

## 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		4
11 – 20	 	8
21 – 30	 	6
31 – 40	 	6
41 – 50	 	6

#### Solution 3:

The frequency table for the given distribution is

Marks	Tally Marks	Frequency
0 – 10		4
10 – 20	 	6
20 – 30		3
30 – 40		4
40 – 50	 	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	<u>15</u>	15
35 – 44	<u>13</u>	28
45 – 54	21	<u>49</u>
55 – 64	16	<u>65</u>
65 – 75	<u>8</u>	73
75 – 84	12	<u>85</u>

**Solution 13:**

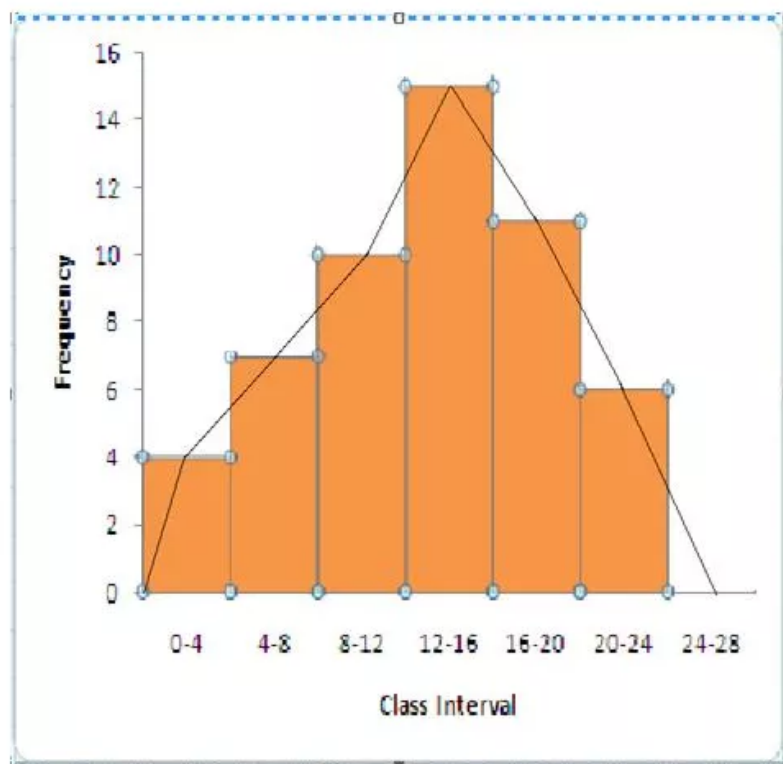
X	0	1	2	3	4	5	6	7	8	9
F	2	5	5	8	4	5	4	4	5	8

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:

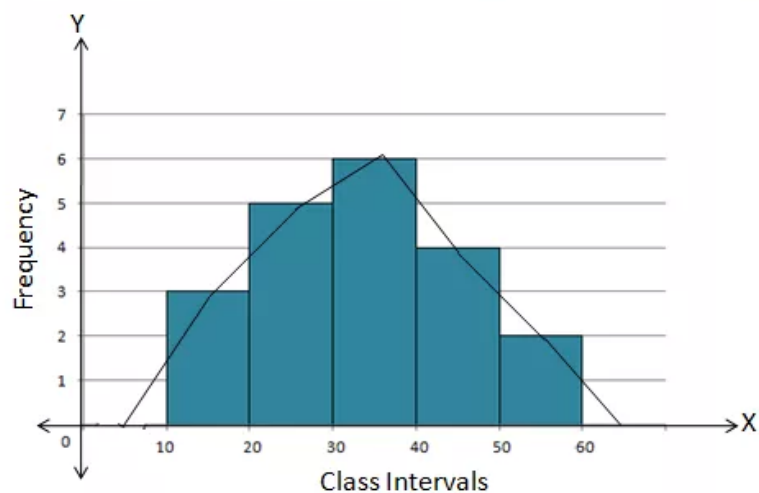
- (i) Drawing a histogram for the given data.
- (ii) Marking the mid-point at the top of each rectangle of the histogram drawn.
- (iii) Also, marking mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
- (iv) Joining the consecutive mid-points marked 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:

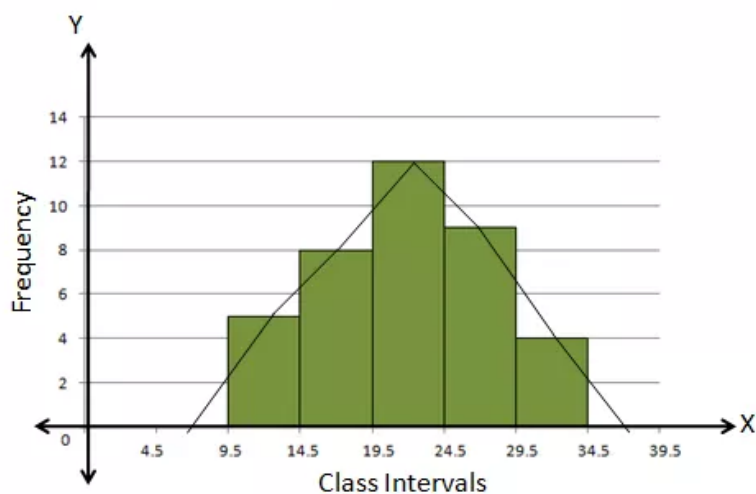
The class intervals are inclusive. We will first convert them into the exclusive form.

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:

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

The required frequency polygon is as follows:

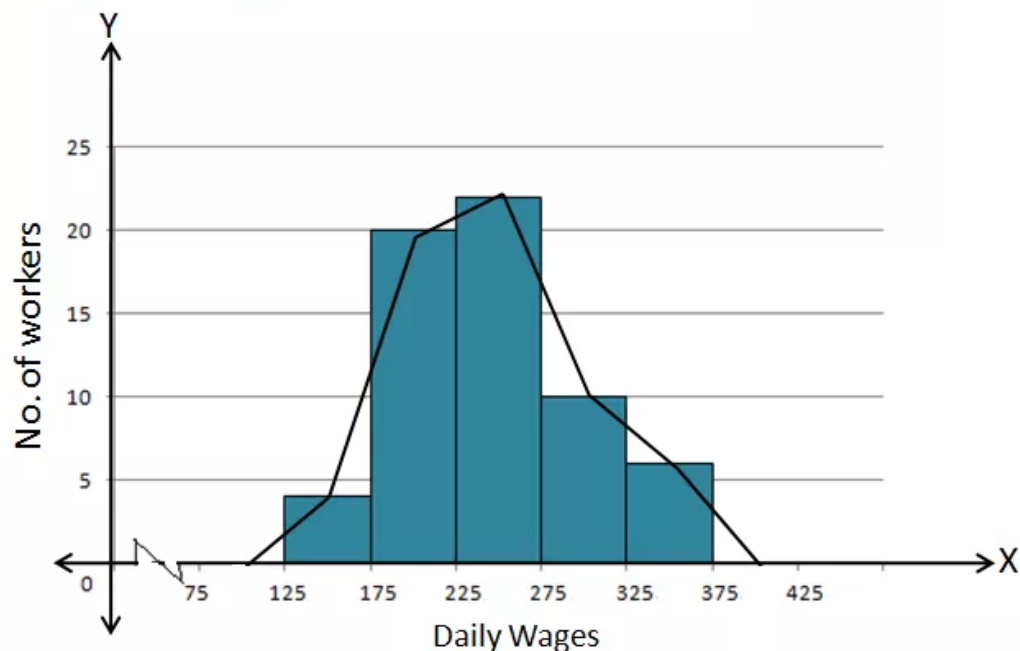


### Solution 4:

Steps:

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

The required frequency polygon is as follows:

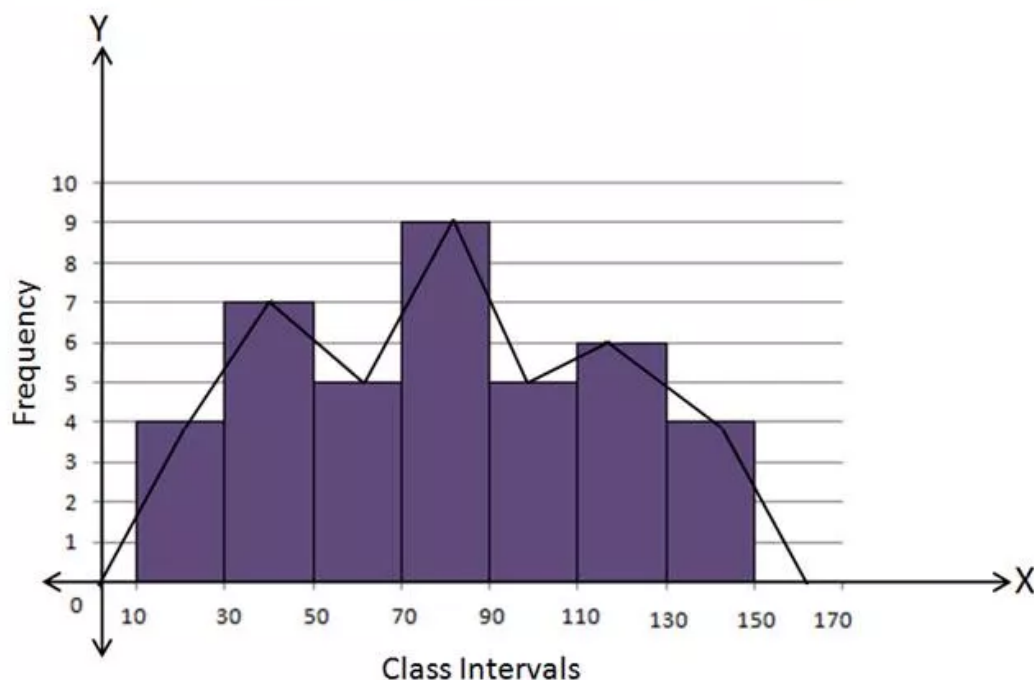


**Solution 5(i):****(a) Using Histogram:**

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:

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

**(b) Without using Histogram:**

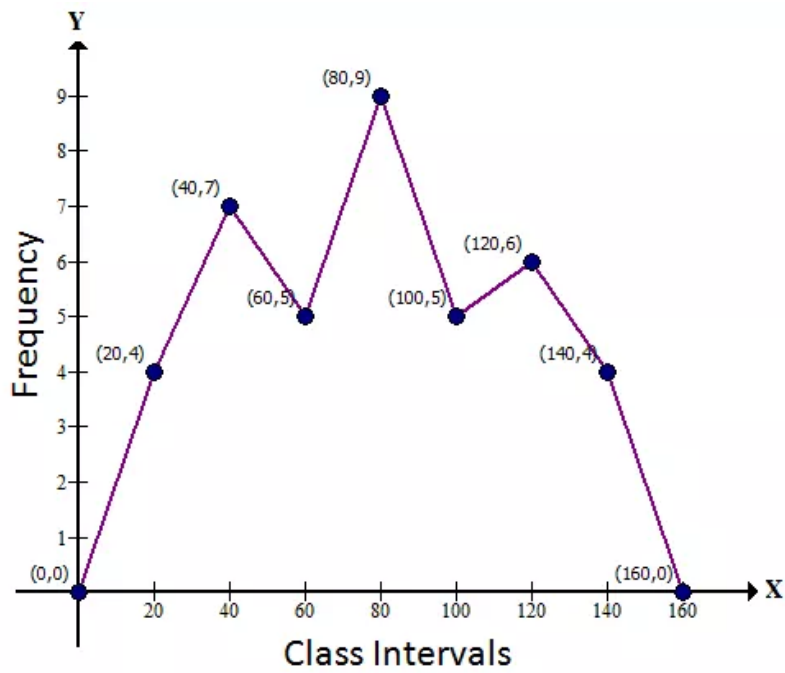
Steps:

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

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

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



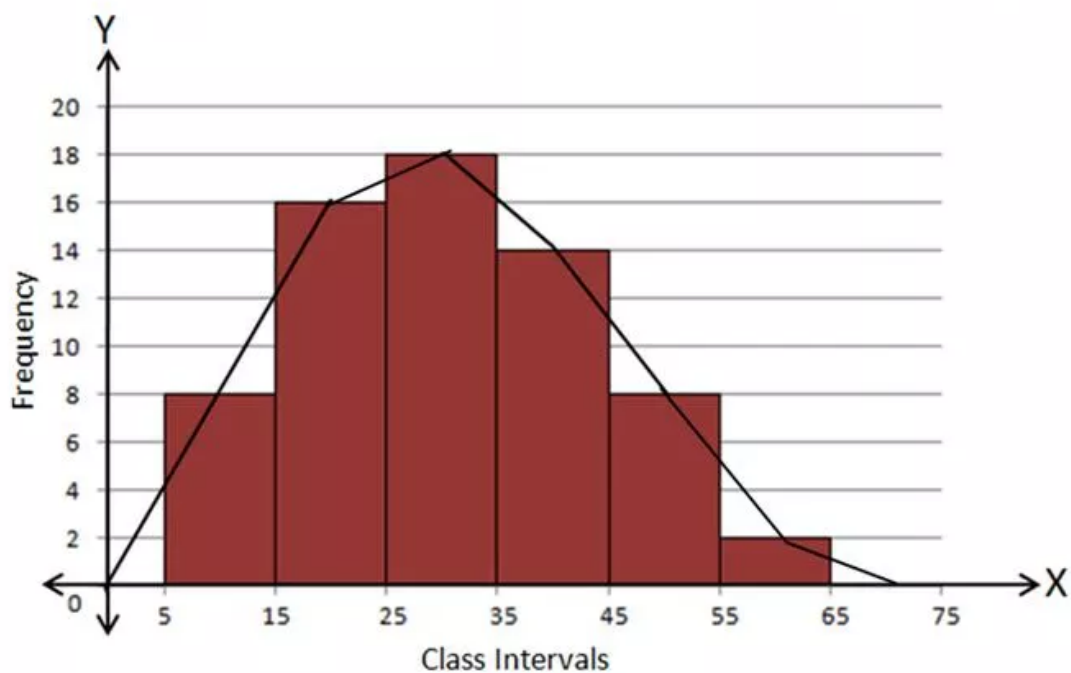
**Solution 5(ii):**

Using Histogram:

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

Steps:

- Draw a histogram for the given data.
- Mark the mid-point at the top of each rectangle of the histogram drawn.
- Also, mark the mid-point of the immediately lower class-interval and mid-point of the immediately higher class-interval.
- 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.

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

- 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
-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

