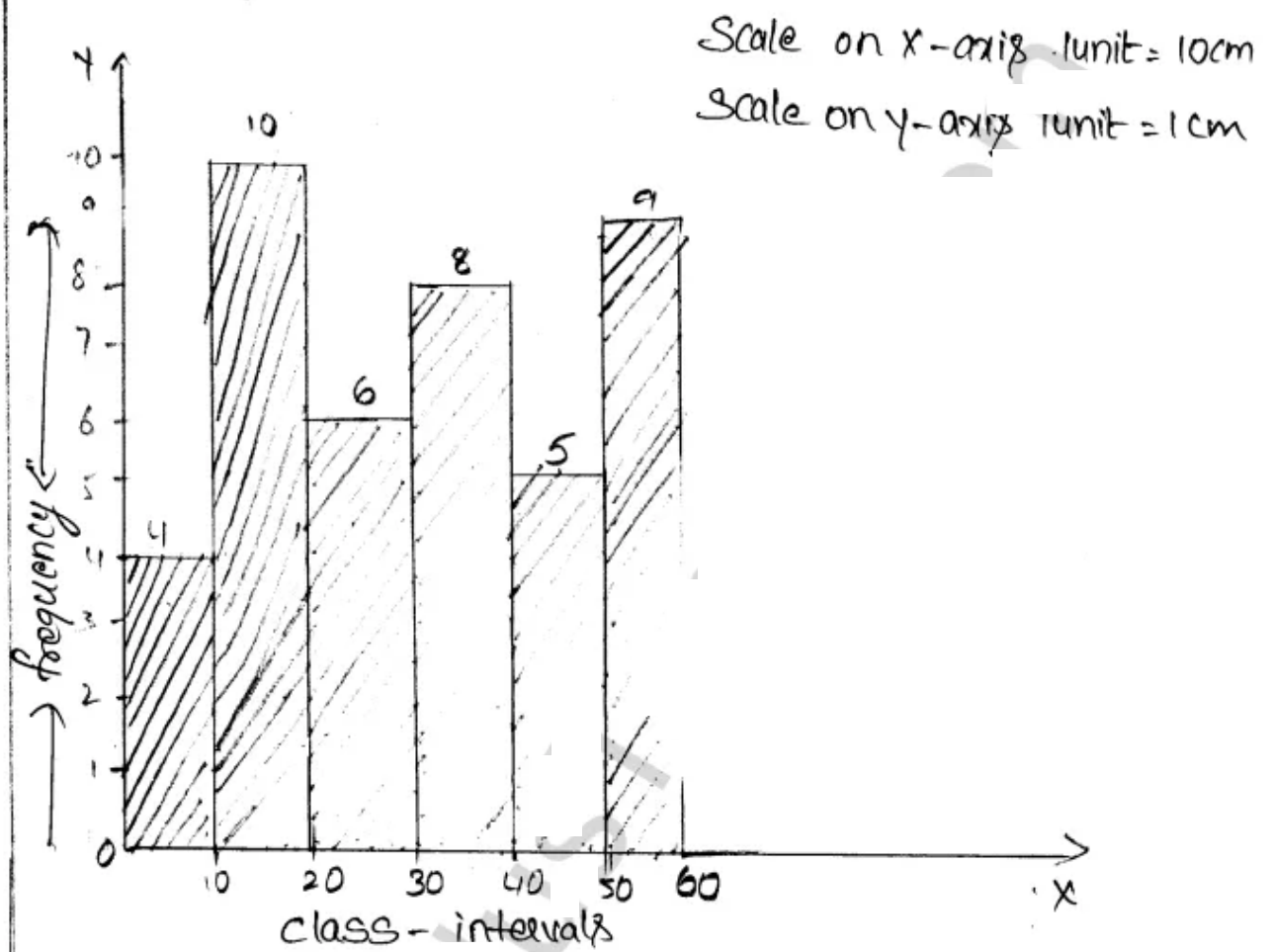
The required bargraph as shown below



Solution - 6 :-

(6)

The histogram is shown below



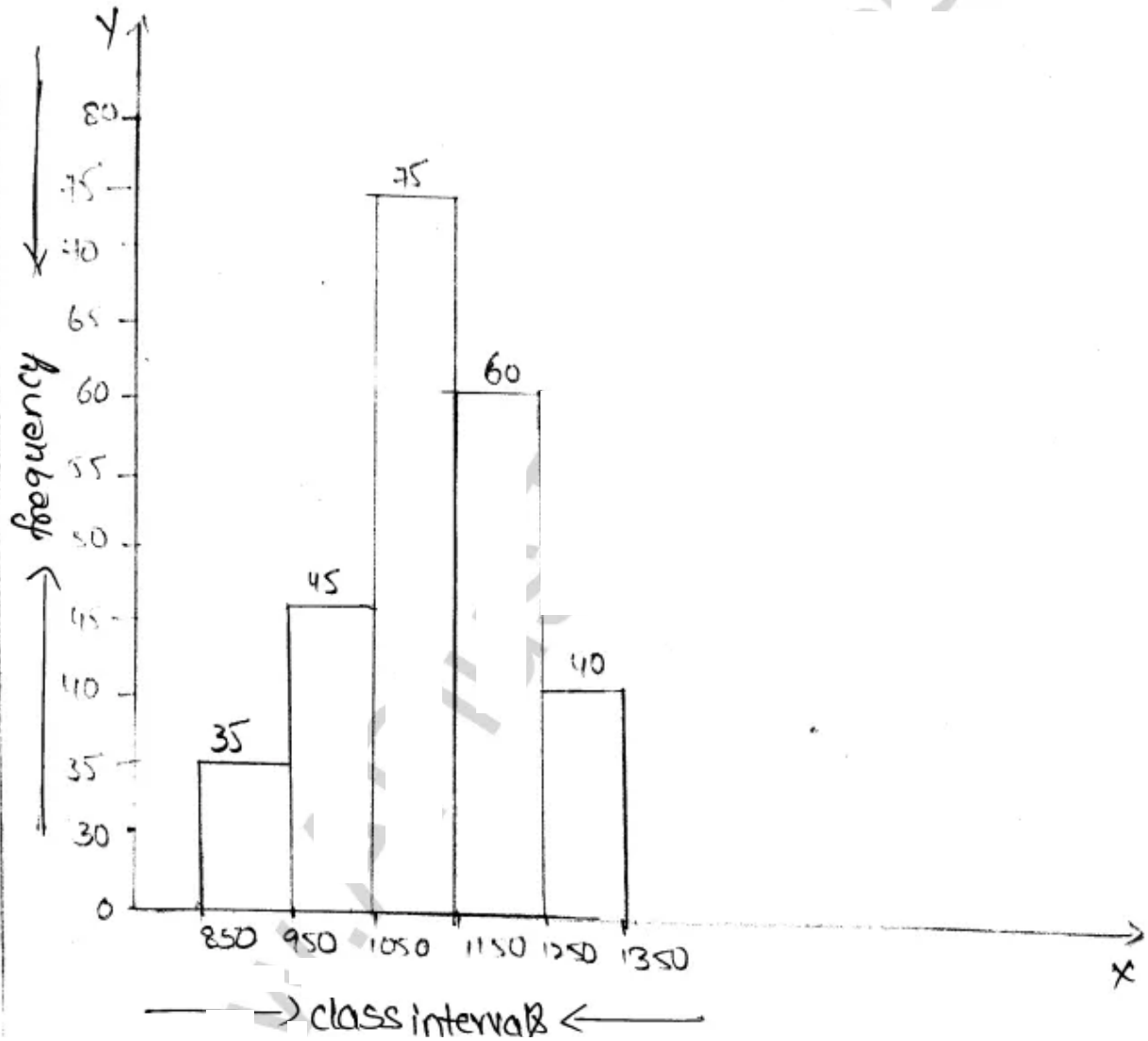
Solution:-

(7)

The required histogram is shown below.

Scale on x axis 1 unit = 100 cm

Scale on y axis 1 unit = 5 cm



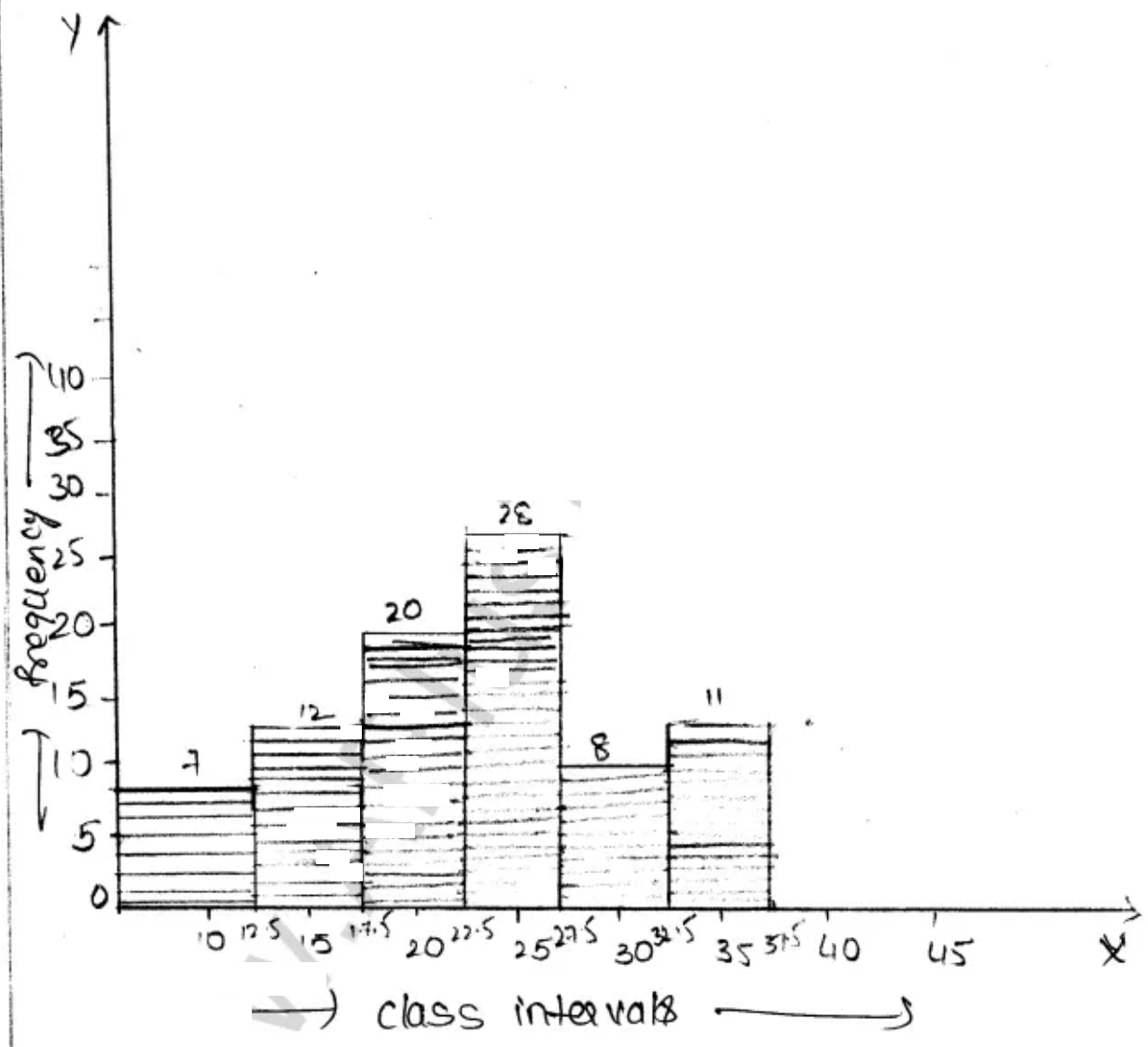
Solution - 8 :-

⑧

The required histogram as shown below

Scale on X-axis unit = 5 cm

Scale on Y-axis unit = 5 cm



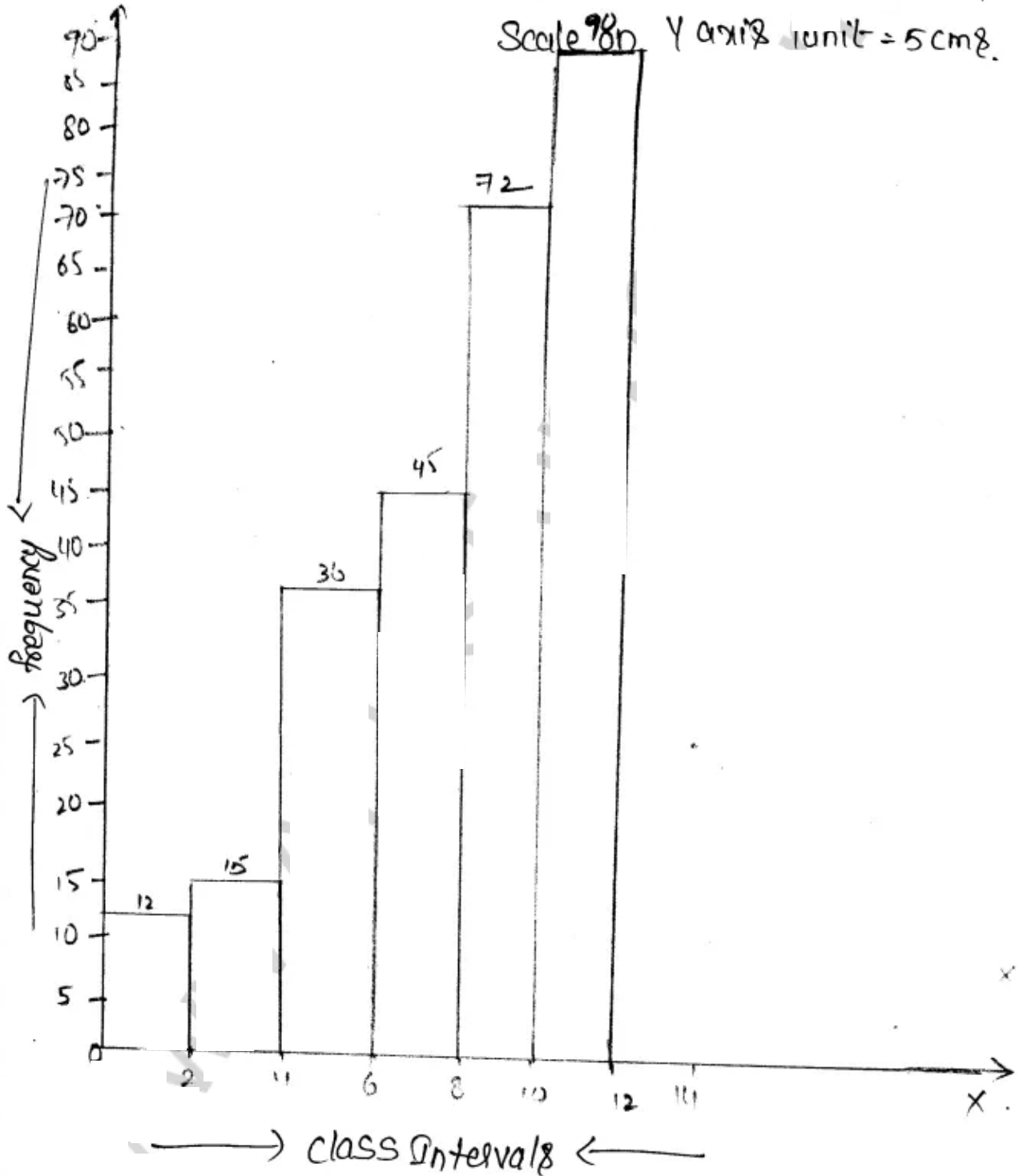
Solution - 9 :

(9)

The required histogram as shown below

Scale on X axis unit = 2cm

Scale on Y axis unit = 5cm



Solution -10 :-

(10)

The required histogram as shown below.

∴ The given frequency distribution is discontinuous, to convert into continuous frequency distribution

adjustment factor = $\frac{\text{lower limit of one class} - \text{upper limit of previous class}}{2}$

$$= \frac{66 - 65}{2} = \frac{1}{2} = 0.5$$

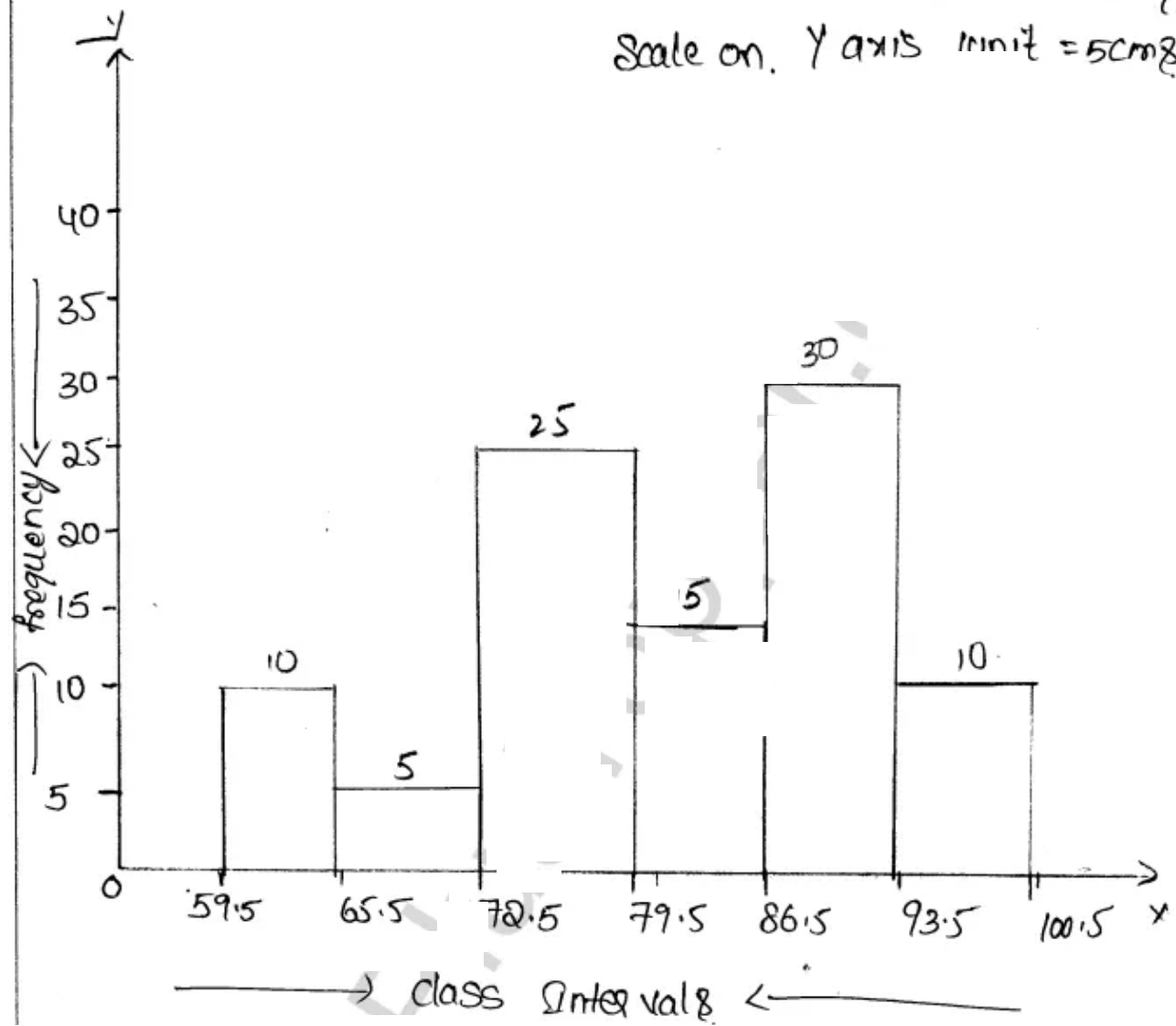
Continuous frequency distribution for the given data is

class before adjustment	class after adjustment	frequency.
59 - 65	59.5 - 65.5	10
66 - 72	65.5 - 72.5	5
73 - 79	72.5 - 79.5	25
80 - 86	79.5 86.5 - 86.5	15
87 - 93	86.5 86.5 - 93.5	30
94 - 100	93.5 93.5 - 100.5	10

(11)

Scale on X axis 1 unit = 6 cmg.

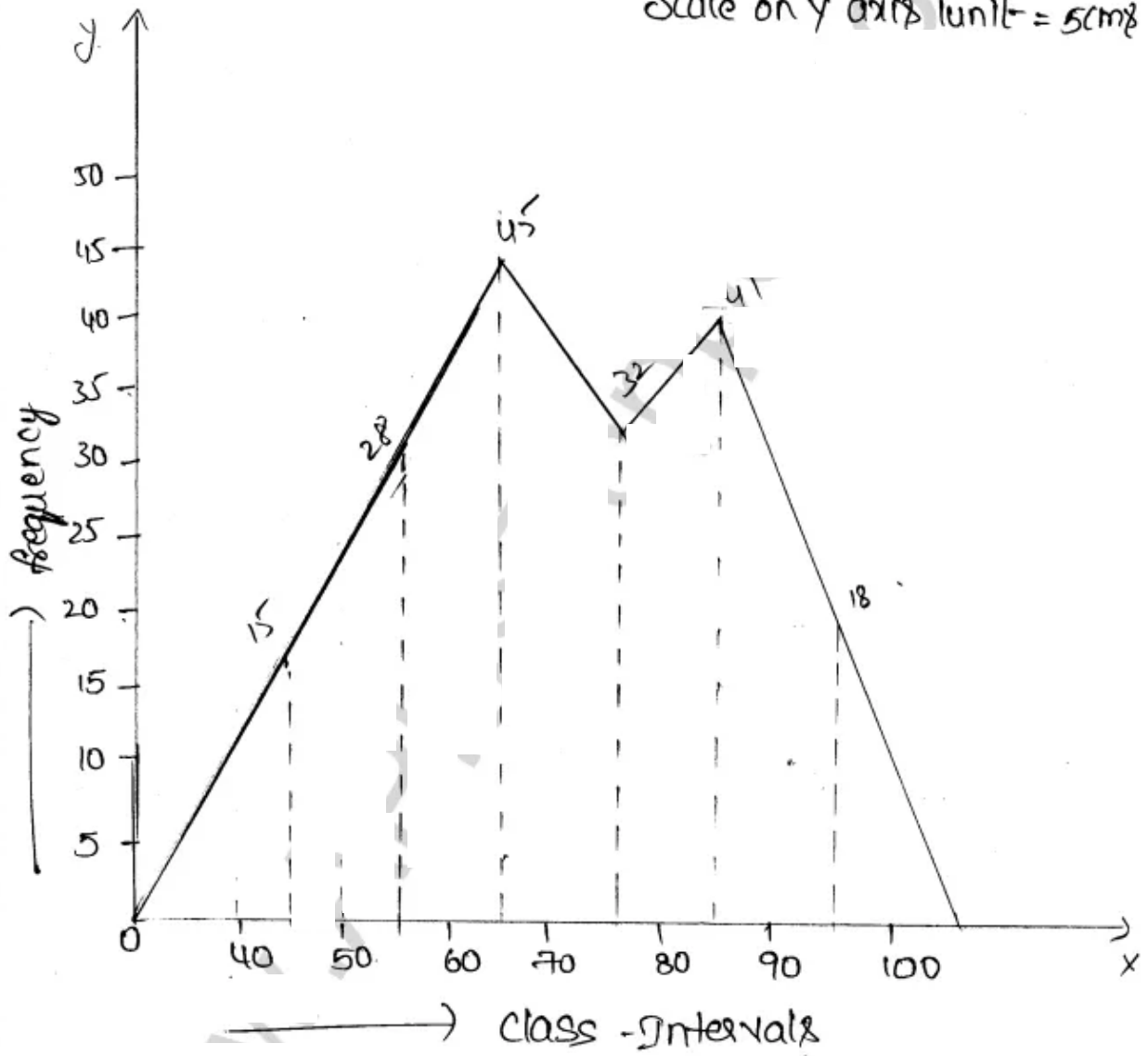
Scale on Y axis 1 unit = 5 cmg



Solution -11

The required frequency polygon as shown below.

Scale on x axis 1 unit = 10 cm
Scale on y axis 1 unit = 5 cm



Solution - 12

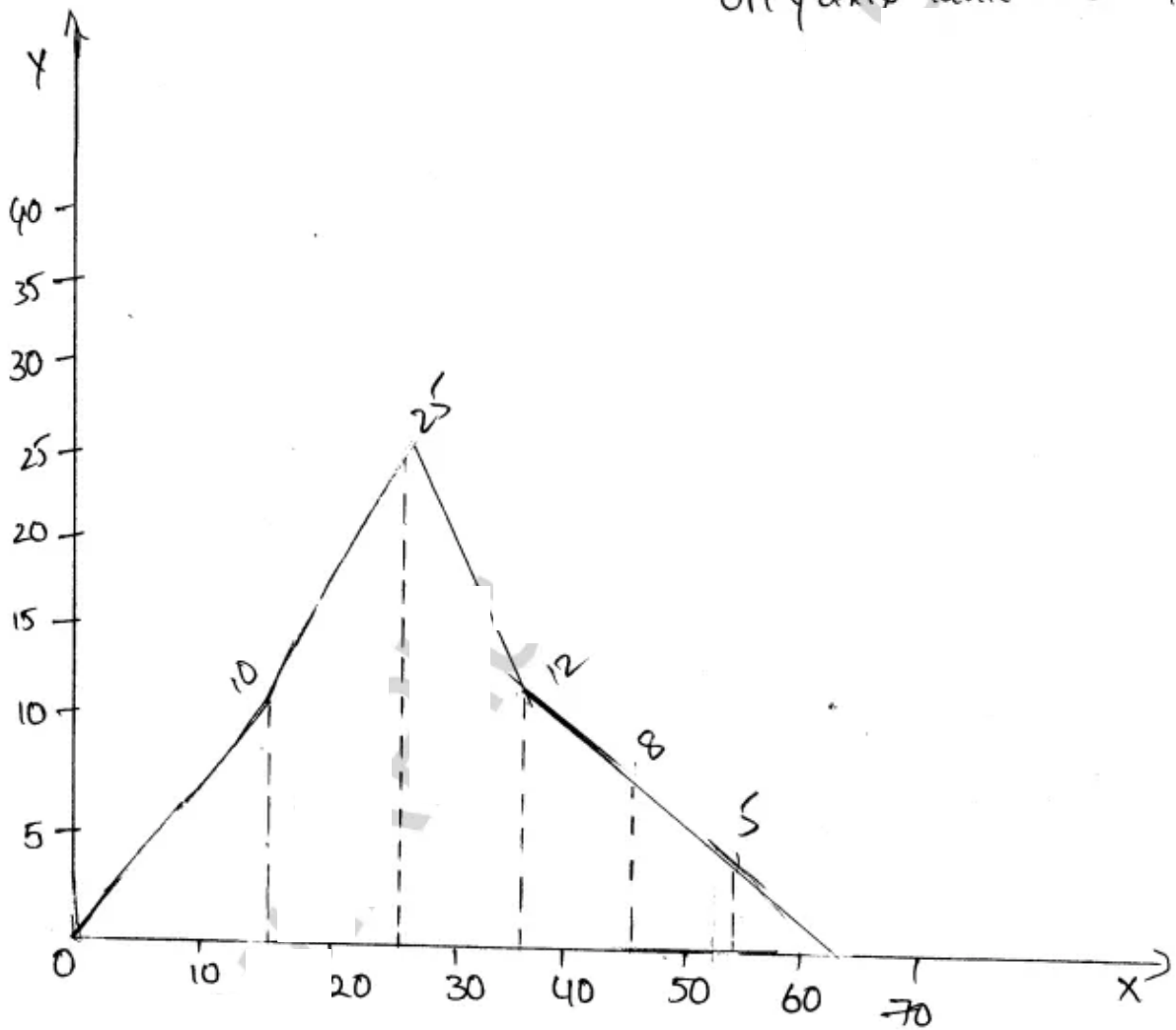
(13)

The required frequency polygon as shown below

Scale

on x axis 1 unit = 10 cm

on y axis 1 unit = 5 cm



Solution-13.

1

(14)

The given frequency distribution is discontinuous, to convert it into a continuous distribution

adjustment factor = $\frac{\text{lower limit of one class} - \text{upper limit of previous class}}{2}$

$$= \frac{21 - 20}{2} = \frac{1}{2} = 0.5$$

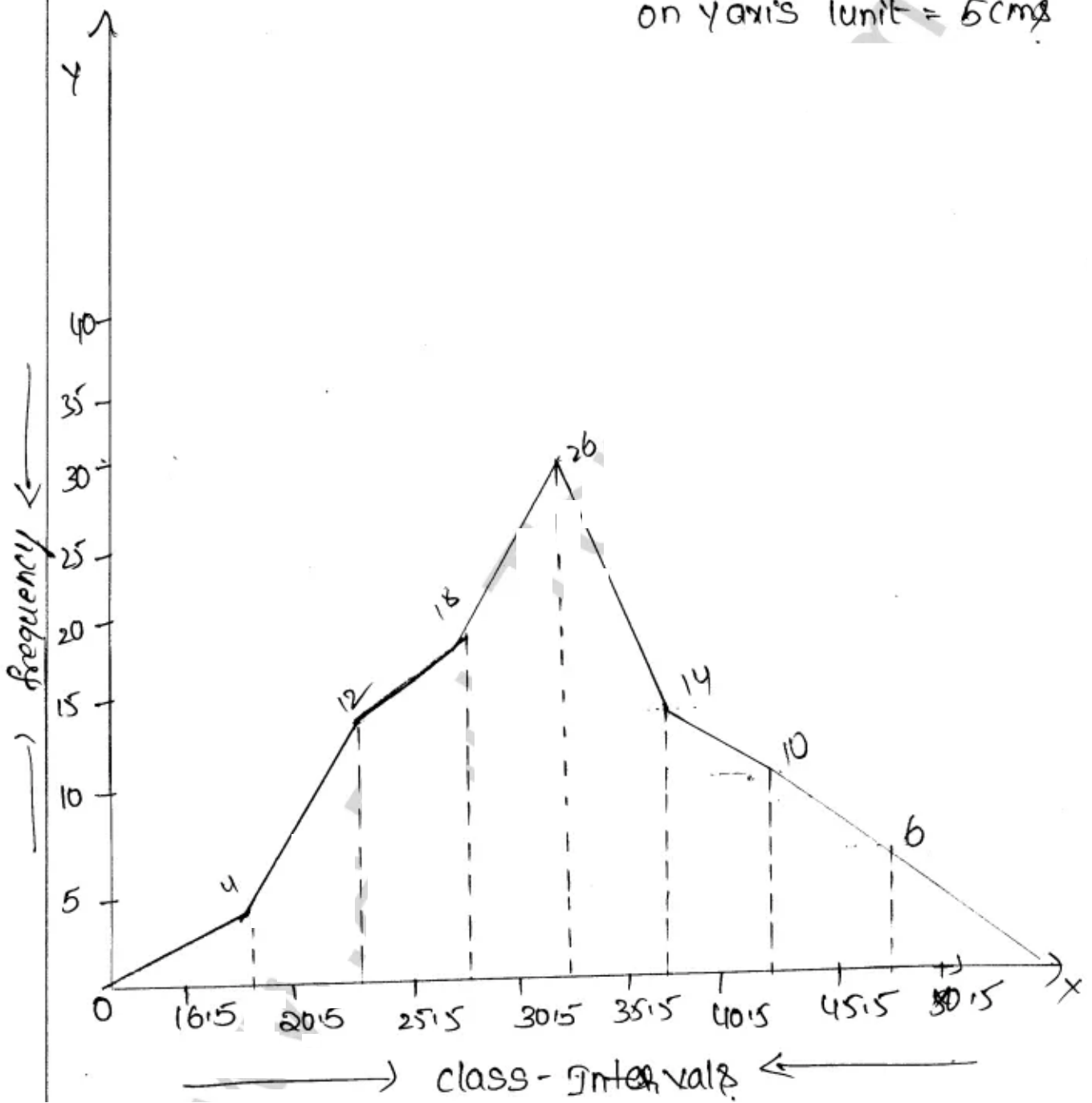
Class before Adjustment	Class after adjustment	frequency.
16-20	16.5 - 20.5	4
21-25	20.5 - 25.5	12
26-30	25.5 - 30.5	18
31-35	30.5 - 35.5	26
36-40	35.5 - 40.5	14
41-45	40.5 - 45.5	10
46-50	45.5 - 50.5	6

(15)

Scale

on x axis unit = 4cm

on y axis unit = 5cm



(16)

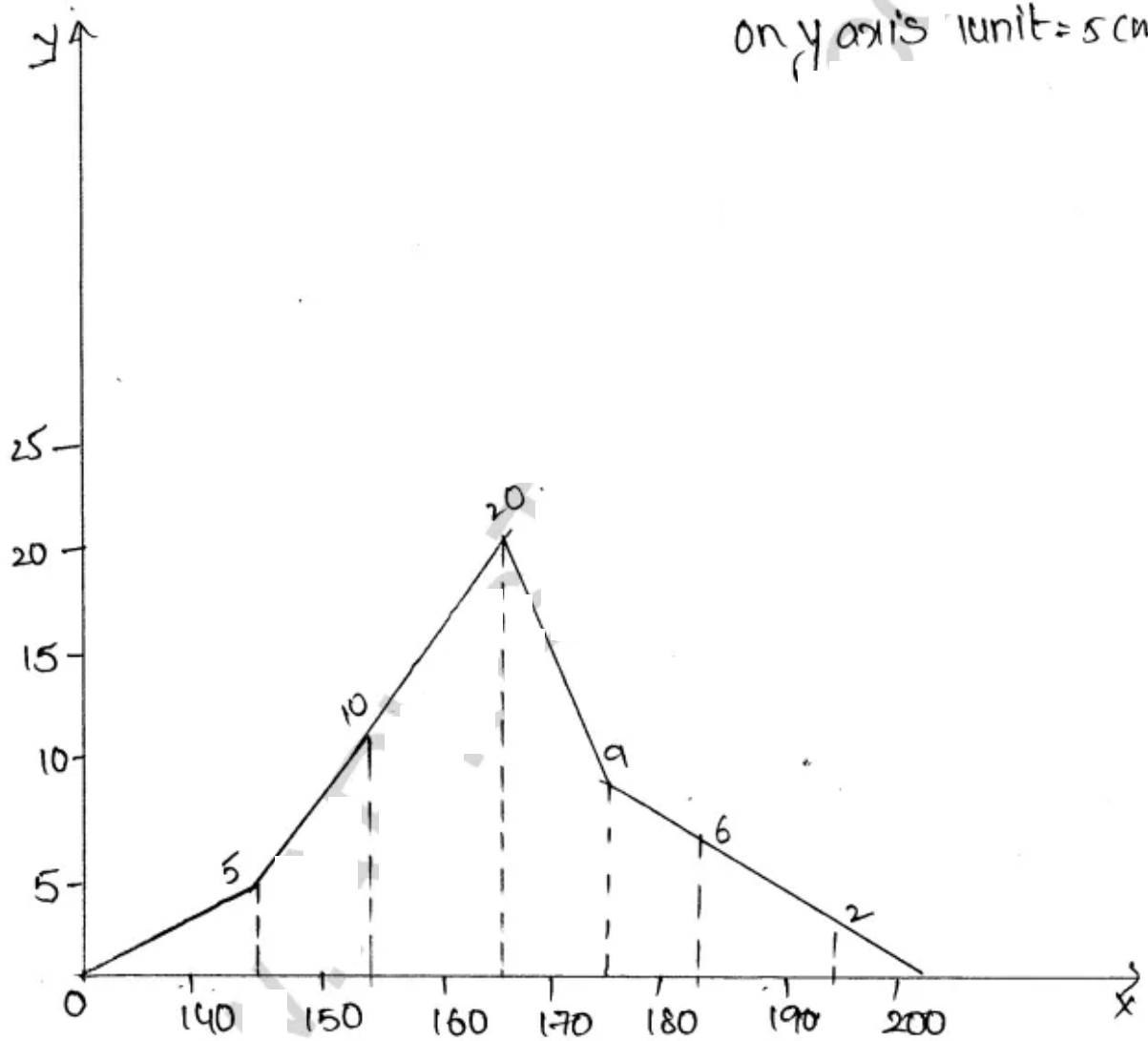
Solution - 14

The required frequency polygon as shown below.

Scale

on x axis's unit = 10 cm/s

on y axis's unit = 5 cm/s



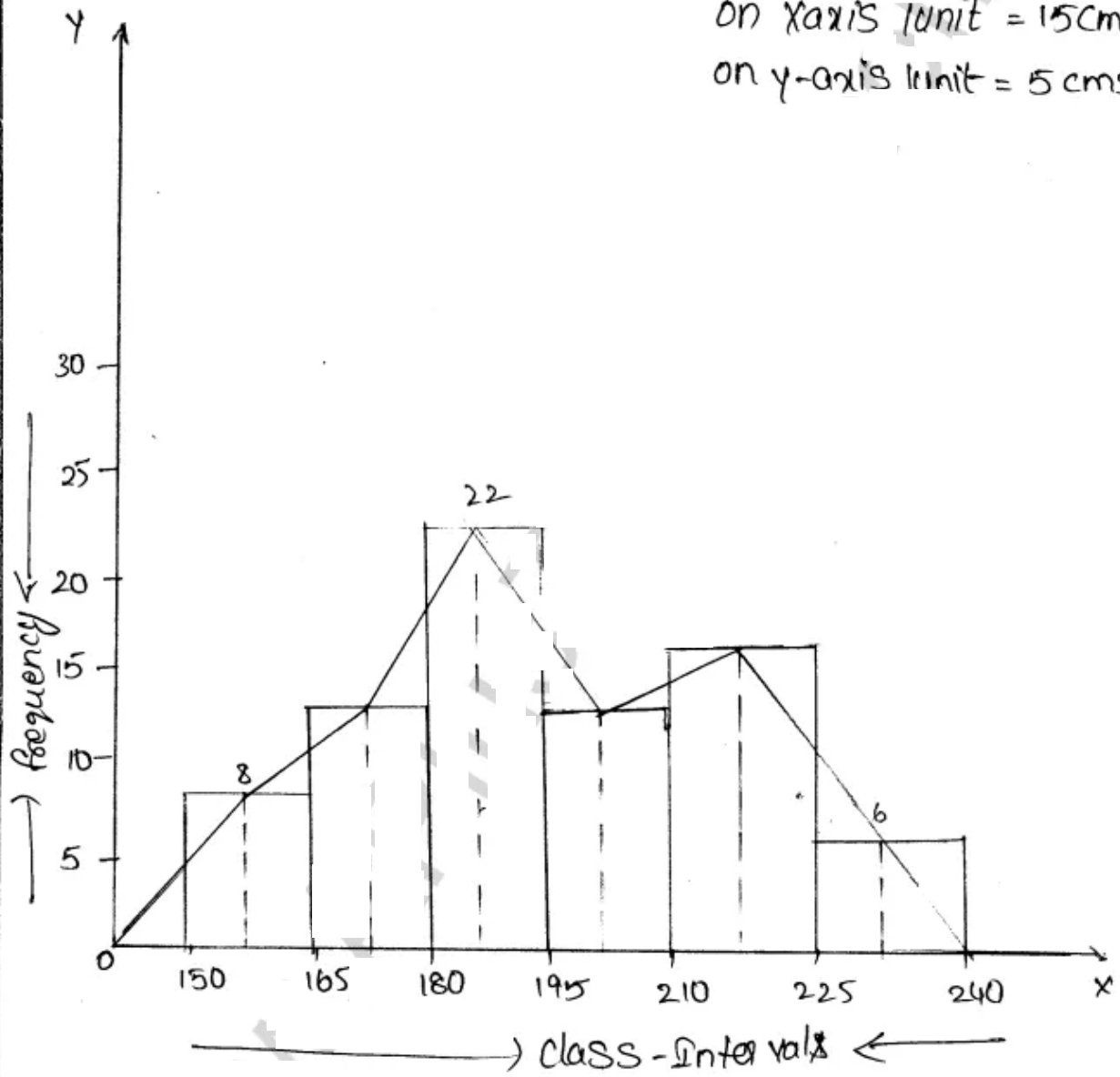
Solution - 15 :-

The required histogram and frequency polygon as shown below

Scale

on x-axis 1 unit = 15 cms

on y-axis 1 unit = 5 cms



Solution - 16 :-

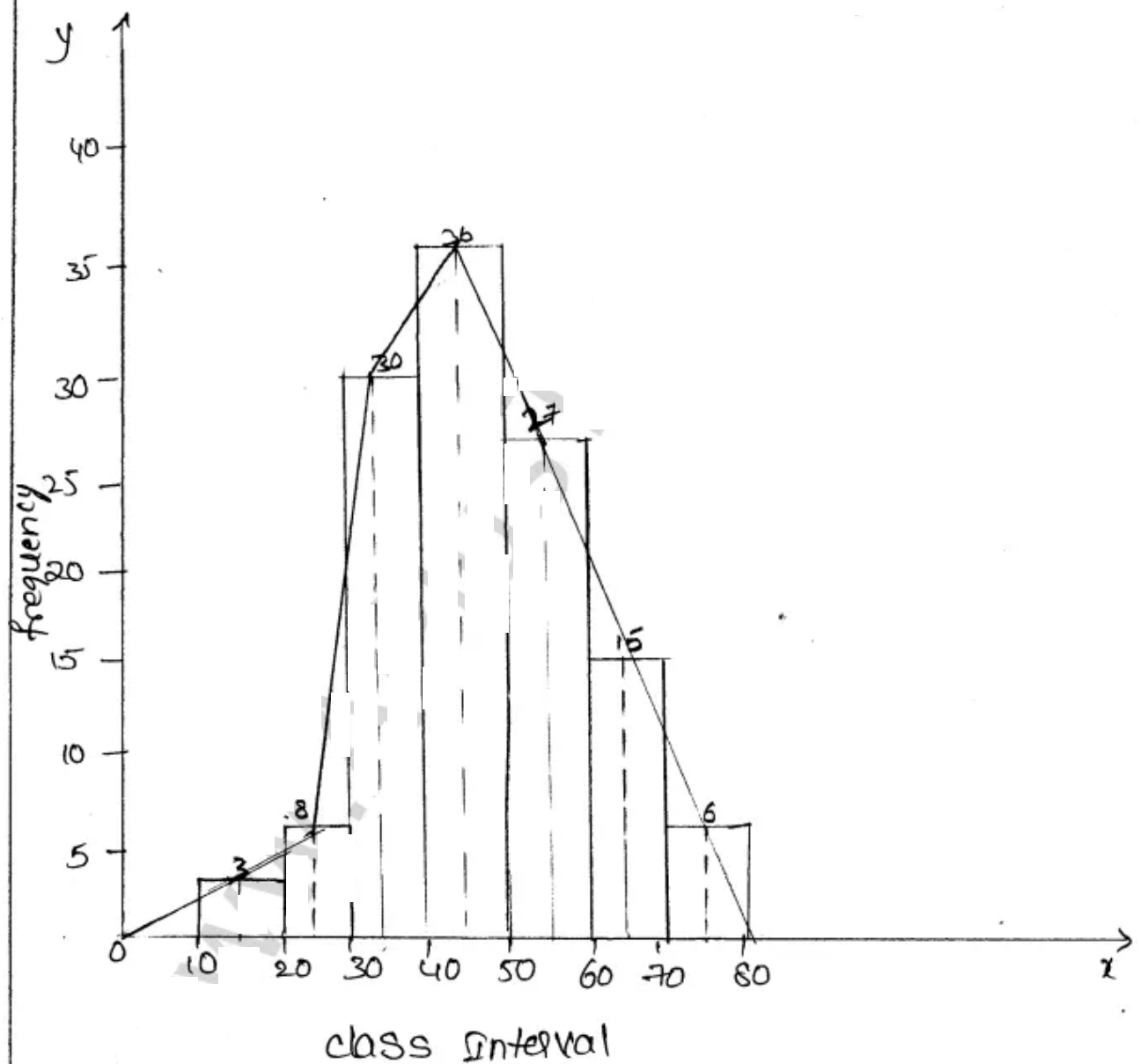
(18)

The required histogram and frequency polygon as shown below.

Scale

on x-axis unit = 10 cms

on y-axis unit = 5 cms.



Solution - 17

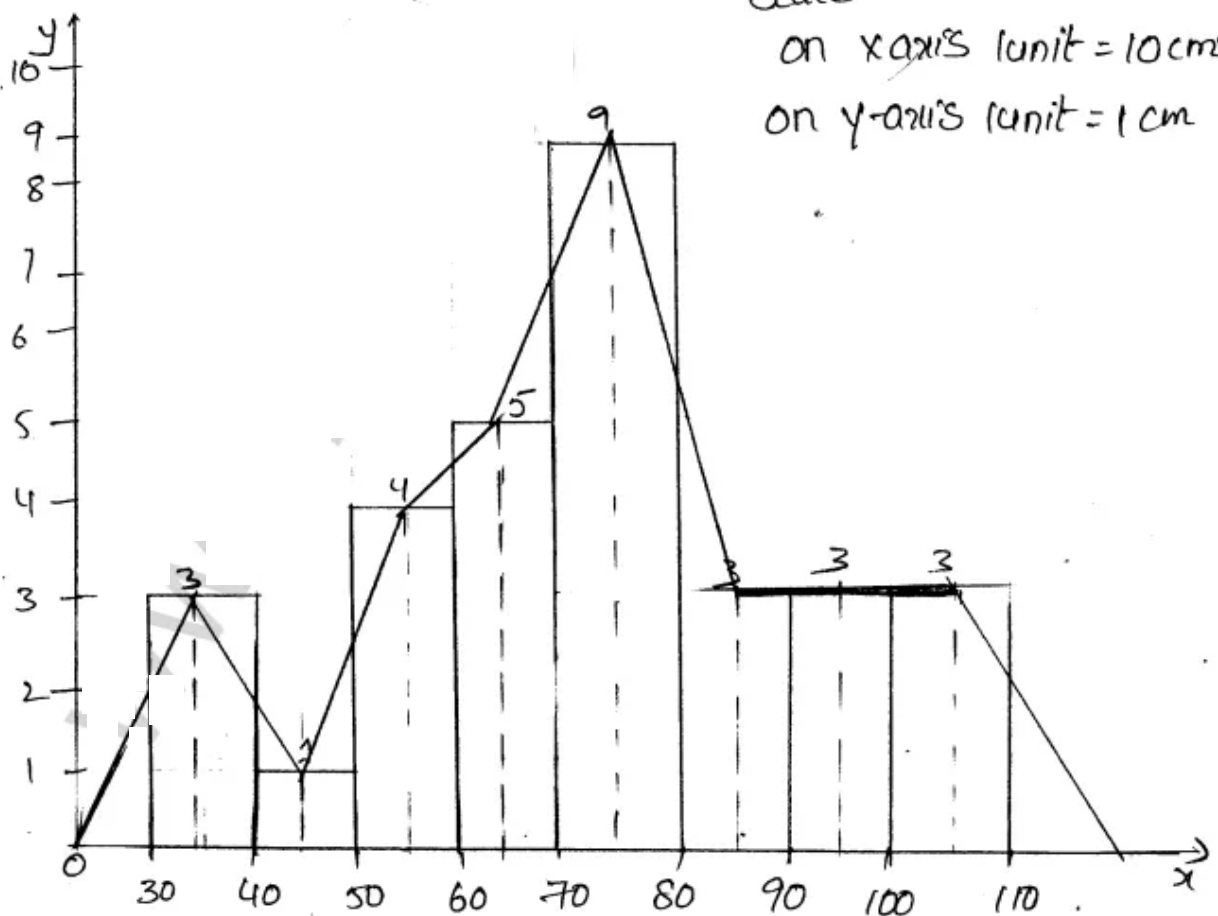
(19)

Given water bills of 32 houses in a locality are

30, 48, 52, 78, 103, 85, 37, 94, 72, 73, 66, 52, 92, 65, 78,
81, 64, 60, 75, 78, 108, 63, 71, 54, 59, 75, 100, 103, 35, 89,
95, 73.

class interval	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110
frequency	3	1	4	5	9	3	3	3

∴ The required histogram and frequency polygon as shown below

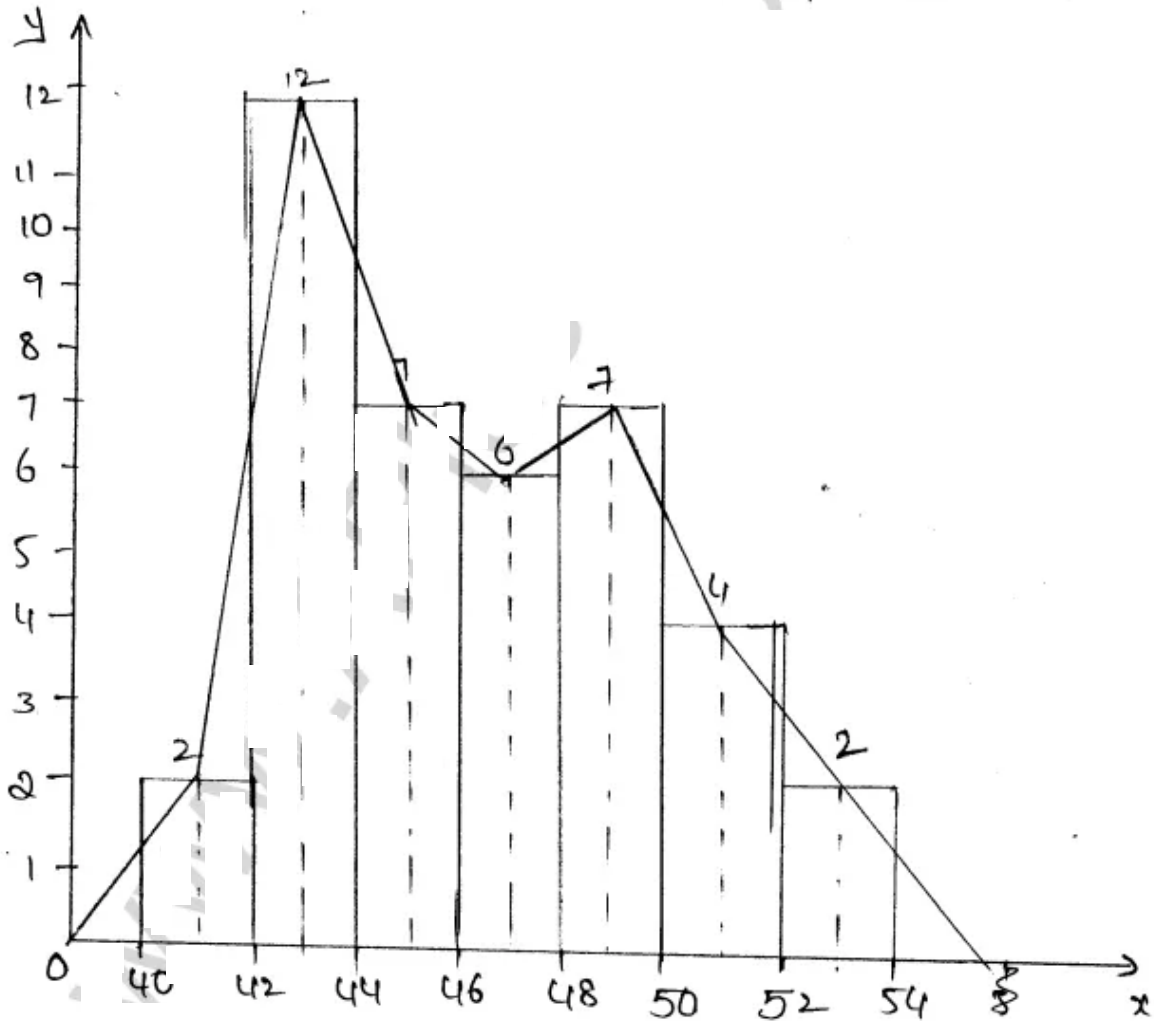


class interval	40-42	42-44	44-46	46-48	48-50	50-52	52-54
frequency	2	12	7	6	7	4	2

Scale

on x-axis unit = 2cms

on y-axis unit = 1cm



Solution - 19 :-

(21)

(i) 18

(ii) 475 - 500

(iii) 34

(iv)

classes	frequency	cummulative frequency.
375 - 400	6	6
400 - 425	18	24
425 - 450	10	34
450 - 475	20	54
475 - 500	4	58