Unit 7
Statistics

Chapter 27
Graphical Representation of Statistical Data

POINTS TO REMEMBER

1. **Graphical Representation of Data**

The tabular representation of data is an ideal way of presenting them in a systematic manner. When these numerical figures are represented pictorially or graphically they become more noticeable and easily intelligible. With the help of these pictures or graphs, data can be compared easily.

In this chapter, we shall deal with three types of graphs, namely.

(i) Histogram (ii) Frequency Polygon (iii) Cumulative Frequency Curve or Ogive.

(A) HISTOGRAM

A histogram is a graphical representation of a frequency distribution in an exclusive form (i.e. in continuous form), in the form of rectangles with class-intervals as bases and the corresponding frequencies as heights, there being no gap between any two successive rectangles.

Method of Drawing a Histogram

Step 1. If the given frequency distribution is in inclusive form, convert it into an exclusive form.

Step 2. Taking suitable scales, mark the class-intervals on x-axis and frequencies on y-axis. Note that the scales chosen for both the axes need not be the same.

Step 3. Construct rectangles with class-intervals as bases and the corresponding frequencies as heights.

(B) FREQUENCY POLYGON

Let $x_1, x_2, x_3, ...x_n$ be the class marks (i.e. mid-points) of the given frequency distribution and let $f_1, f_2, f_3, ..., f_n$ be the corresponding frequencies. We plot the points $(x_1, f_1), (x_2, f_2), (x_3, f_3) ....., (x_n, f_n)$ on a graph paper and join these points by line segments. We complete the diagram in the form of a polygon by taking two more classes (called imagined classes), one at the beginning and the other at the end.

This polygon is known as the frequency polygon of the given frequency distribution.

Method of Drawing A Frequency Polygon

Steps :

(i) Calculate the class marks $x_1, x_2, x_3, ..., x_n$ of the given class intervals.

(ii) Mark $x_1, x_2, x_3, ..., x_n$ along the x-axis on some suitable scale.

(iii) Mark the frequencies $f_1, f_2, f_3, ..., f_n$ along the y-axis on some suitable scale.

(iv) Join the points $(x_1, f_2), (x_2, f_2), (x_3, f_3), ..., (x_n, f_n)$ by line segments.

Arundeep's Foundation Math-X

(v) Take two class intervals each of frequency zero, one at the beginning and the other at the end of the frequency table, find their class marks. (These classes are imagined classes.)

(vi) Join the mid-point of the first class interval to the mid-point of the imagined class at the beginning. Also join the mid-point of the last class interval to the mid-point of the imagined class at the end.

C) CUMULATIVE FREQUENCY CURVE OR OGIVE

In order to represent a frequency distribution by an ogive, we mark the upper-class limits along *x*-axis and the corresponding cumulative frequencies along *y*-axis and join these points by a free hand curve, called an ogive. To complete the ogive, we plot the lower limit of first class interval on *x*-axis and join this point with first point of the curve.

Method of Drawing an Ogive
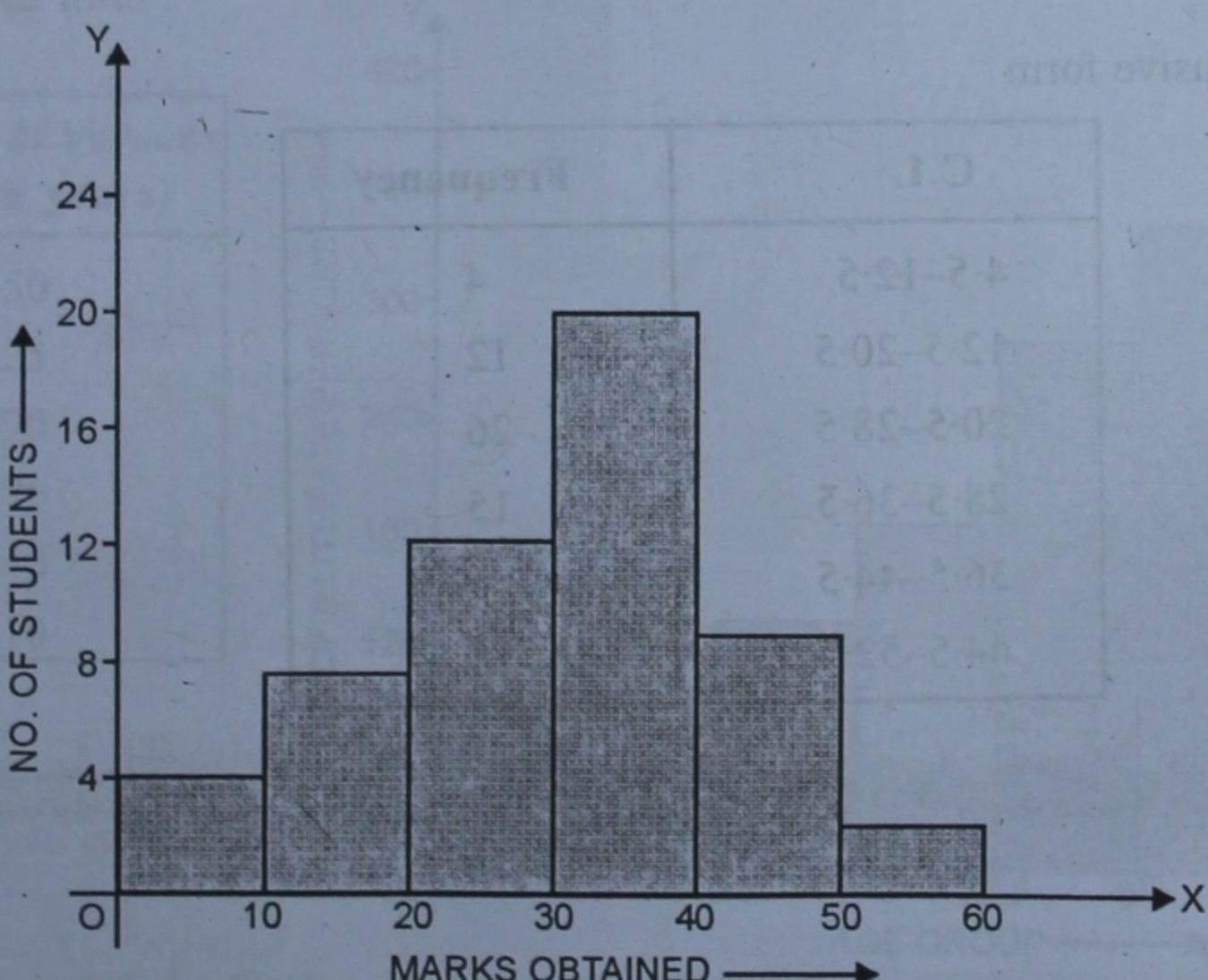
Step 1. If the given frequency distribution is in inclusive form, then convert it to an exclusive form.

Step 2. Prepare the cumulative frequency table.

Step 3. Mark the upper-limits of class-intervals along *x*-axis and their corresponding cumulative frequencies along *y*-axis.

Step 4. Also, plot the lower-limit of first class-interval with cumulative frequency 0.

Step 5. Join these points by a free hand curve to obtain the required ogive.

EXERCISE 27

Q.1. Draw a histogram to represent the following data :

Marks obtained	0–10	10–20	20–30	30–40	40–50	50–60
No. of students	4	7	12	20	9	2

Sol. We take marks obtained on *x*-axis and no. of students on *y*-axis. Histogram of the given data is given below :
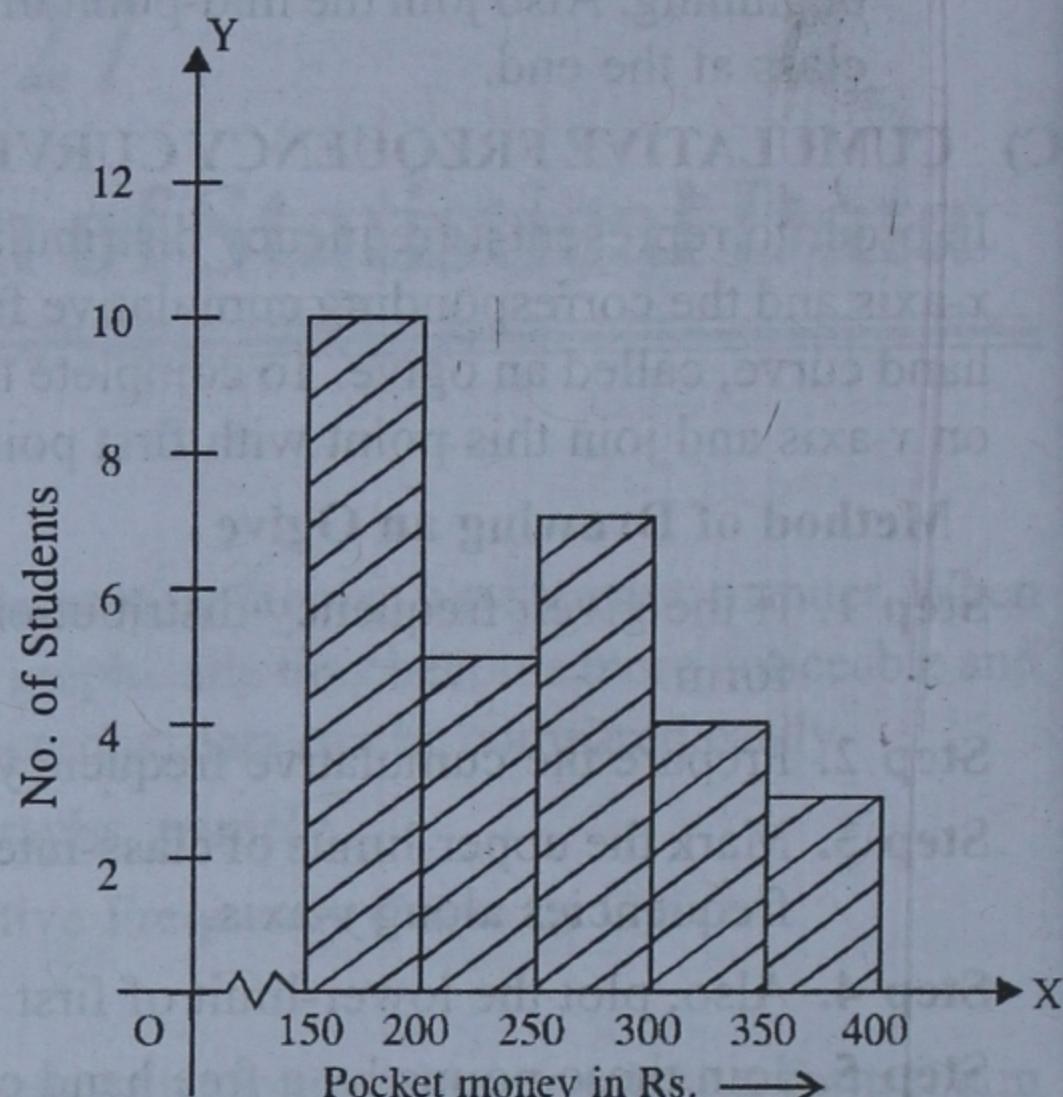
Q. 2. Draw a histogram to represent the following data :   **(2005)**

Pocket money in Rs.	No. of Students
150-200	10
200-250	5
250-300	7
300-350	4
350-400	3

Sol.

Pocket money in Rs.	No. of students
150-200	10
200-250	5
250-300	7
300-350	4
350-400	3

Histogram is given along side :
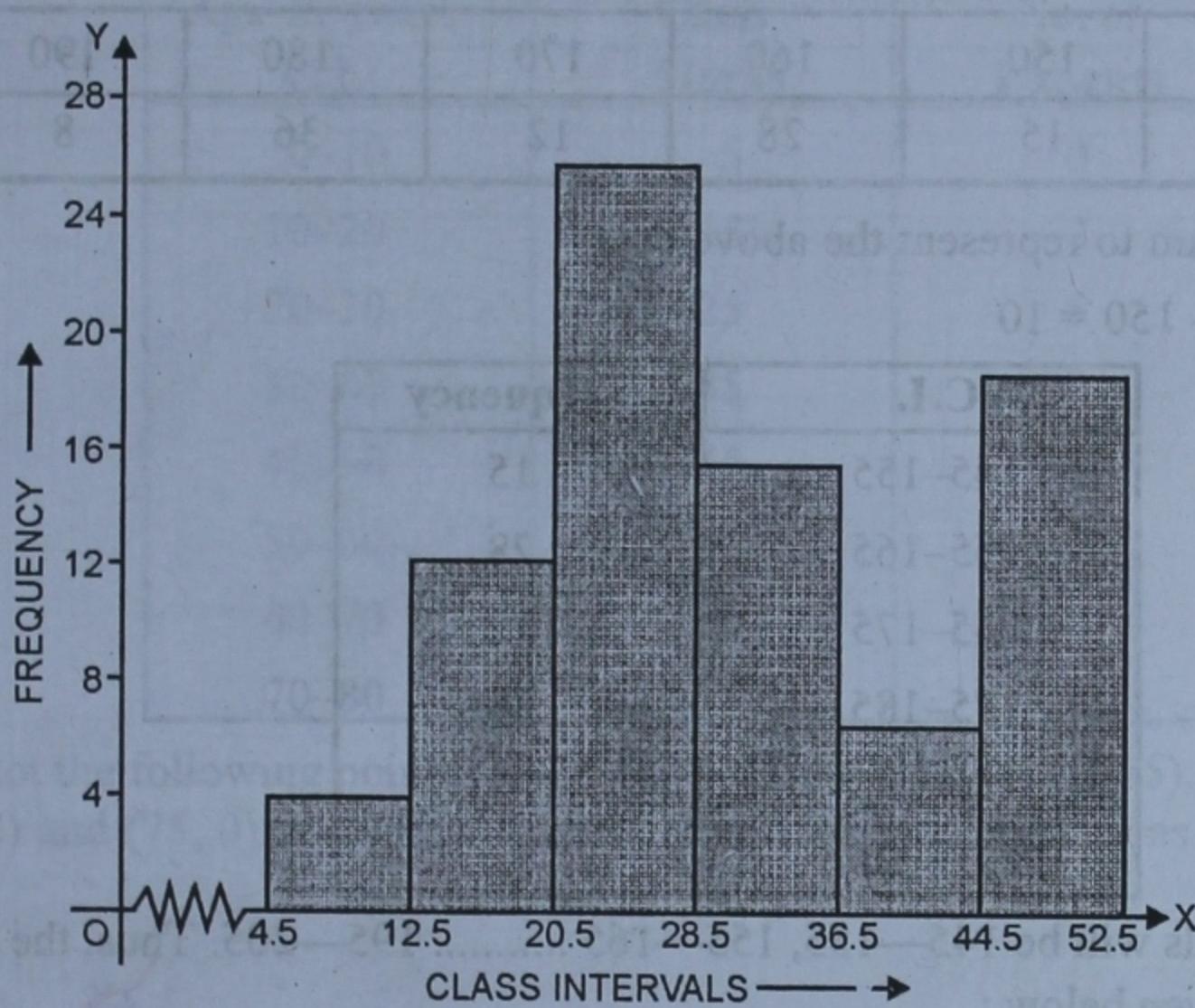
Q.3. Construct a histogram for the following frequency distribution :

Class-interval	5–12	13–20	21–28	29–36	37–44	45–52
Frequency	4	12	26	15	6	18

Sol. We write the given class intervals in exclusive form and then we will draw the histogram given below :

Data in exclusive form

C.I.	Frequency
4·5–12·5	4
12·5–20·5	12
20·5–28·5	26
28·5–36·5	15
36·5–44·5	6
44·5–52·5	18

Q.4. The following table shows the number of illiterate persons in the age group (10–69) in a town:
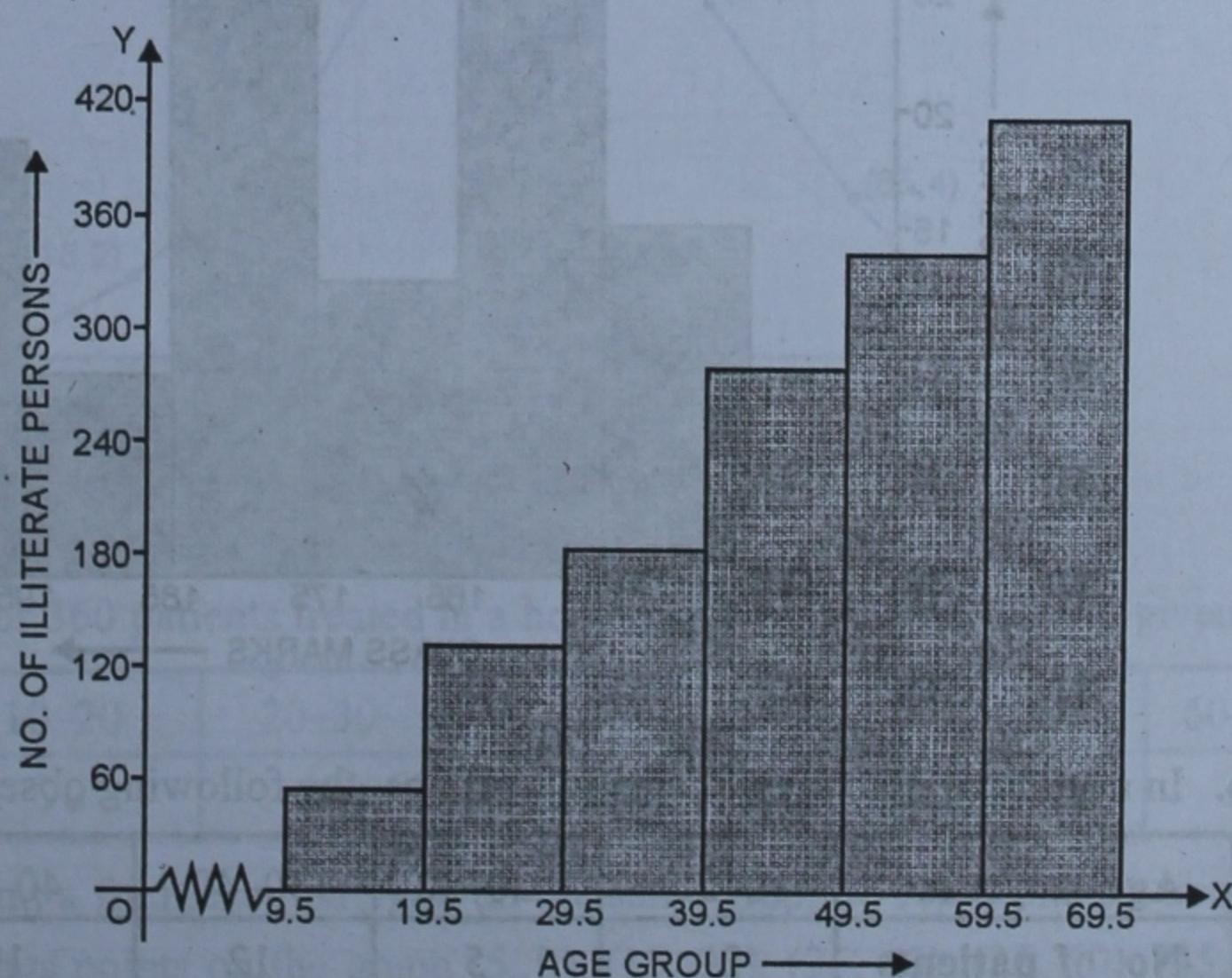
Age-group (in years)	10–19	20–29	30–39	40–49	50–59	60–69
Number of illiterate persons	50	125	190	275	340	410

Draw a histogram to represent the above data.

Sol. We write the data in exclusive form and then represent it in histogram as given below :

In exclusive form

Age group (in years)	No. of Persons
9·5–19·5	50
19·5–29·5	125
29·5–39·5	190
39·5–49·5	275
49·5–59·5	340
59·5–69·5	410

Q.5. Draw a histogram to represent the following data :
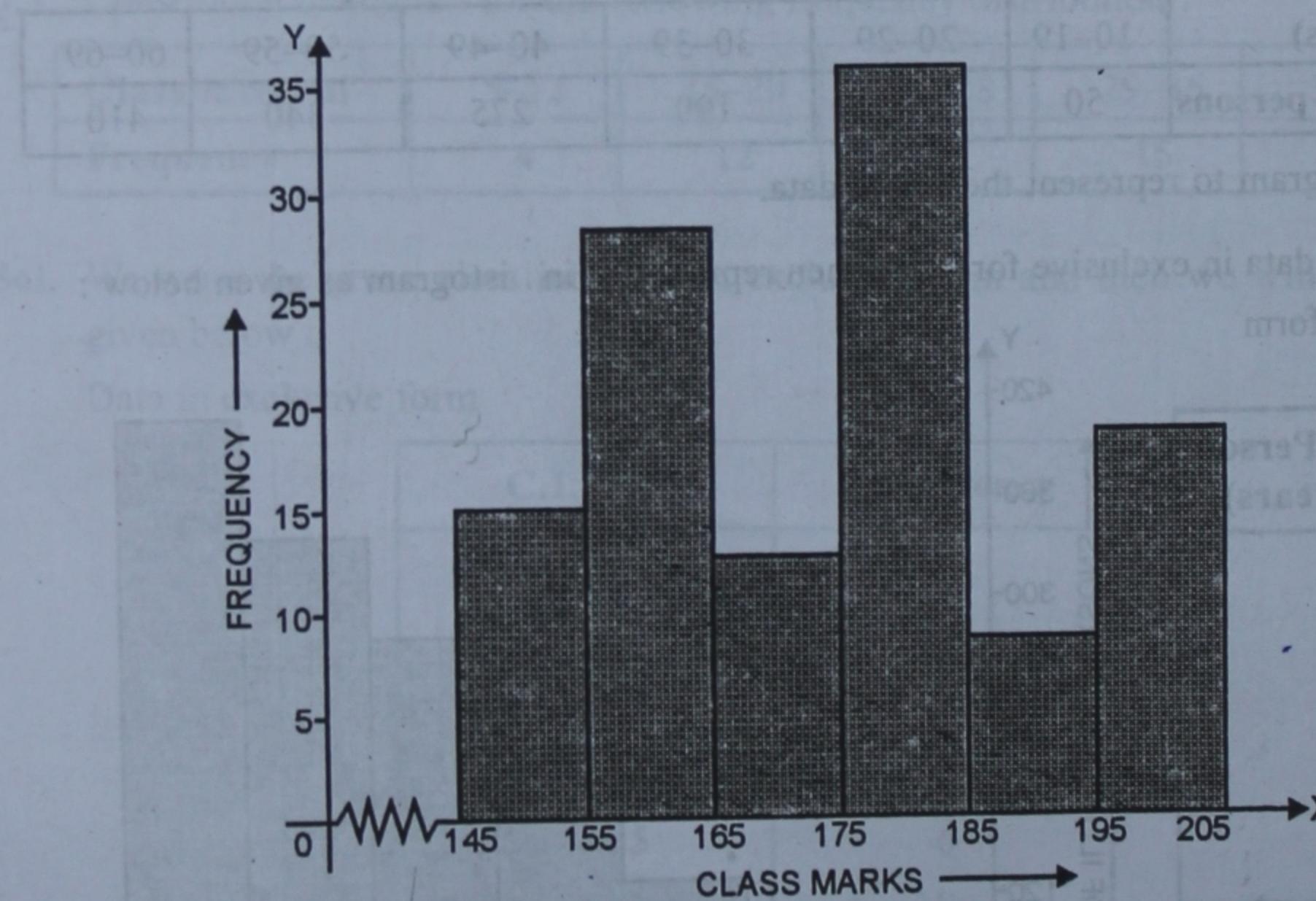
Class-Mark	150	160	170	180	190	200
Frequency	15	28	12	36	8	18

Draw a histogram to represent the above data.

Sol. Here, $h = 160 - 150 = 10$

C.I.	Frequency
145–155	15
155–165	28
165–175	12
175–185	36
185–195	8
195–205	18

∴ Class intervals will be 145—155, 155—165 .... 195—205. Thus, the histogram of the given data is given below :

**Q.6.** In a study of diabetic patients in a village, the following observations were noted :
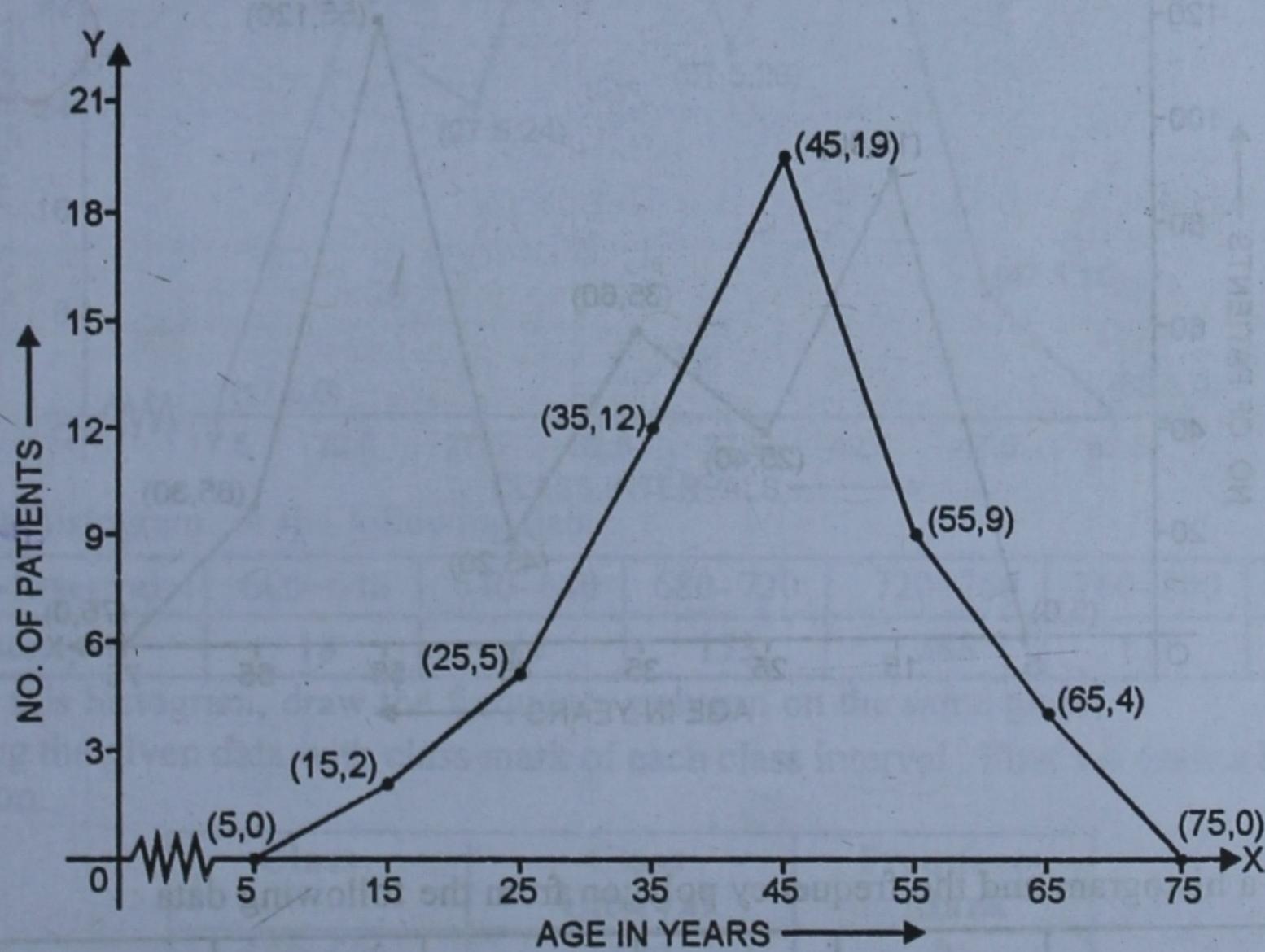
Age in years	10–20	20–30	30–40	40–50	50–60	60–70
No. of patients	2	5	12	19	9	4

Represent the above data by a frequency polygon.

Sol. Represent the above data by a frequency polygon.

Age in years C.I.	Class Marks	No. of Patients
0–10	5	0
10–20	15	2
20–30	25	5
30–40	35	12
40–50	45	19
50–60	55	9
60–70	65	4
70–80	75	0

We plot the following points on the graph : (5, 0), (15, 2), (25, 5), (35, 12), (45, 19), (55, 9), (65, 4) and (75, 0) and join them to form a frequency polygon as given below :
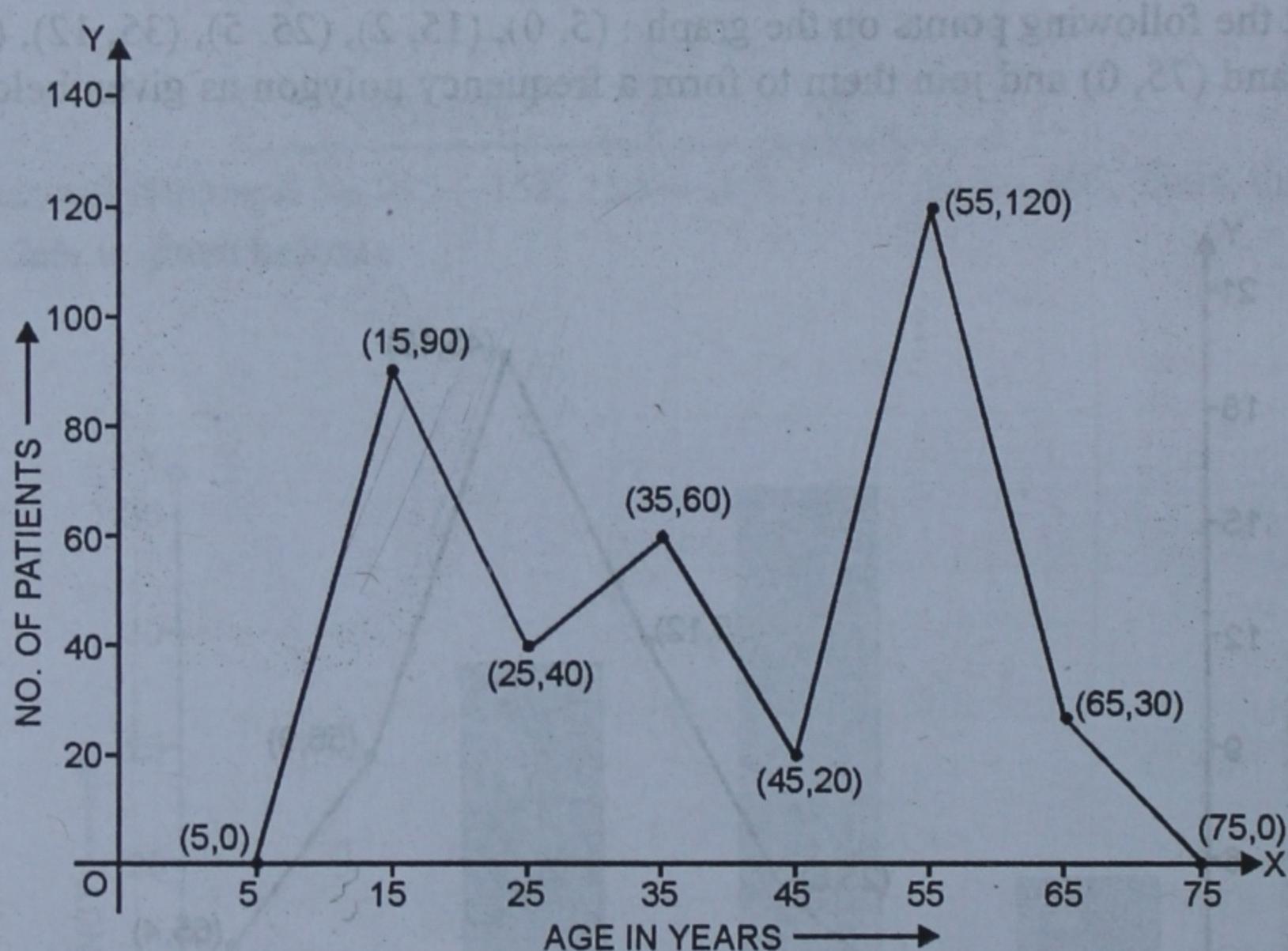

Q.7. The ages (in years) of 360 patients treated in a hospital on a particular day are given below :

Age in years	10–20	20–30	30–40	40–50	50–60	60–70
No. of patients	90	40	60	20	120	30

Draw a histogram and a frequency polygon on the same graph to represent the above data.

Sol. We plot the followings points on the graph (5, 0), (15, 90), (25, 40), (35, 60), (45, 20), (55, 120), (65, 30) and (75, 0) and join them to form the frequency polygon :

Age in year	Class Marks	No. of Patients
0–10	5	0
10–20	15	90
20–30	25	40
30–40	35	60
40–50	45	20
50–60	55	120
60–70	65	30
70–80	75	0
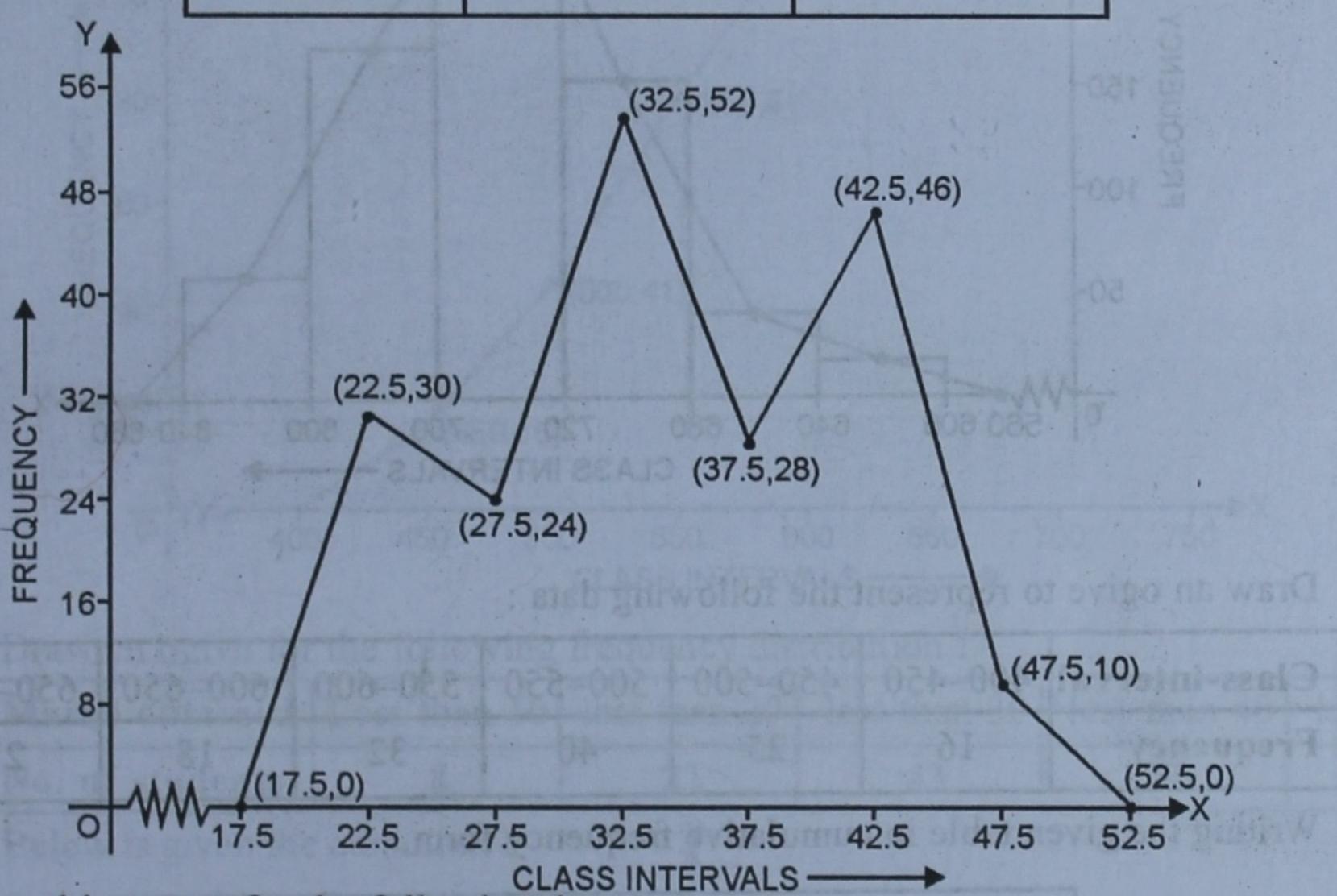
Q.8. Draw a histogram and the frequency polygon from the following data : ˙

Class-interval	20–25	25–30	30–35	35–40	40–45	45–50
Frequency	30	24	52	28	46	10

Sol. We plot the following points on the graph.

(17·5, 0), (22·5, 30), (27·5, 4, 24), (32·5, 52), (37·5, 28), (42·5, 46), (47·5, 10) and (52·5, 0) and join them to form a frequency polygon :

C.I. Marks	Class	Frequency
15–20	17·5	0
20–25	22·5	30
25–30	27·5	24
30–35	32·5	52
35–40	37·5	28
40–45	42·5	46
45–50	47·5	10
50–55	52·5	0

Q.9. Draw a histogram for the following data :
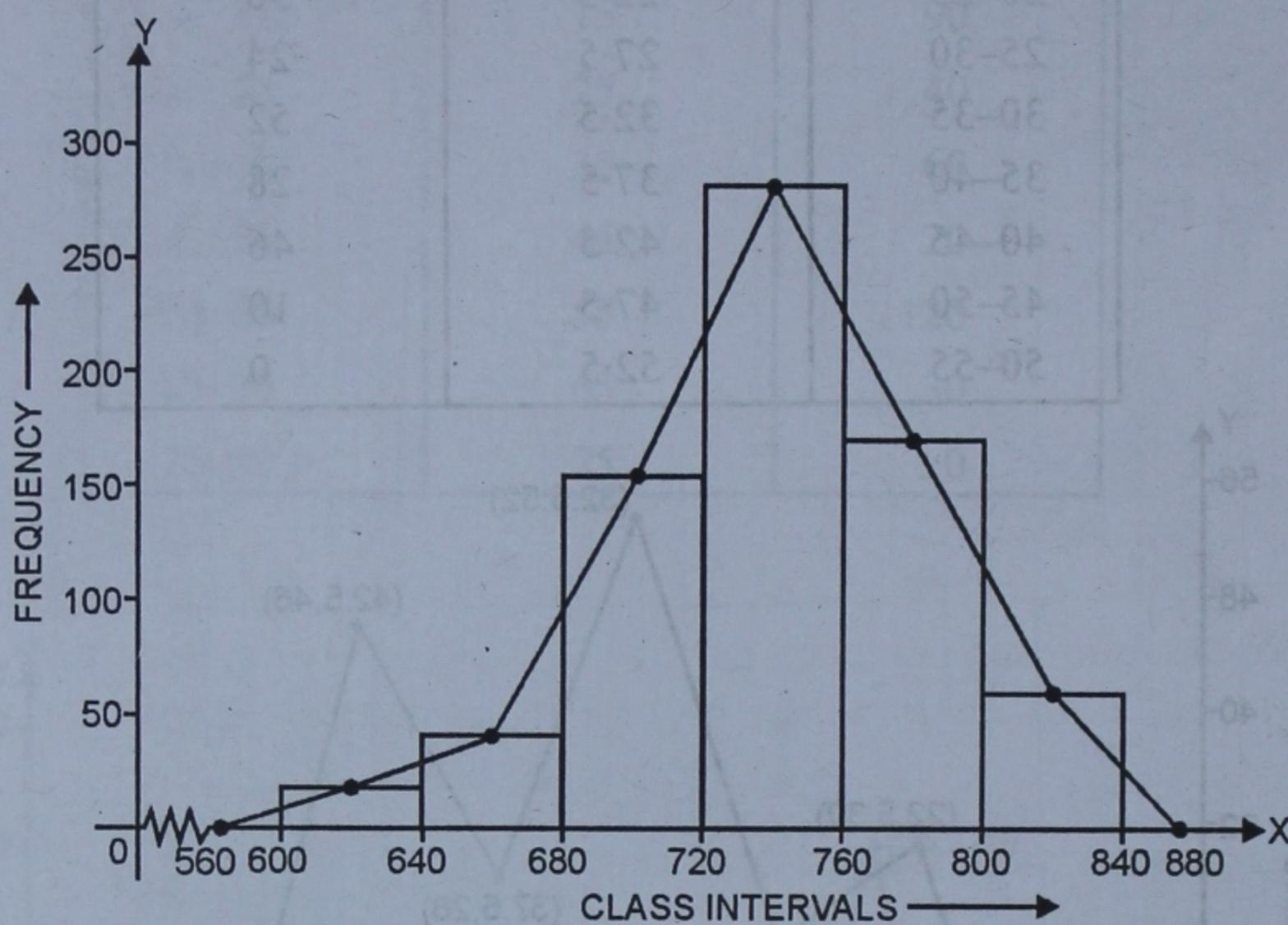
Class-Interval :	600–640	640–680	680–720	720–760	760–800	800–840
Frequency :	18	45	153	288	171	63

Using this histogram, draw the frequency polygon on the same graph.

Sol. Writing the given data with class mark of each class interval : First we draw a histogram, then polygon.

Class	Class Interval	Frequency Mark
560–600	580	0
600–640	620	18
640–680	660	45
680–720	700	153
720–760	740	288
760–800	780	171
800–840	820	63
840–880	860	0

Now, plotting the mid-points given below on the graph and join them to get a polygon as shown in the given figure.
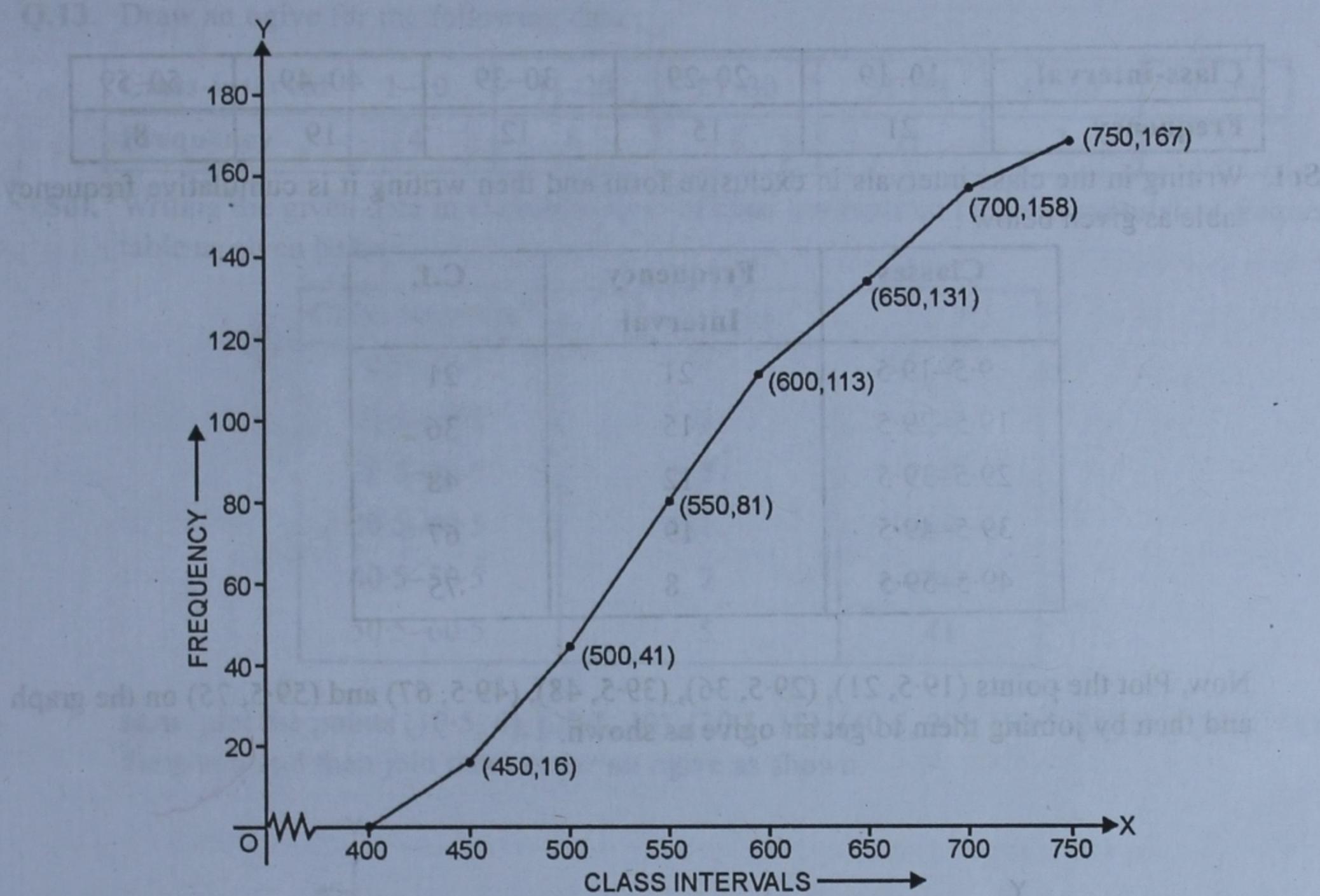

Q.10. Draw an ogive to represent the following data :

Class-interval	400–450	450–500	500–550	550–600	600–650	650–700	700–750
Frequency	16	25	40	32	18	27	9

Sol. Writing the given table in cumulative frequency form,

Class	Frequency Interval	Cumulative frequency
400–450	16	16
450–500	25	41
500–550	40	81
550–600	32	113
600–650	18	131
650–700	27	158
700–750	9	167
	Total	167

Now, plot the points (450, 16), (500, 41), (550, 81), (600, 113), (650, 131), (700, 158) and (750, 167) on the graph and join them in free hand to get an ogive as shown in the figure

Q.11. Draw an ogive for the following frequency distribution :
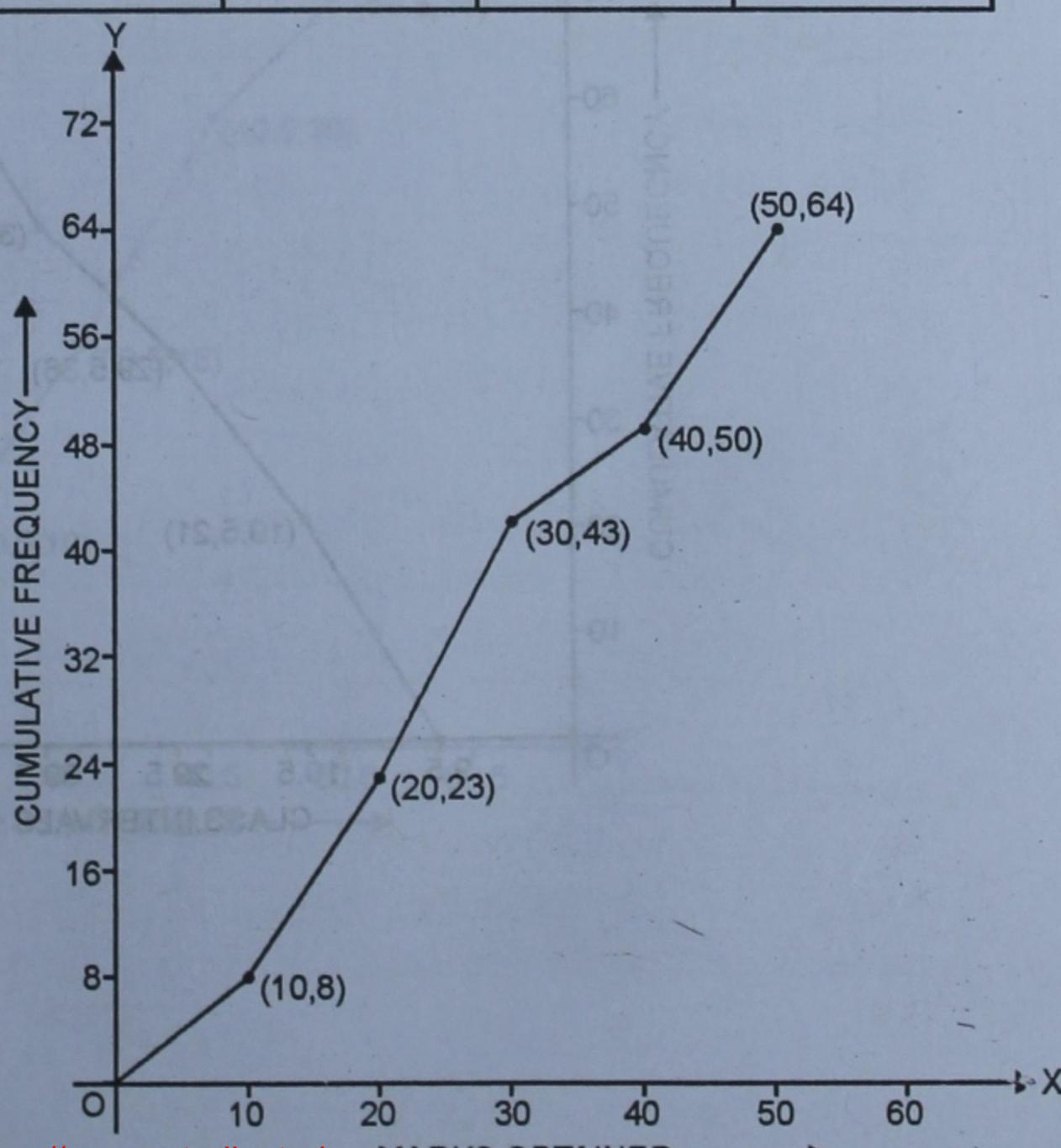
Marks obtained	Less than 10	less than 20	less than 30	less than 40	less than 50
No. of students	8	23	43	50	64

Sol. Below is given the cumulative frequency table :

Marks	Classes Obtained	C.f.
Less than 10	0–10	8
Less than 20	10–20	23
Less than 30	20–30	43
Less than 40	30–40	50
Less than 50	40–50	64

Plot the point (10, 8), (20, 23),(30, 43), (40, 50) and (50, 64) on the graph and join them to form an ogive.

Q.12. Draw an ogive for the following frequency distribution :
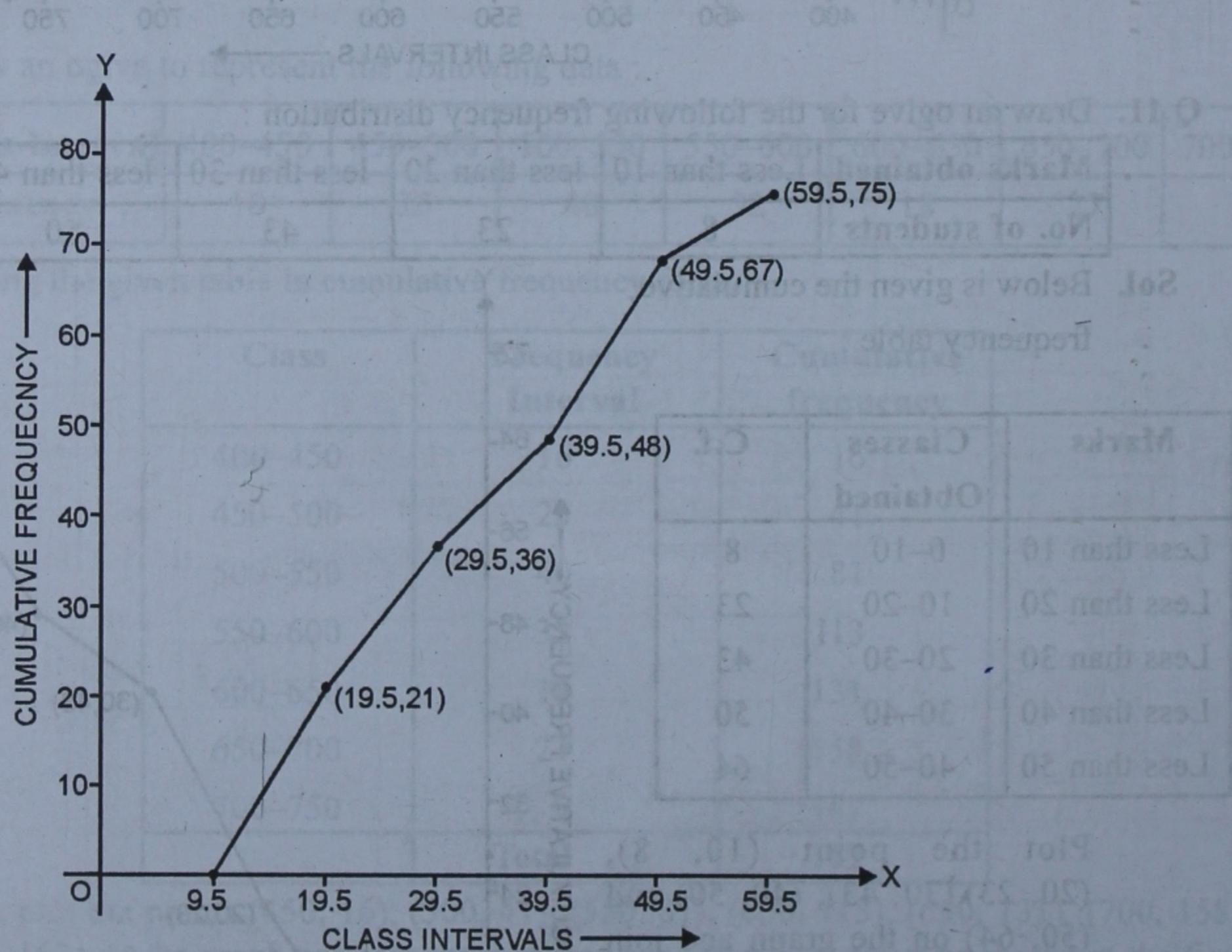
Class-interval	10–19	20–29	30–39	40–49	50–59
Frequency	21	15	12	19	8

Sol. Writing in the class intervals in exclusive form and then writing it is cumulative frequency table as given below :

Classes	Frequency Interval	C.f.
9·5–19·5	21	21
19·5–29·5	15	36
29·5–39·5	12	48
39·5–49·5	19	67
49·5–59·5	8	75

Now, Plot the points (19·5, 21), (29·5, 36), (39·5, 48), (49·5, 67) and (59·5, 75) on the graph and then by joining them to get an ogive as shown.

Q.13. Draw an ogive for the following data :

Class-interval	1–10	11–20	21–30	31–40	41–50	51–60
Frequency	4	6	8	11	7	5

Sol. Writing the given data in exclusive form of class intervals and then in cumulative frequency table as given below :

Class-Interval	Frequency	C.F.
0·5–10·5	4	4
10·5–20·5	6	10
20·5–30·5	8	18
30·5–40·5	11	29
40·5–50·5	7	36
50·5–60·5	5	41

Now, plot the points (10·5, 4), (20·5, 10), (30·5, 18), (40·5, 29), (50·5, 36) and (60·5, 41) on the graph and then join them to get an ogive as shown.