12

Statistics

Checkpoint (Page 167)

1. The class mark of the class 10 – 20 is

(*a*) 10 (*b*) 20

(*c*) 15 (*d*) 5

Sol. (*c*) 15

Required class mark = $\frac{10 + 20}{2} = 15$

2. In the following set of discrete data

7, 5, 3, 2, 3, 5, 7, 1, 3, 7, 8, 9, 10

the frequency of 7 is

(*a*) 7 (*b*) 3

(*c*) 2 (*d*) 4

Sol. (*b*) 3

Here 7 occurs 3 times only. Hence, the required frequency is 3.

3. The mean of 25 observations is 34. If each observation is increased by 2, what is the new mean?

Sol. We know that if each observation x is increased by a, then the new mean $\bar{x}$ is increased by a and so the new mean = $\bar{x} + a$

$\therefore$ The required new mean = 34 + 2 = 36.

4. What is the class size of a class 35 – 40 of some grouped data?

Sol. The required class size is 40 – 35 = 5.

5. If the mean of six observations is 12, the mean of the first four observations is 13 and that of the last three observations is 14, then what is the fourth observation?

Sol. Let x_1, x_2, x_3, x_4, x_5 and x_6 be six observations.

Given that

$$\frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6}{6} = 12$$

$$\therefore \quad x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 12 \times 6 = 72 \ldots(1)$$

Also, $$\frac{x_1 + x_2 + x_3 + x_4}{4} = 13$$

$$\therefore \quad x_1 + x_2 + x_3 + x_4 = 13 \times 4 = 52 \ldots(2)$$

$\therefore$ Subtracting (2) from (1), we get

$$x_5 + x_6 = 72 - 52 = 20 \ldots(3)$$

Again, $$\frac{x_4 + x_5 + x_6}{3} = 14$$

$$\Rightarrow \quad x_4 + x_5 + x_6 = 14 \times 3 = 42 \ldots(4)$$

$\therefore$ Subtracting (3) from (4), we get

$$x_4 = 42 - 20 = 22$$

$\therefore$ The required fourth observation is 22.

6. The mean of five numbers is 18. If one number is excluded, then the mean of the remaining numbers becomes 16. What is the excluded number?

Sol. Required excluded number is $18 \times 5 - 16 \times 4$

$= 90 - 64 = 26.$

7. What is the difference between the mean and median of the first five composite numbers?

Sol. The first five composite numbers are 4, 6, 8, 9 and 10.

The mean of these numbers = $\bar{x}$

$= \frac{4 + 6 + 8 + 9 + 10}{5} = 7.4$

and the median = 8

$\therefore$ Required difference = 8 – 7.4 = 0.6

8. If the mean of the observations $2x$, $3x + 1$, $4x - 5$ and $x + 8$ is 6, then find the value of x.

Sol. We have

$$\text{Mean} = \frac{2x + (3x + 1) + (4x - 5) + (x + 8)}{4}$$

$$= \frac{10x + 4}{4} = 6 \qquad \text{[Given]}$$

$\Rightarrow \quad 10x = 24 - 4 = 20$

$\therefore \quad x = 2$

$\therefore$ The required value of x is 2.

9. Find the median of 72, – 30, 59, – 7, 8, – 6.

Sol. Writing the given numbers in decreasing order, we have

72, 59, 8, –6, –7, –30.

The number of observation is 6 which is even.

$\therefore$ The mean of $\frac{6}{2}$ th and $\left(\frac{6}{2} + 1\right)$ th observation

= 3rd and 4th observation is the median

$\therefore$ The required median is $\frac{8 - 6}{2}$, i.e. 1.

10. If the mean of x^2 and $\frac{1}{x^2}$ is 17, where $x > 0$, what is the value of $x + \frac{1}{x}$?

Sol. Given that

$$\frac{1}{2}\left(x^2 + \frac{1}{x^2}\right) = 17$$

$$\Rightarrow \quad x^2 + \frac{1}{x^2} = 34$$

$$\Rightarrow \quad \left(x + \frac{1}{x}\right)^2 - 2x \times \frac{1}{x} = 34$$

$$\Rightarrow \quad \left(x + \frac{1}{x}\right)^2 = 34 + 2 = 36$$

$$\therefore \quad x + \frac{1}{x} = \sqrt{36} = 6$$

which is the required value.

Check Your Progress

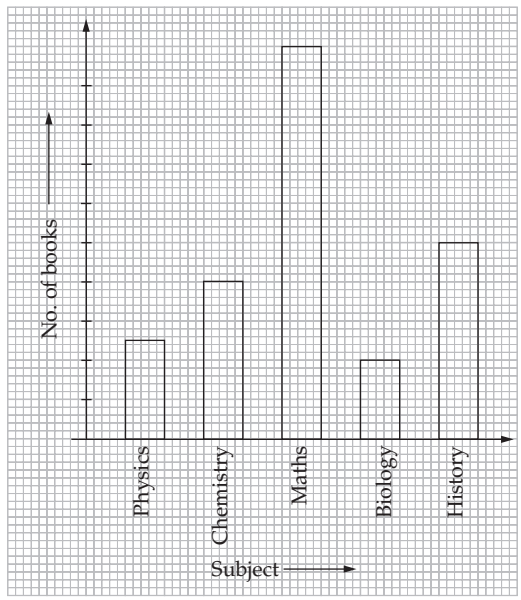
(Page 173)

Multiple-Choice Questions

1. The numbers of books in different subjects in a library is given below:

Subject	*No. of books*
Physics	120
Chemistry	200
Mathematics	500
Biology	100
History	250

The librarian represented the data as shown below.



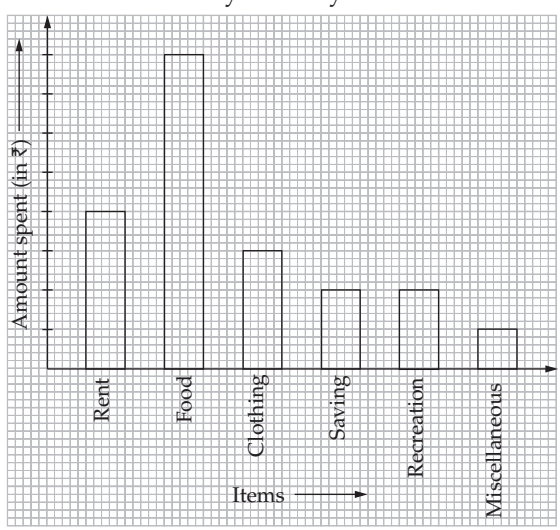
Which of the following would be the scale used by the librarian on the y-axis?

(a) 1 unit = 10 books (b) 1 unit = 50 books

(c) 1 unit = 75 books (d) 1 unit = 100 books

Sol. (a) 1 unit = 10 books

2. The bar graph below shows the amount spent on different items by a family in a certain month.



If the total amount spent on different items by a family in a certain month is ₹ 10,000, then what is the amount spent on food?

(*a*) ₹ 2000 (*b*) ₹ 3000

(*c*) ₹ 4000 (*d*) ₹ 5000

Sol. (*c*) ₹ 4000

Total number of units covered by different items

$= 20 \times 5 = 100$ units

100 units = ₹ 10,000

$$\text{Value of 1 unit} = \frac{₹\,10,000}{100} = ₹\,100$$

Number of units covered by food = 40 units

$= 40 \times ₹\,100$

$= ₹\,4000$

Very Short Answer Type Questions

3. To draw the histogram to represent each of the following frequency distributions:

Class interval	10-15	15-25	25-30	30-45	45-60
Frequency	7	8	9	12	18

find the adjusted frequency for the class 30–45.

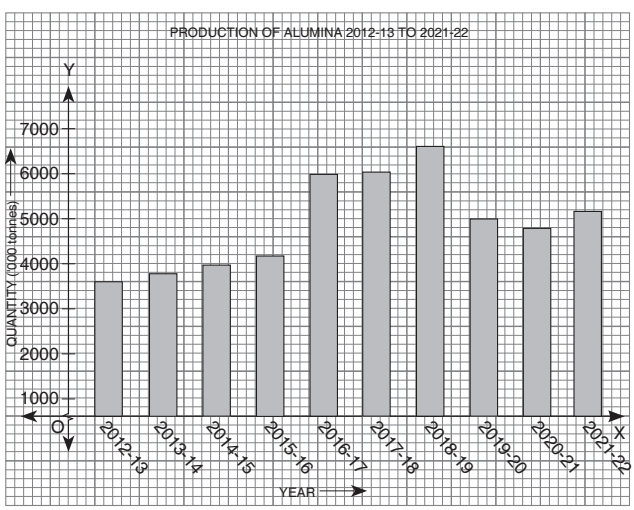
Sol. Adjusted frequency of the class

$$= \frac{\text{minimum class size}}{\text{class size of the class}} \times \text{frequency of the class}$$

∴ Adjusted frequency for the class 30 – 45

$$= \frac{5}{15} \times 12 = 4$$

4. The following bar graph gives the production of alumina from the year 2012-13 to 2021-22.



In which year, was the production of alumina maximum.

Sol. The production of alumina was maximum in the year 2018–19.

5. Consider the following frequency distribution.

Class interval	*Frequency*
10 – 30	25
40 – 60	32
70 – 90	30
100 – 120	43
130 – 150	21
160 – 180	10

(*a*) What is the total frequency in the above distribution?

(*b*) Which interval of the inclusive form of frequency distribution contains the greatest frequency?

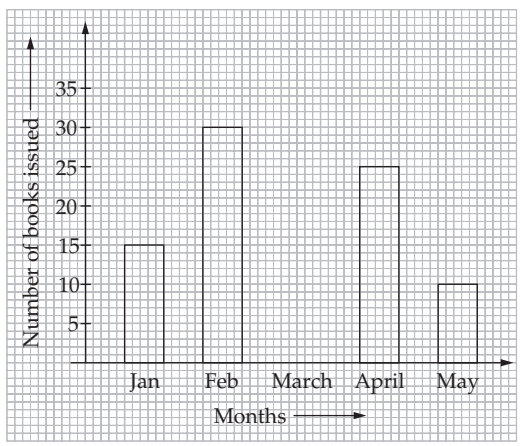
Sol. (*a*) Total frequency

$= 25 + 32 + 30 + 43 + 21 + 10$

$= 161$

(*b*) The class interval 100–120 contains the greatest frequency.

6. Radhika is a librarian in a school. She keeps a record of the number of books issued to a particular section of the class. The graphs shows the number of books issued to Class 9 Section A over a period of five months, from January to May. If the number of books issued over these five months is 100, find the number of books issued in the month of March.



Sol. Number of books issued in January = 15

Number of books issued in February = 30

Let number of books issued in March be x.

Number of books issued in April = 25

Number of books issued in May = 10

Given number of books issued in 5 months = 100

$15 + 30 + x + 25 + 10 = 100$

$\Rightarrow \quad x = 100 - 80$

$\Rightarrow \quad x = 20$

Number of books issued in March = 20.

Short Answer Type Questions

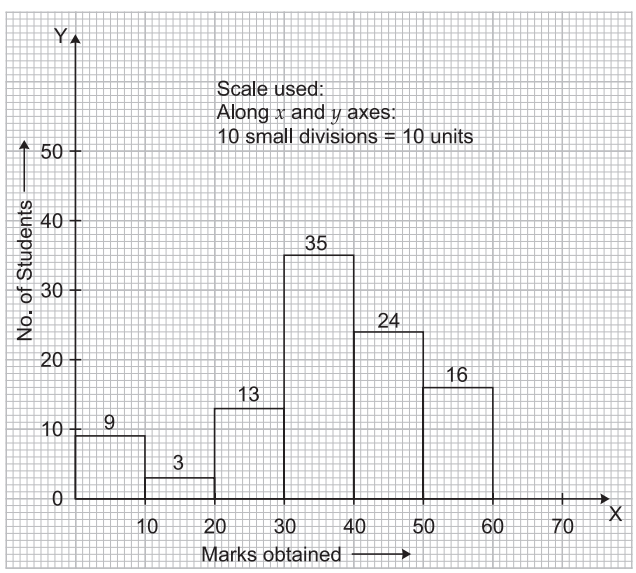
7. Draw the histogram for the given data.

Marks	*Number of students*
0 – 10	9
10 – 20	3
20 – 30	13
30 – 40	35
40 – 50	24
50 – 60	16
Total	100

Sol. The frequency distribution table is as follows:

Marks obtained	*Number of students*
0–10	9
10–20	3
20–30	13
30–40	35
40–50	24
50–60	16
	Total = 100

The required histogram is shown below:



A histogram showing the marks obtained by a number of students

8. Construct a histogram for the given data and hence, answer the following questions:

Class interval	*Frequency*
1 – 3	24
4 – 6	30
7 – 9	28
10 – 12	41
13 – 15	19
16 – 18	8

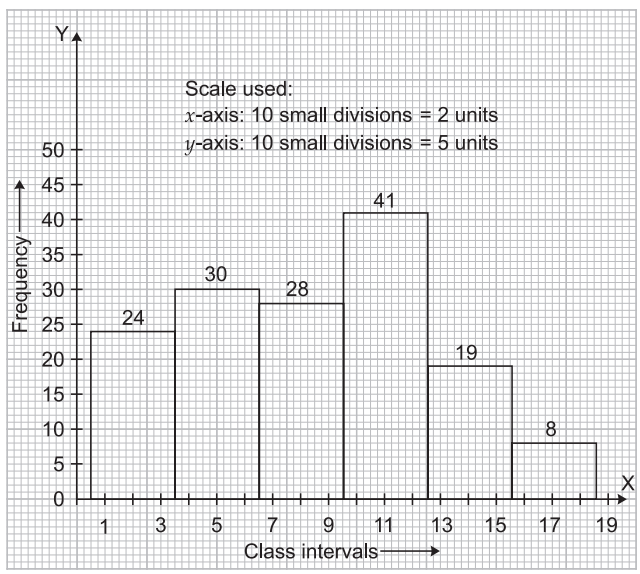
(*a*) What is the total frequency in the table?

(*b*) Which interval of the inclusive form of frequency distribution contains the greatest frequency?

(*c*) How many scores were reported from 10 through 18?

Sol. We see that the data given in the table are in inclusive form. Therefore, we represent the data in exclusive form by adding and subtracting $\frac{4-3}{2} = 0.5$ with the upper limit and the lower limit respectively of each inclusive class. The table shown as follows:

Class interval	*Frequency*
0.5–3.5	24
3.5–6.5	30
6.5–9.5	28
9.5–12.5	41
12.5–15.5	19
15.5–18.5	8
	Total : 150



(*a*) Required total frequency = 150

(*b*) We see that 41 is the greatest frequency corresponding to the interval 10 – 12 of inclusive form of frequency distribution.

∴ 10 – 12 is the required interval.

(*c*) Required number of scores = 41 + 19 + 8 = 68

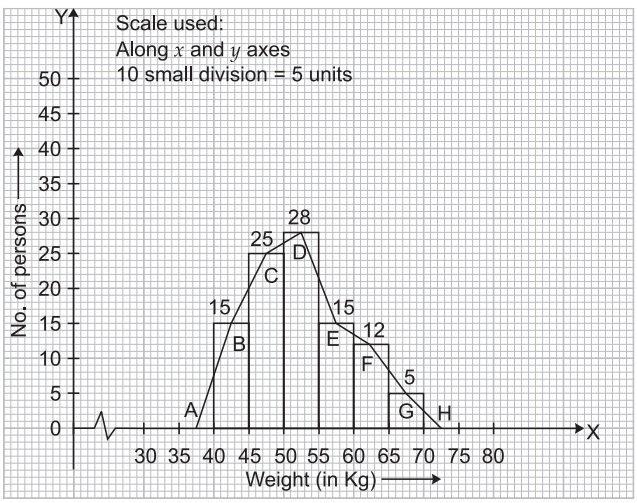
Long Answer Type Questions

9. Construct a histogram and frequency polygon for the following frequency distribution.

Weight (in kg)	*Number of persons*
40 – 45	15
45 – 50	25
50 – 55	28
55 – 60	15
60 – 65	12
65 – 70	5

[CBSE SP 2012]

Sol.



∴ ABCDEFGHA is the required frequency polygon.

10. The following are the scores of two groups of Class VI students in a test of reading ability.

Scores	*Group A*	*Group B*
53 – 55	2	1
50 – 52	3	2
47 – 49	12	4
44 – 46	14	6
41 – 43	18	8
38 – 40	22	12
35 – 37	10	16
32 – 34	13	20
	Total = 94	Total = 69

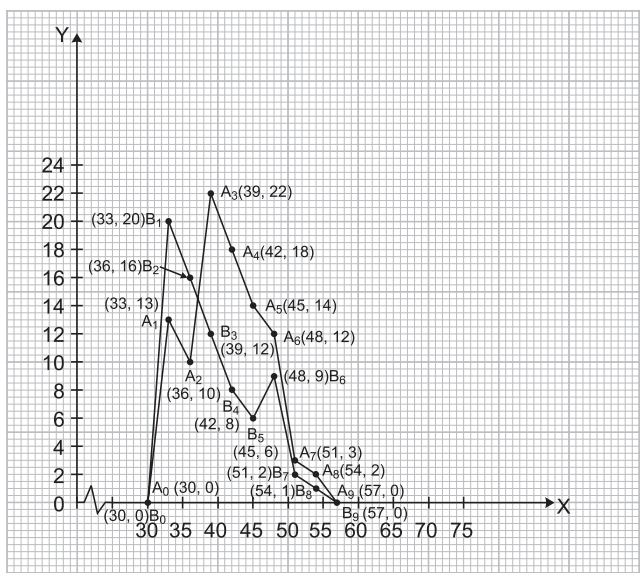
Construct a frequency polygon for each of these two groups of students on the same axes without drawing histograms.

Sol. The exclusive forms of the frequency distribution are as follows:

Scores	*Group A*	*Group B*
31.5 – 34.5	13	20
34.5 – 37.5	10	16
37.5 – 40.5	22	12
40.5 – 43.5	18	8
43.5 – 46.5	14	6
46.5 – 49.5	12	4
49.5 – 52.5	3	2
52.5 – 55.5	2	1
	Total = 94	Total = 69

We see the class marks of different classes of scores are $\frac{31.5 + 34.5}{5}$ = 33, $\frac{34.5 + 37.5}{2}$ = 36, $\frac{37.5 + 40.5}{2}$ = 39…, $\frac{52.5 + 55.5}{2}$ = 54, i.e. 33, 36, 39, 42, 45, 48, 51 and 54. Now, to draw the frequency polygon for Group A of students, we plot the points A_1(33, 13), A_2(36, 10), A_3(39, 22), A_4(42, 18), A_5(45, 14), A_6(48, 12), A_7(51, 3), and A_8(54, 2) and join these points pair wires successively by eight line segments.

Similarly, to draw the frequency polygon for Group B of students, we plot the points B_1(33, 20), B_2(36, 16), B_3(39, 12), B_4(42, 18), B_5(45, 6), B_6(48, 9), B_7(51, 2), and B_8(54, 1) and join them pairwise successively by eight other line segments.



The polygon $A_0\,A_1\,A_2\,A_3\,A_4\,A_5\,A_6\,A_7\,A_8\,A_9\,A_0$ is the required frequency polygon for Group A students and $B_0\,B_1\,B_2\,B_3\,B_4\,B_5\,B_6\,B_7\,B_8\,B_9\,B_0$ is the required frequency polygon for Group B students, where A_1, A_2 … A_8, A_9, A_0 are the points (33, 13), (36, 10), (39, 22), (42, 18), (45, 14), (48, 12), (51, 3), (54, 2), (57, 0) and (30, 0) respectively and B_1, B_2, … B_8, B_9, B_0 are the points (33, 20), (36, 16), (39, 12), (42, 8), (45, 13), (48, 6), (48, 9), (51, 2), (54, 1), (57, 0), and (30, 0) respectively. Scales used are as follows:

Along *x*-axis : 10 small divisions = 5 units

Along *y*-axis : 10 small divisions = 2 units

Higher Order Thinking Skills (HOTS) Questions

(Page 176)

1. Construct a histogram from the following distribution of class marks of different classes along with their frequencies.

Class marks	*Frequency*
180	12
200	20
220	30
240	15
260	10
280	5
300	7

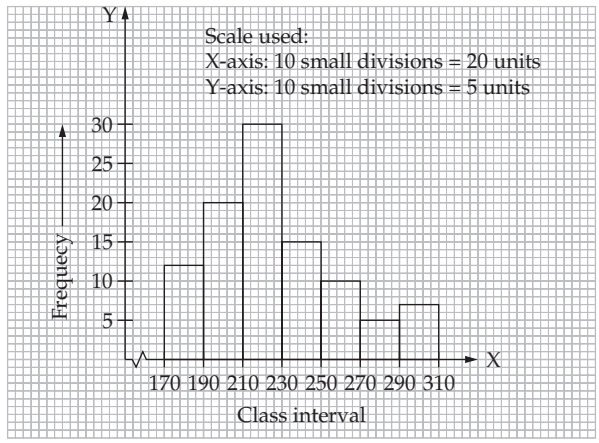
Sol. Class width = 200 – 180 = 20

Half of the class width = $\frac{20}{2}$ = 10

The given distribution with class-intervals along with their frequency are as follows.

Class intervals	*Frequency*
170 – 190	12
190 – 210	20
210 – 230	30
230 – 250	15
250 – 270	10
270 – 290	5
290 – 310	7

The required histogram is shown here.



2. An electrician using a digital voltmeter measures the output voltage of the plug sockets in the newly-constructed house. The data collected by him is shown in the table given.

Voltage (in volts)	*Frequency (No. of plug socket)*
200 – 210	7
210 – 220	5
220 – 230	15
230 – 240	10
240 – 250	2

Draw a frequency polygon to represent the above data.

Sol. We take two hypothetical class intervals namely 190 – 200 at the beginning and 250 – 260 at the end, each with zero frequency and get the following distribution table.

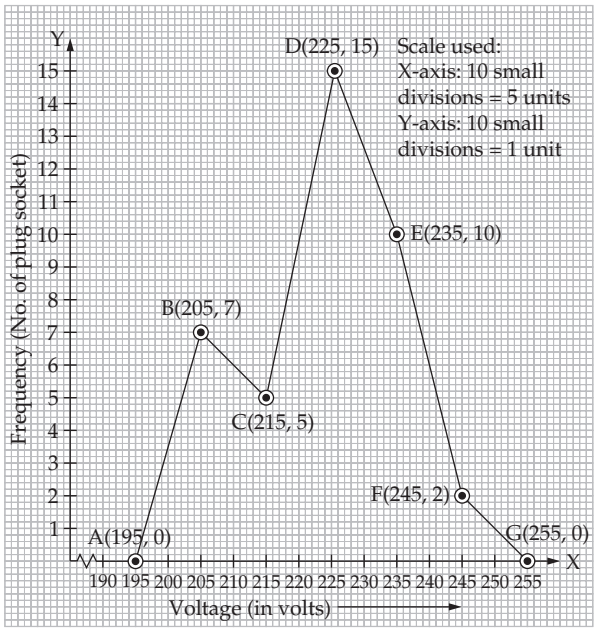
Voltage (in volts)	*Class marks*	*Frequency (No. of plug socket)*
190 – 200	195	0
200 – 210	205	7
210 – 220	215	5
220 – 230	225	15
230 – 240	235	10
240 – 250	245	2
250 – 260	255	0

We represent the class-marks along the *x*-axis and the frequency along the *y*-axis on a suitable scale.

We plot the points A(195, 0), B(205, 7), C(215, 5) D(225, 15), E(235, 10), F(245, 2) and G(255, 0).

Join the points A, B, C, D, E, F and G.

ABCDEFG is the required polygon.



Self-Assessment

(Page 176)

Multiple-Choice Questions

1. In a grouped frequency distribution, three classes are as follows:

10.5 – 20.5, 20.5 – 30.5, 30.5 – 40.5

Then the class marks are respectively

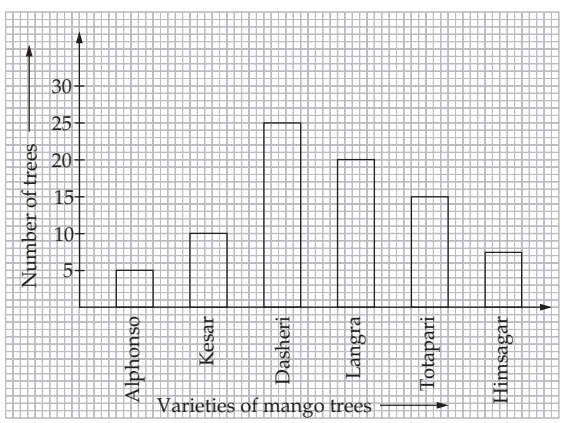
(*a*) 10.5, 20.5 and 30.5 (*b*) 15.5, 25.5 and 35.5

(*c*) 20.5, 30.5 and 40.5 (*d*) 10, 10 and 10.

Sol. (*b*) 15.5, 25.5 and 35.5

The class marks of the three given classes are $\frac{10.5 + 20.5}{2} = 15.5$, $\frac{20.5 + 30.5}{2} = 25.5$ and $\frac{30.5 + 40.5}{2} = 35.5$ respectively.

2. The bar graph given below shows the number of each variety of mango fruit tree in an orchard.



How many more Himsagar trees are there in the orchard than the Alphonso trees?

(*a*) 5 (*b*) 10

(*c*) 8 (*d*) 3

Sol. (*d*) 3

3. Consider the following frequency distribution with unequal class intervals.

Class interval	*Frequency*
10 – 15	7
15 – 25	10
25 – 30	4
30 – 50	8
50 – 60	40
60 – 90	90

Find the adjusted frequency for the class interval 60 – 90.

(*a*) 21 (*b*) 15 (*c*) 40 (*d*) 90

Sol. (*b*) 15

Adjusted frequency of the class

$= \frac{\text{minimum class size}}{\text{class size of this class}} \times$ frequency of the class

$= \frac{5}{30} \times 90$

$= 15$

4. In the class interval 30-40, 40-50, the number 40 is included in

(*a*) 30-40

(*b*) 40-50

(*c*) both the intervals

(*d*) None of these intervals

Sol. (*b*) 40-50

Fill in the Blanks

5. In a bar graph, **width** of the bar is not important.

6. In a histogram, areas of the rectangles erected are **proportional** to the corresponding frequencies.

7. The class mark of the class interval 2.4–6.6 is **4.5**.

Sol. Class mark $= \frac{2.4 + 6.6}{2}$

$= \frac{9}{2}$

$= 4.5$

8. The lower limit of class interval 40–50 is **40**.

Assertion-Reason Type Questions

Directions (Q. Nos. 9 to 12): Each of these questions contains an assertion followed by reason. Read them carefully, and answer the question on the basis of the following options, select the one that best describes the two statements.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

9. **Assertion (A):** 9 – 11, 12 – 14, 15 – 17, … are examples of inclusive group.

Reason (R): In an exclusive group, upper limit and lower limit are included in the class.

Sol. (*c*)

Assertion is in correct but reason is incorrect as in exclusive group lower limit is included.

10. **Assertion (A):** In a distribution of the form 0 – 10, 10 – 20, 20 – 30,… the true upper limit is equal to the upper limit of the class.

Reason (R): The given distribution is exclusive.

Sol. (*a*)

Both assertion and reason are correct and reason is correct explanation of assertion.

11. **Assertion (A):** In a bar graph, all the bars are of equal width.

Reason (R): There are spaces between the bars of the bar graph.

Sol. (*b*)

Both assertion and reason are true but reason is not the correct explanation of assertion.

12. **Assertion (A):** Frequency polygons can also be drawn independently without drawing histograms.

Reason (R): Class marks can be used to plot the points.

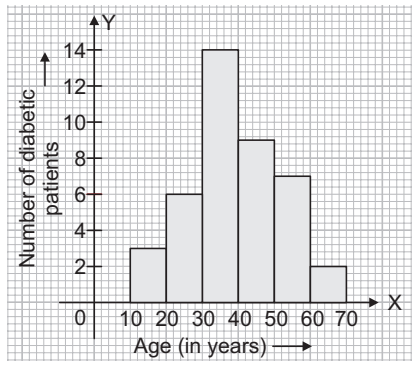
Sol. (*a*)

Both assertion and reason are true and reason is the correct explanation of assertion.

Case Study Based Questions

13. A survey was conducted that shows the ages of diabetic patients admitted in a hospital during a year. The data was recorded in the frequency distribution table and has been represented by the histogram.

Age (in years)	10–20	20–30	30–40	40–50	50–60	60–70
Number of diabetic patients	3	6	14	9	5	2



Study the graph and answer the following questions.

(*a*) Which of the following age group has the minimum number of diabetic patients?

Ans. 60–70

(*b*) Which of the following age group has the maximum number of diabetic patients?

Ans. 30–40

(*c*) (*i*) What is the total number of diabetic patients in the age group of 10–70?

Ans. 39

or

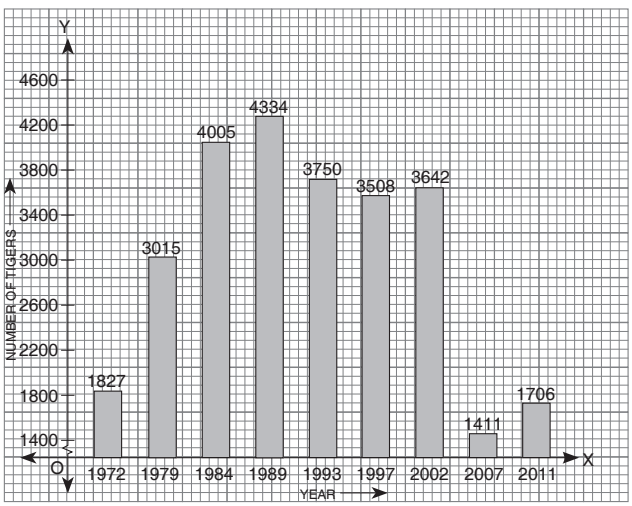
(*ii*) How many more diabetic patients are there in the age group 40–50 than in the age group 60–70?

Ans. 7

14. The Government of India has taken a pioneering initiative for conserving its national animal, the Tiger, by launching the 'Project Tiger' in 1973. A survey was conducted by the Ministry of Environment, Forests and Climate change, according to which population of tiger has increased.

The following table gives the population of tigers in India.

Year	*Number of tigers*
1972	1827
1979	3015
1984	4005
1989	4334
1993	3750
1997	3508
2002	3642
2007	1411
2011	1706



Read the above bar graph and answer the following questions:

(*a*) In which year were the number of tigers minimum?

Ans. 2007

(*b*) In which year were the number of tigers maximum?

Ans. 1989

(*c*) (*i*) How much decrease in number of tigers was there between 2002 to 2007?

Ans. 2231

or

(*ii*) How much increase in number of tigers was there between 2007 to 2011?

Ans. 295

Very Short Answer Type Questions

15. What is the significance of the widths of bars in a bar graph?

Sol. We know that the widths of the bars in a bar graph have no significance.

16. The seats won by the major political parties in the recent election are given below.

Political party	A	B	C	D	E	F	G
Seats won	29	22	37	99	12	9	8

Which political party won the largest number of seats? Find the percentage of seats won by that party.

Sol. Political part D won the largest number of seats

Total number of seats

$$= 29 + 22 + 37 + 99 + 12 + 9 + 8$$

$$= 216$$

Percentage of seats won by party D

$$= \frac{99}{216} \times 100$$

$$= 45.83\% \text{ (approx.)}$$

17. If a is the class mark and y is the upper limit of a class in a continuous frequency distribution, what is the lower limit of the class?

Sol. Let the lower limit of the class be x.

Then,

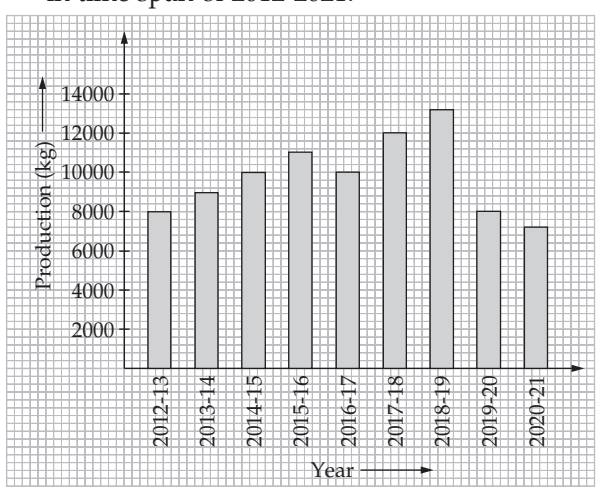
$$\frac{x + y}{2} = a$$

$$\Rightarrow \quad x + y = 2a$$

$$\Rightarrow \quad x = 2a - y$$

$\therefore$ Lower limit of the class $= 2a - y$

18. The production of gold bullion from 2012-13 to 2020-21 is given in the bar graph given below, What is the difference between the maximum and minimum production of gold bullion in time span of 2012-2021.



Sol. The minimun production of gold bullion was in the year 2020-21. It was 7200 kg.

The maximum production of gold bullion was in the year 2018-19. It was 13200 kg.

Difference between the maximum and minimum production of gold bullion

= 13200 kg – 7200 kg

= 6000 kg

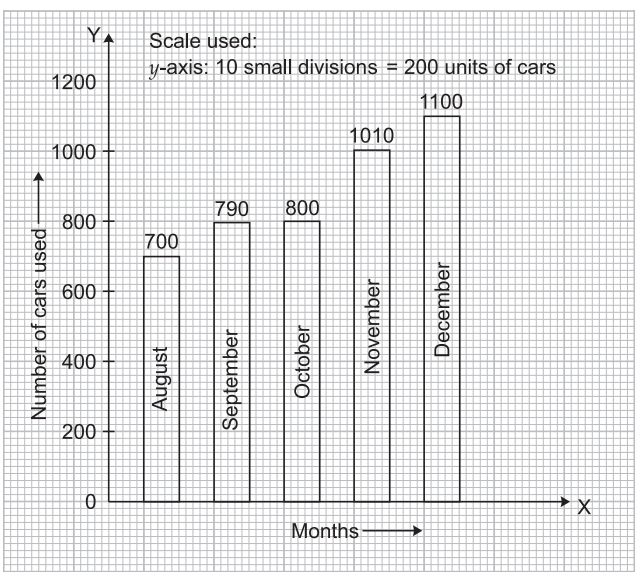
Short Answer Type Questions

19. Represent the following data by a bar graph:

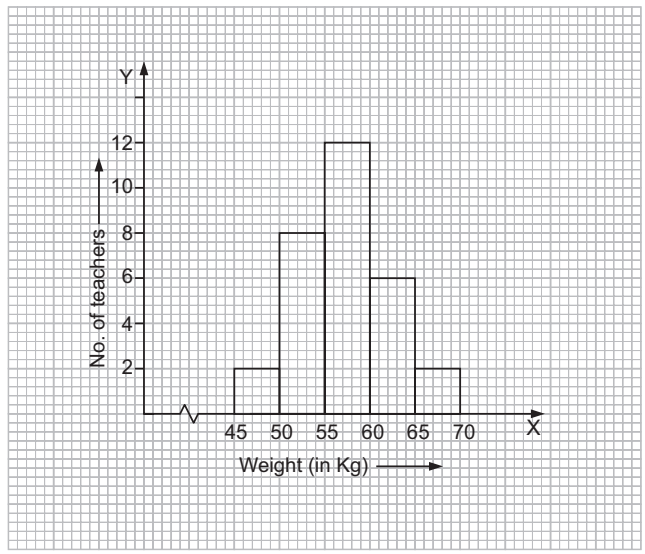
The number of cars sold in Delhi during August, 1998 to December, 1998 was as follows:

Month	*Number of cars sold*
August	700
September	790
October	800
November	1010
December	1100

Sol. Bar graph showing the number of cars sold in different months of a year.



20. Prepare a grouped frequency distribution table for the histogram shown below:



Histogram for the weight of 30 teachers in a school.

Sol. The required grouped frequency distribution table for the given histogram is as follows:

Weight in kg	45–50	50–55	55–60	60–65	65–70
No. of teachers	2	8	12	6	2

Long Answer Type Questions

21. Draw the histogram to represent the following data.

Class interval	*Frequency*
5 – 12	10
13 – 20	20
21 – 28	27
29 – 36	25
37 – 44	7
45 – 52	14

Sol. We have to first make the class intervals continuous.

The difference of the lower limit of second class 13 – 20 and the upper limit of the first class 5 – 12 = 13 – 12 = 1.

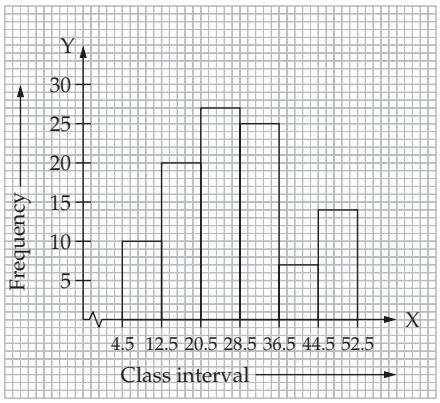
Hence the first continuous class is

$\left(5-\frac{1}{2}\right)-\left(12+\frac{1}{2}\right)$, *i.e.* 4.5 – 12.5

The frequency distribution table for continuous classes is as follows.

Class	*Frequency*
4.5 – 12.5	10
12.5 – 20.5	20
20.5 – 28.5	27
28.5 – 36.5	25
36.5 – 44.5	7
44.5 – 52.5	14

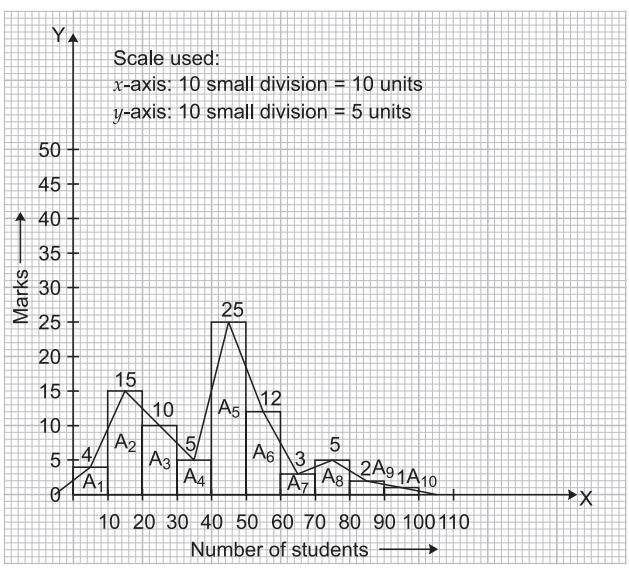
The required histogram is drawn below.



22. Draw a histogram and a frequency polygon for the following data:

Marks	*Number of students*
0 – 10	4
10 – 20	15
20 – 30	10
30 – 40	5
40 – 50	25
50 – 60	12
60 – 70	3
70 – 80	5
80 – 90	2
90 – 100	1

Sol.



$\therefore$ $A_0A_1A_2A_3A_4A_5A_6A_7A_8A_9A_{10}A_{11}A_0$ is the required frequency polygon.

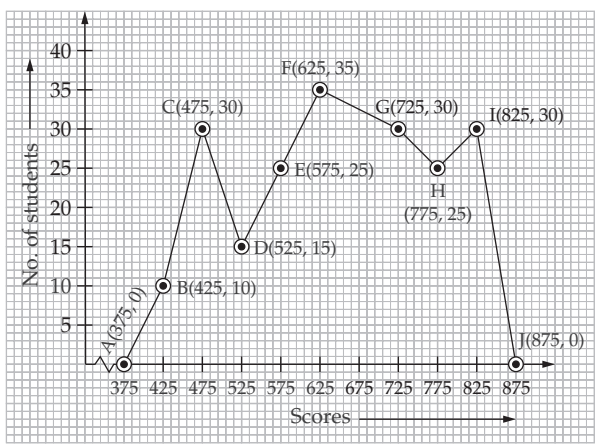
23. Draw a frequency polygon (without using a histogram) for the scores of 200 students in a test as given below.

Scores	*No. of students*
400 – 450	10
450 – 500	30
500 – 550	15
550 – 600	25
600 – 650	35
700 – 750	30
750 – 800	25
800 – 850	30
	Total 200

Sol. We take two imaginary class intervals namely 350 – 400 at the beginning and 850 – 900 at the end, each with zero frequency. We get the following frequency distribution table.

Scores	*Class marks*	*No. of students*
350 – 400	375	0
400 – 450	425	10
450 – 500	475	30
500 – 550	525	15
550 – 600	575	25
600 – 650	625	35
700 – 750	725	30
750 – 800	775	25
800 – 850	825	30
850 – 900	875	0

The frequency polygon ABCDEFGHIJ is drawn below.



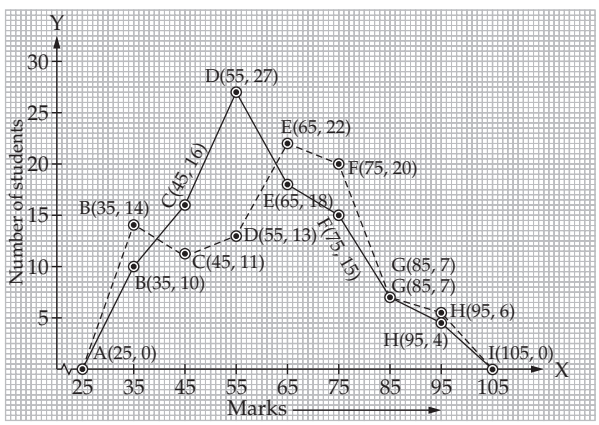
24. The marks obtained by students of two sections A and B of class 9 in a school are given below.

Marks	*Numbers of students*	
	Section A	*Section B*
30 – 40	10	14
40 – 50	16	11
50 – 60	27	13
60 – 70	18	22
70 – 80	15	20
80 – 90	7	7
90 – 100	4	6

Draw a frequency polygon, without drawing a histogram, for each of two sections on the same axes.

Sol.

Marks	*Class marks*	*Numbers of students*	
		Section A	*Section B*
30 – 40	35	10	14
40 – 50	45	16	11
50 – 60	55	27	13
60 – 70	65	18	22
70 – 80	75	15	20
80 – 90	85	7	7
90 – 100	95	4	6



ABCDEFGHI is the frequency polygon for Section A and AB′C′D′E′F′G′H′I is the frequency polygon for Section B.

Let's Compete

(Page 179)

Multiple-Choice Questions

1. If the class marks of four successive classes in a grouped frequency distribution are 63, 68, 73 and 78, then the class size and the class in which the observation 65.5 lies are respectively

(*a*) 5 and 65.5 – 70.5 (*b*) 10 and 60.5 – 70.5

(*c*) 5 and 63.5 – 68.5 (*d*) 10 and 65.5 – 75.5

Sol. (*a*) 5 and 65.5 – 70.5

Let the four successive classes be $x_1 - x_2$, $x_2 - x_3$, $x_3 - x_4$ and $x_4 - x_5$.

$\therefore$ Their respective class marks are

$$d_1 = \frac{x_1 + x_2}{2} = 63,\ d_2 = \frac{x_2 + x_3}{2} = 68,$$

$$d_3 = \frac{x_3 + x_4}{2} = 73 \text{ and } d_4 = \frac{x_4 + x_5}{2} = 78$$

$\therefore$ $x_1 + x_2 = 126$ …(1)

$x_2 + x_3 = 136$ …(2)

$x_3 + x_4 = 146$ …(3)

and $x_4 + x_5 = 156$ …(4)

Also, $x_2 - x_1 = d_2 - d_1 = 68 - 63 = 5$ …(1′)

$x_3 - x_2 = 5$ …(2′)

$x_4 - x_3 = 5$ …(3′)

$x_5 - x_4 = 5$ …(4′)

From (1) and (1′), we have

$$x_2 = \frac{126 + 5}{2} = \frac{131}{2} = 65.5 \text{ and } x_1 = 60.5$$

From (2) and (2′), we have

$$x_3 = \frac{136 + 5}{2} = \frac{141}{2} = 70.5 \text{ and } x_4 = 75.5$$

From (3) and (3′), we have

$$x_4 = \frac{146 + 5}{2} = \frac{151}{2} = 75.5 \text{ and } x_5 = 80.5$$

From (4) and (4′), we have

$$x_5 = \frac{156 + 5}{2} = \frac{161}{2} = 80.5 \text{ and } x_6 = 85.5$$

Now, the observation 65.5 lies in the class 65.5 – 70.5, i.e. in $x_2 - x_3$.

2. In a bar graph, the widths of bars

(*a*) have no significance.

(*b*) are proportional to the corresponding heights.

(*c*) are proportional to the corresponding frequencies.

(*d*) are proportional to the space between two consecutive bars.

Sol. (*a*) have no significance.

3. For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequency of respective classes and abscissae are respectively

(*a*) lower limits of the classes

(*b*) upper limits of the classes

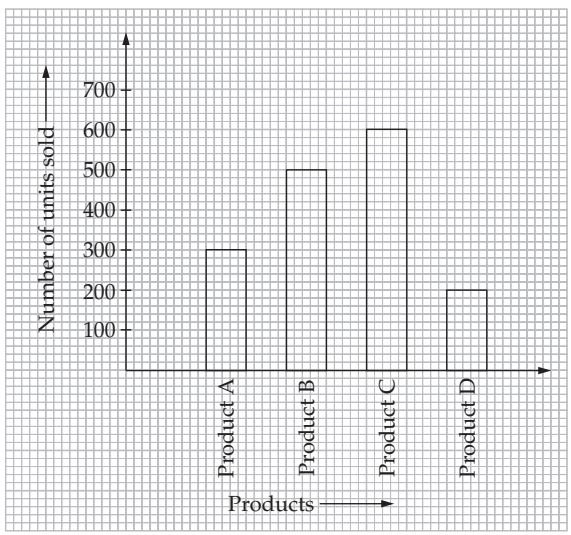
(*c*) class marks of the classes

(*d*) upper limits of the preceding classes

Sol. (*c*) class marks of the classes

We know that the respective abscissa of the points of frequency polygon are the class marks of the classes.

4. The bar graph 1 shows the sales of different products in a particular month in a departmental store.



Bar graph 1

What is the total number of units sold by all the products in the departmental store?

(*a*) 500 (*b*) 800

(*c*) 1000 (*d*) 1600

Sol. (*d*) 1600

Total Number of units sold

$= 300 + 500 + 600 + 200 = 1600$

5. In bar graph 1, which is the best-selling product and how many more units it sells than the product that sells the least.

(*a*) Product A : 100 units

(*b*) Product B : 200 units

(*c*) Product C : 300 units

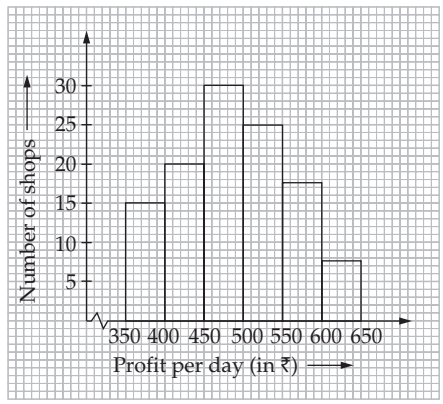
(*d*) Product C : 400 units

Sol. (*d*) Product C: 400 units

Best selling product is product C, 600 units.

Product D sells the least and sells only 200 units.

6. The histogram given below shows the daily profit (in ₹) of 115 shops in the market.



Which of the following is correct according to the histogram?

(*a*) The number of shops having profit between ₹ 400 – ₹ 450 per day in 25.

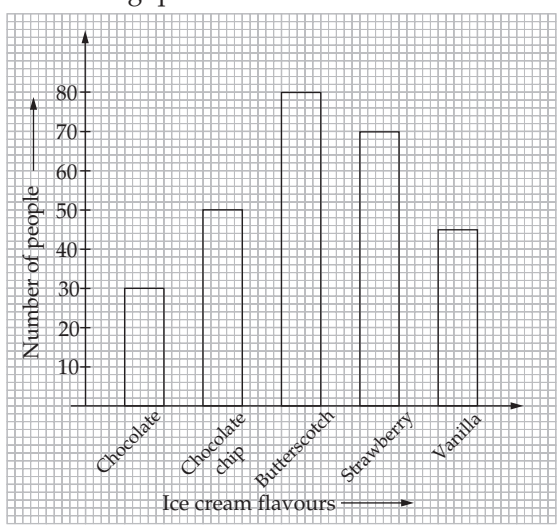
(*b*) The number of shops having profit between ₹ 350 – ₹ 400 per day is 20.

(*c*) The number of shops having profit between ₹ 550 – ₹ 600 per day is 18.

(*d*) The number of shops having profit between ₹ 500 – ₹ 550 per day is 30.

Sol. (*c*) The number of shops having profit between ₹ 550 – ₹ 600 per day is 18.

7. In a sample survey, an ice cream making company took feedback on preferred ice cream flavours. Study the bar graph and answer the following questions.



Bar graph 2

How many people prefer butterscotch over vanilla flavour in ice creams?

(*a*) 35 (*b*) 45

(*c*) 80 (*d*) 30

Sol. (*a*) 35

8. From bar graph 2, find the total number of people who participated in the sample survey.

(*a*) 160 (*b*) 230

(*c*) 275 (*d*) 300

Sol. (*c*) 275

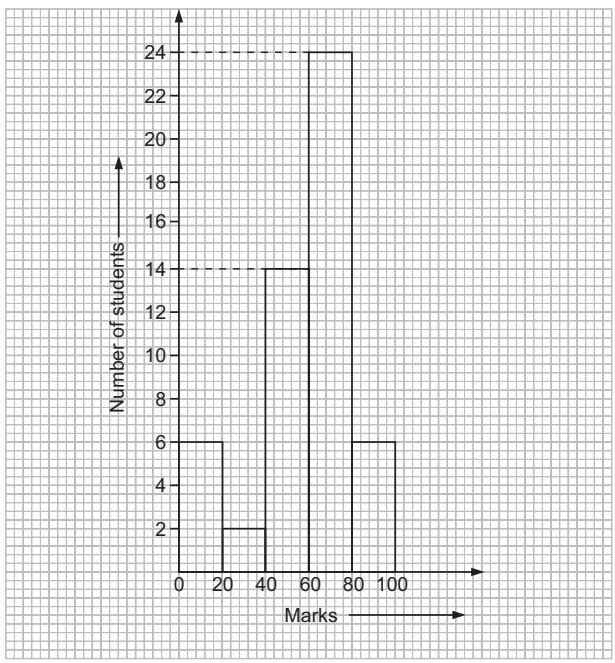
Total number of people who participated in the sample survey

$$= 30 + 50 + 80 + 70 + 45 = 275$$

9. In the given graph, the number of students who scored 40 and more than 40 marks is

(*a*) 30 (*b*) 44

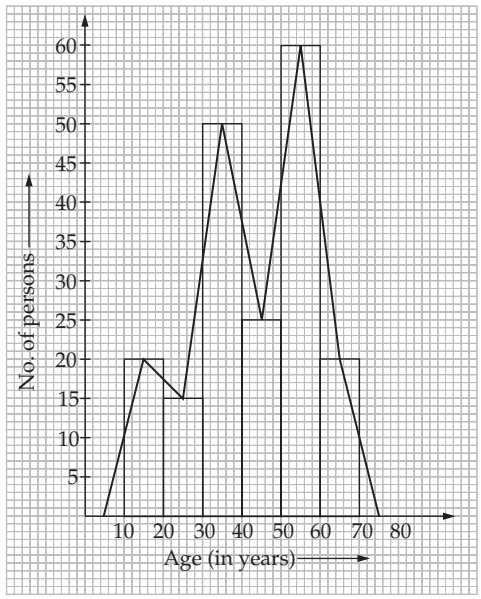
(*c*) 24 (*d*) 38



Sol. (*b*) 44

From the graph, we see that 14 students marks lie between 40 and 60, 24 students marks lie between 60 and 80 and 6 students marks lie between 80 and 100. Hence, the required number of students whose marks is greater than and equal to 40 is 14 + 24 + 6 = 44.

10. The frequency polygon given below shows the number of person in different age groups.



Which of these is not true about the frequency polygon?

(*a*) The maximum number of persons is in the age group 50 – 60 years.

(*b*) The total number of persons in the age group 10 to 30 years is 40.

(*c*) The total number of persons surveyed is 200.

(*d*) The total number of persons in the age group 30 to 60 years is 135.

Sol. (*b*) and (*c*)

Life Skills

(Page 181)

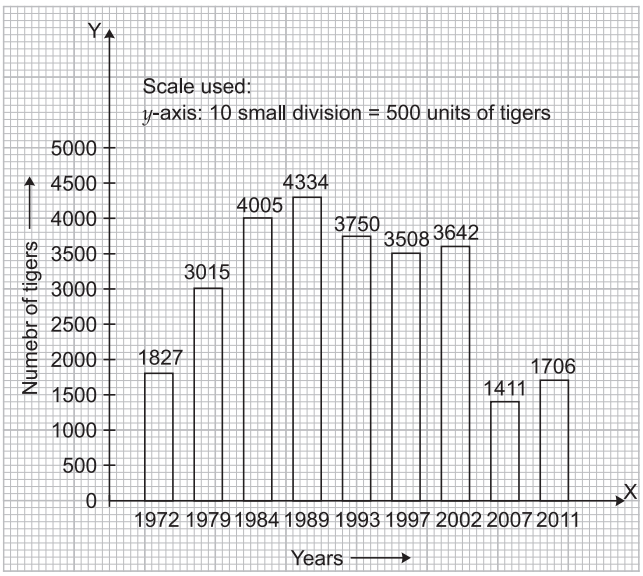
1. The following table gives the population of tigers in India.

Year	*Number of tigers*
1972	1827
1979	3015
1984	4005
1989	4334
1993	3750
1997	3508
2002	3642
2007	1411
2011	1706

(*a*) Represent the above data by a bar graph.

(*b*) What steps do you think helped to stop the decline of tiger population from 2007 to 2011?

Sol. (*a*) The required bar graph is as follows:



A bar graph showing the number of tigers in different years.

(*b*) Creating awareness and educating people about the significance of tigers and discouraging poaching.

2. A social organisation decided to build up a clinic in a small village that has no healthcare facilities. They conducted a census to collect information about the ages of people living in that village and recorded the following data.

Age (in years)	*Frequency (number of people)*
0–10	12
10–20	40
20–30	50
30–40	28
40–50	50
50–60	30
60–70	15
70–80	10

(*a*) Draw a histogram for the above frequency table. From the histogram answer the following questions:

(*b*) What is the total population of the village?

(*c*) How many people are 50 years or more than 50 years old?

Sol. (*a*) The required histogram for the given frequency table is shown below:

(*b*) Required total population of the village is

12 + 40 + 50 + 28 + 50 + 30 + 15 + 10 = 235

(*c*) Required number of people who are more than or equal to 50 years old

= 30 + 15 + 10

= 55