Chapter 18. Statistics

Exercise 18(A)

Solution 1:
(a) Discrete variable.
(b) Continuous variable.
(c) Discrete variable.
(d) Continuous variable.
(e) Discrete variable.

Solution 2:

The frequency table for the given distribution is

Marks	Tally Marks	Frequency
1 – 10	𝍸	4
11 – 20	𝍸 |||	8
21 – 30	𝍸 |	6
31 – 40	𝍸 |	6
41 – 50	𝍸 |	6

Solution 3:

The frequency table for the given distribution is

Marks	Tally Marks	Frequency
0 – 10	𝍸	4
10 – 20	𝍸 |	6
20 – 30	|||	3
30 – 40	𝍸	4
40 – 50	𝍸 ||	7

In this frequency distribution, the marks 30 are in the class of interval 30 – 40 and not in 20 – 30. Similarly, marks 40 are in the class of interval 40 – 50 and not in 30 – 40.

Solution 4:

(a)Variable.

(b)Discrete variables.

(c)Continuous variable.

(d)The range is $25-6=19$

(e)Lower limit is 35 and upper limit is 46

(f)The class mark is $22-29=\frac{22+29}{2}=\frac{51}{2}=25.5$

Solution 5:

In case of frequency 10 - 19 the lower class limit is 10, upper class limit is 20 and mid-value is $\frac{10+19}{2} = 14.5$

In case of frequency 20 - 29 the lower class limit is 20, upper class limit is 29 and mid-value is $\frac{20+29}{2} = 24.5$

In case of frequency 30 - 39 the lower class limit is 30, upper class limit is 39 and mid-value is $\frac{30+39}{2} = 34.5$

In case of frequency 40 - 49 the lower class limit is 40, upper class limit is 49 and mid-value is $\frac{40+49}{2} = 44.5$

Solution 6:

In case of frequency 1.1 - 2.0 the lower class limit is 1.1, upper class limit is 2.0 and class mark is $\frac{1.1+2.0}{2} = 1.55$

In case of frequency 2.1 - 3.0 the lower class limit is 2.1, upper class limit is 3.0 and class mark is $\frac{2.1+3.0}{2} = 2.55$

In case of frequency 3.1 - 4.0 the lower class limit is 3.1, upper class limit is 4.0 and class mark is $\frac{3.1+4.0}{2} = 3.55$

Solution 7:

(a)

The actual class limit of the fourth class will be:

44.5-49.5.

(b)

The class boundaries of the sixth class will be:

54.5-59.5

(c)

The class mark of the third class will be the average of the lower bound and the upper bound of the interval. Therefore class mark will be:

$\frac{40+44}{2} = 42$

(d)

The upper and lower limit of the fifth class is 54 and 50 respectively.

(e)

The size of the third class will be: 44 - 40 + 1 =5.

Solution 8:

(i)The cumulative frequency distribution table is

C.I	c.f
0 – 8	9
8 – 16	22
16 – 24	34
24 – 32	41
32 – 40	56
40 – 48	62

(ii)The cumulative frequency distribution table is

C.I	c.f
1 – 10	12
11 – 20	30
21 – 30	53
31 – 40	68
41 – 50	78

Solution 9:

(i)The frequency distribution table is

C.I	c.f
10 – 19	8
20 – 29	11
30 – 39	4
40 – 49	7

(ii)The frequency distribution table is

C.I	c.f
5 – 10	18
10 – 15	12
15 – 20	16
20 – 25	27
25 – 30	17

Solution 10:

The frequency table is

C.I	c.f
0 – 10	6
10 – 20	9
20 – 30	15
30 – 40	9
40 – 50	14
50 – 60	17

Solution 11:

The frequency distribution table is

C.I	c.f
4 – 7	85
7 – 10	55
10 – 13	103
13 – 16	57

(i)The number of students in the age group $10-13$ is 103

(ii)The age group which has the least number of students is $7-10$

Solution 12:

Class Interval	Frequency	Cumulative Frequency
25 – 34	15	15
35 – 44	13	28
45 – 54	21	49
55 – 64	16	65
65 – 75	8	73
75 – 84	12	85

Solution 13:

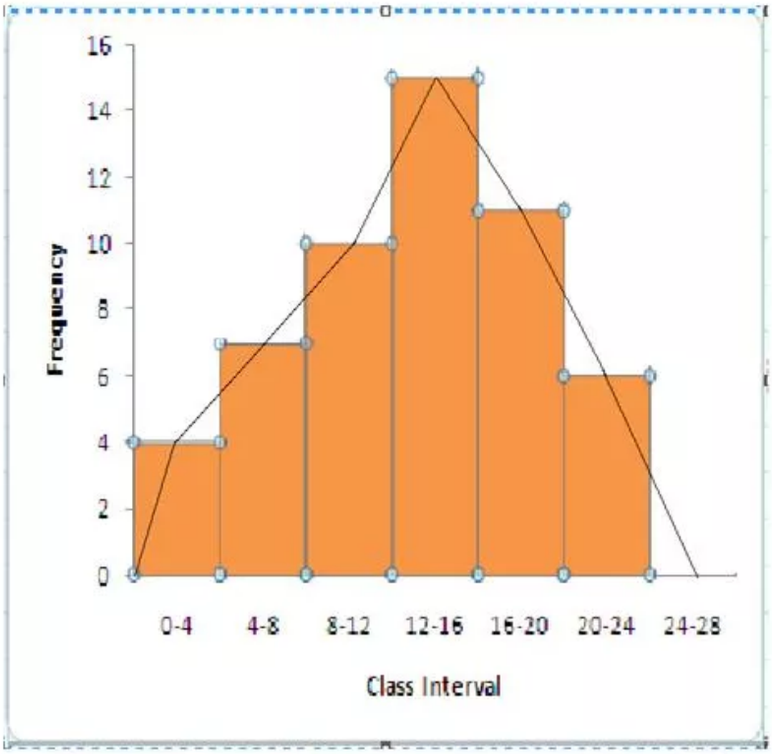
X	0	1	2	3	4	5	6	7	8	9
F	2	5	5	8	4	5	4	4	5	8

Most occurring digits are 3 and 9. Least occurring digits are 0.

Exercise 18(B)

Solution 1:

The frequency polygon is shown in the following figure



Steps:

(i)Drawing a histogram for the given data.

(ii)Marking the mid-point at the top of each rectangle of the histogram drawn.

(iii)Also, marking mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.

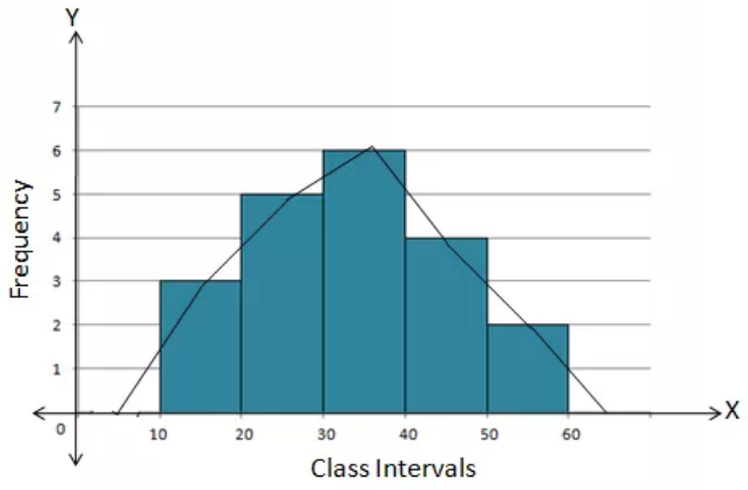
(iv)Joining the consecutive mid-points marked by straight lines to obtain the required frequency polygon.

Solution 2:

Steps:

i. Draw a histogram for the given data.
ii. Mark the mid-point at the top of each rectangle of the histogram drawn.
iii. Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
iv. Join the consecutive mid-points marked by straight lines to obtain the required frequency polygon.

The required combined histogram and frequency polygon is shown in the following figure:



Solution 3:

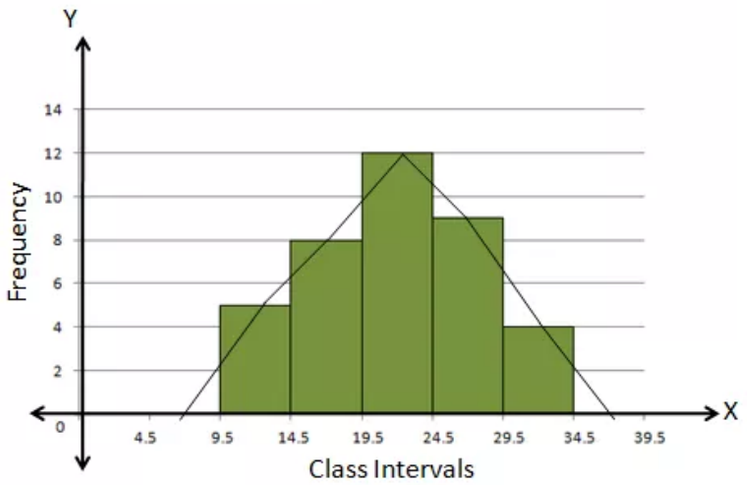
The class intervals are inclusive. We will first convert them into the exclusive form.

Class-Interval	Frequency
9.5 - 14.5	5
14.5 - 19.5	8
19.5 - 24.5	12
24.5 - 29.5	9
29.5 - 34.5	4

Steps:

i. Draw a histogram for the given data.
ii. Mark the mid-point at the top of each rectangle of the histogram drawn.
iii. Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
iv. Join the consecutive mid-points marked by straight lines to obtain the required frequency polygon.

The required frequency polygon is as follows:



Solution 4:

Steps:

i. Draw a histogram for the given data.
ii. Mark the mid-point at the top of each rectangle of the histogram drawn.
iii. Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
iv. Join the consecutive mid-points marked by straight lines to obtain the required frequency polygon.

The required frequency polygon is as follows:

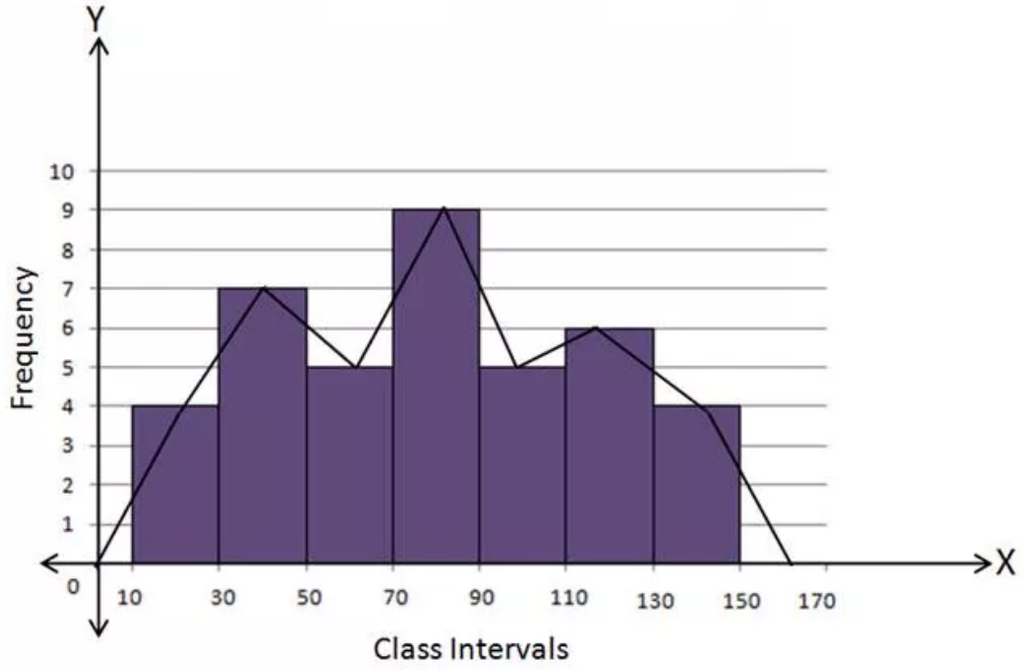
Solution 5(i):

(a) Using Histogram:

C.I.	f
10 - 30	4
30 - 50	7
50 - 70	5
70 - 90	9
90 - 110	5
110 - 130	6
130 - 150	4

Steps:

i. Draw a histogram for the given data.
ii. Mark the mid-point at the top of each rectangle of the histogram drawn.
iii. Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
iv. Join the consecutive mid-points marked by straight lines to obtain the required frequency polygon.



(b) Without using Histogram:

Steps:

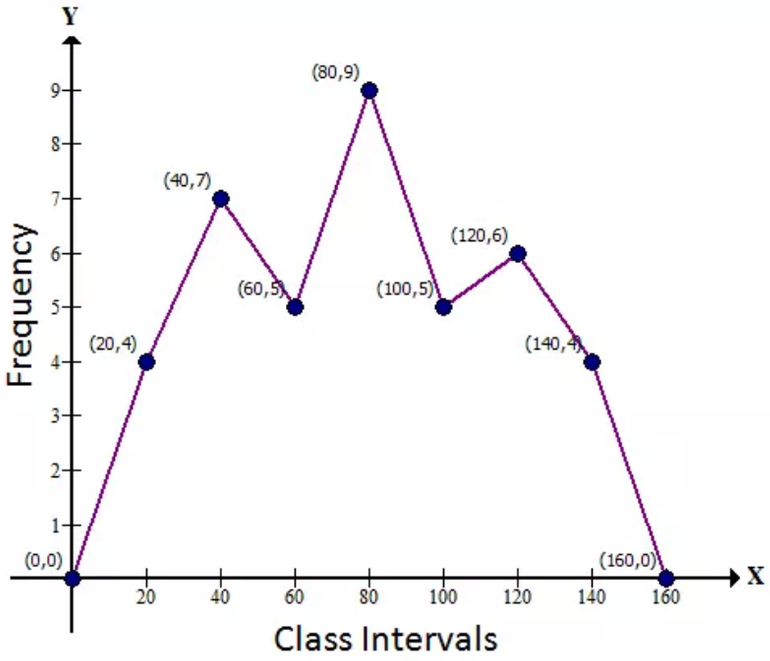
i. Find the class-mark (mid-value) of each given class-interval.

$$\text{Class-mark} = \text{mid-value} = \frac{\text{Upper limit} + \text{Lower limit}}{2}$$

ii. On a graph paper, mark class-marks along X-axis and frequencies along Y-axis.
iii. On this graph paper, mark points taking values of class-marks along X-axis and the values of their corresponding frequencies along Y-axis.

iv. Draw line segments joining the consecutive points marked in step (3) above.

C.I.	Class-mark	f
-10 - 10	0	0
10 - 30	20	4
30 - 50	40	7
50 - 70	60	5
70 - 90	80	9
90 - 110	100	5
110 - 130	120	6
130 - 150	140	4
150 - 170	160	0



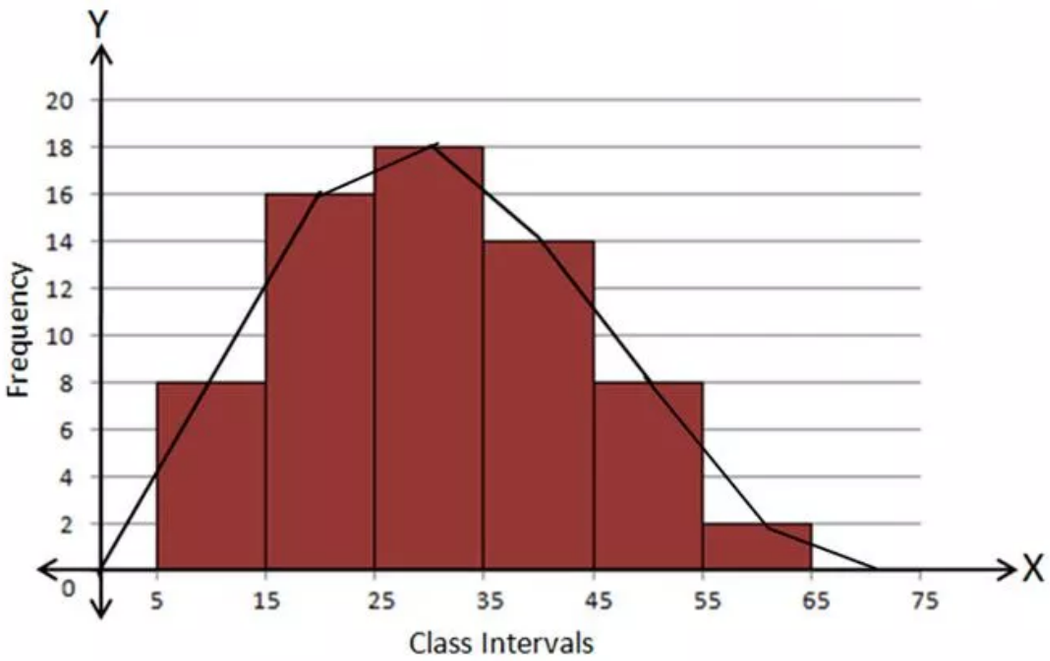
Solution 5(ii):

Using Histogram:

C.I.	f
5 - 15	8
15 - 25	16
25 - 35	18
35 - 45	14
45 - 55	8
55 - 65	2

Steps:

i. Draw a histogram for the given data.
ii. Mark the mid-point at the top of each rectangle of the histogram drawn.
iii. Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
iv. Join the consecutive mid-points marked by straight lines to obtain the required frequency polygon.



Without using Histogram:

Steps:

i. Find the class-mark (mid-value) of each given class-interval.

$$\text{Class}-\text{mark} = \text{mid}-\text{value} = \frac{\text{Upper limit} + \text{Lower limit}}{2}$$

ii. On a graph paper, mark class-marks along X-axis and frequencies along Y-axis.
iii. On this graph paper, mark points taking values of class-marks along X-axis and the values of their corresponding frequencies along Y-axis.
iv. Draw line segments joining the consecutive points marked in step (3) above.

C.I.	Class-mark	f
-5 - 5	0	0
5 - 15	10	8
15 - 25	20	16
25 - 35	30	18
35 - 45	40	14
45 - 55	50	8
55 - 65	60	2
65 - 75	70	0