MATHEMATICS

Chapter 14: Statistics

Statistics

1. Facts or figures collected with a definite purpose are called **data**.

2. **Statistics** deals with collection, presentation, analysis and interpretation of numerical data.

3. Arranging data in an order to study their salient features is called **presentation of data**.

4. Data arranged in ascending or descending order is called arrayed data or an **array**.

5. When an investigator with a definite plan or design in mind collects data first handedly, it is called primary data.

6. Data when collected by someone else, say an agency or an investigator, comes to you, is known as the secondary data.

7. **Range** of the data is the difference between the maximum and the minimum values of the observations.

8. The small groups obtained on dividing all the observations are called classes or **class intervals** and the size is called the **class size** or class width.

   Class size = Upper limit – Lower limit

9. **Class mark** of a class is the mid-value of the two limits of that class.

10. The number of times an observation occurs in the data is called the **frequency** of the observation.

11. A **frequency distribution** in which the upper limit of one class differs from the lower limit of the succeeding class is called an Inclusive or discontinuous frequency distribution.

12. A frequency distribution in which the upper limit of one class coincides with the lower limit of the succeeding class is called an exclusive or **continuous frequency distribution**.

13. In case of continuous frequency distribution, the upper limit of a class is not to be included in that class while in discontinuous both the limits are included.

14. The **cumulative frequency** of a class-interval is the sum of frequencies of that class and the classes which precede (come before) it.

15. A data can be represented **graphically** through:

    (i) Bar graph (ii) Histogram (iii) Frequency polygon.

16. A **bar graph** is a diagram showing a system of connections or interrelations between two or more things by using bars.

17. In a bar graph, rectangular bars of uniform width are drawn with equal spacing between them on one axis, usually the x-axis. The value of the variable is shown on the other axis that is the y-axis.

18. A **histogram** is a graphical representation of a frequency distribution in the form of rectangles with class intervals as bases and heights proportional to the corresponding frequencies such that there is no gap between any two successive rectangles.

19. If classes are not of equal width, then the height of the rectangle is calculated by the ratio of the frequency of that class, to the width of that class

20. **Frequency polygons** are a graphical device for understanding the shapes of distributions.

21. If both a histogram and a frequency polygon are to be drawn on the same graph, then we should first draw the histogram and then join the mid-points of the tops of the adjacent rectangles in the histogram with line-segments to get the frequency polygon.

22. A measure of central tendency tries to estimate the central value which represents the entire data.

23. The three **measures of central tendency** for ungrouped data are mean, mode and median.

24. The **mean** value of a variable is defined as the sum of all the values of the variable divided by the number of values.

25. If x_1, x_2, x_3 ...., x_n are n values of a variable X, then the arithmetic mean of these values is given by:

$$\text{Mean } (\bar{x}) = \frac{1}{n} \sum_{i=1}^{n} x_i$$

If a variate X takes values x_1, x_2, x_3 ...., x_n with corresponding frequencies f_1, f_2, f_3 ,... f_n respectively, then arithmetic mean of these values is given by

$$\text{Mean } (\bar{x}) = \frac{\sum f_i x_i}{\sum f_i}$$

26. **Median** is the value of middle most observation(s).

27. The median is calculated only after arranging the data in ascending order or descending order.

$$\begin{cases} \text{If n is odd, then median} = \left(\frac{n+1}{2}\right)^{th} \text{observation} \\ \\ \text{If n is even, then median} = \left\{ \dfrac{\left(\frac{n}{2}\right)^{th} \text{observation} + \left(\frac{n}{2}+1\right)^{th} \text{observation}}{2} \right\} \end{cases}$$

28. **Mode** of a statistical data is the value of that variate which has the maximum frequency.

29. The variate corresponding to the highest frequency is to be taken as the mode and not the frequency.

30. The disadvantage of arithmetic mean is that it is affected by extreme values.

31. The disadvantage of mode is that it is not uniquely defined in many cases.

Introduction to Statistics

A study dealing with the collection, presentation and interpretation and analysis of data is called as statistics.

Data

- Facts /figures numerical or otherwise collected for a definite purpose is called as data.
- data collected first-hand data:- Primary
- Secondary data: Data collected from a source that already had data stored

Frequency

The number of times a particular instance occurs is called frequency in statistics.

Ungrouped data

Ungrouped data is data in its original or raw form. The observations are not classified in groups.

Grouped data

In grouped data, observations are organized in groups.

Class Interval

- The size of the class into which a particular data is divided.
- E.g divisions on a histogram or bar graph.
- Class width = upper class limit – lower class limit

Regular and Irregular class interval

Regular class interval: When the class intervals are equal or of the same sizes.

E.g 0-10, 10-20, 20-30….. 90-100

Irregular class interval: When the class intervals are of varying sizes.

E.g 0-35, 35-45, 45-55, 55- 80, 80-90, 90-95, 95-100

Frequency table

A frequency table or distribution shows the occurrence of a particular variable in a tabular form.

Sorting

- Raw data needs to be sorted in order to carry out operations.

- Sorting ⇒ ascending order or descending order

Ungrouped frequency table

When the frequency of each class interval is not arranged or organised in any manner.

Grouped frequency table

The frequencies of the corresponding class intervals are organised or arranged in a particular manner, either ascending or descending.
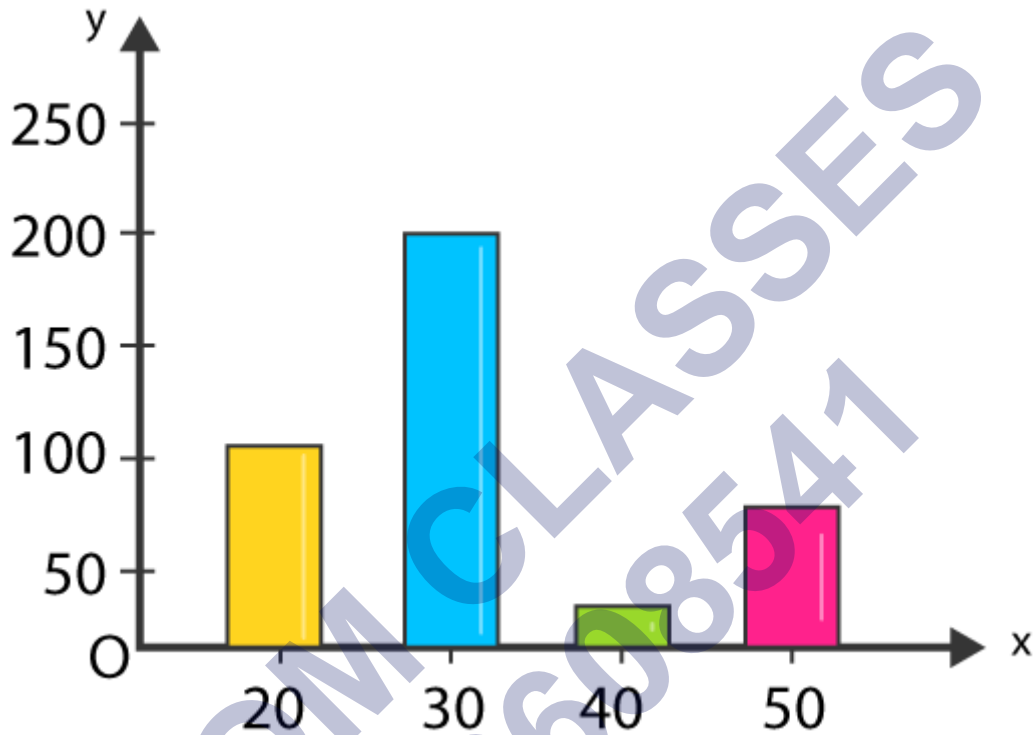
Graphical Representation of Data

Bar graphs

Graphical representation of data using bars of equal width and equal spacing between them (on one axis). The height

Savings (in percentage)	Number of Employees (Frequency)
20	105
30	199
40	29

50	73
Total	400

The data can be represented as:


Variable being a number

- A variable can be a number such as 'no. of students' or 'no. of months'.

- Can be represented by bar graphs or histograms depending on the type of data.

Discrete → bar graphs

Continuous → Histograms

Histograms

- Like bar graphs, but for continuous class intervals.

- Area of each rectangle is ∝ Frequency of a variable and the width is equal to the class interval.
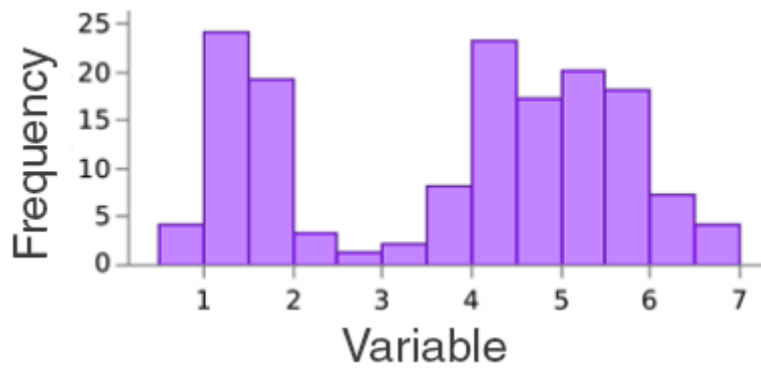
Frequency polygon

If the midpoints of each rectangle in a histogram are joined by line segments, the figure formed will be a frequency polygon.

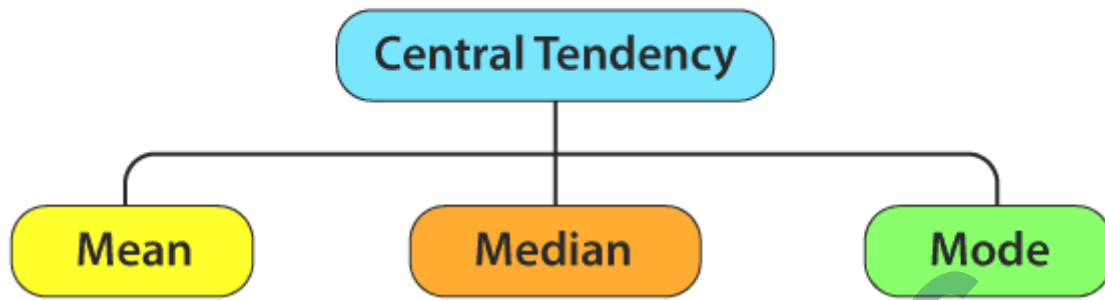Can be drawn without histogram. Need midpoints of class intervals
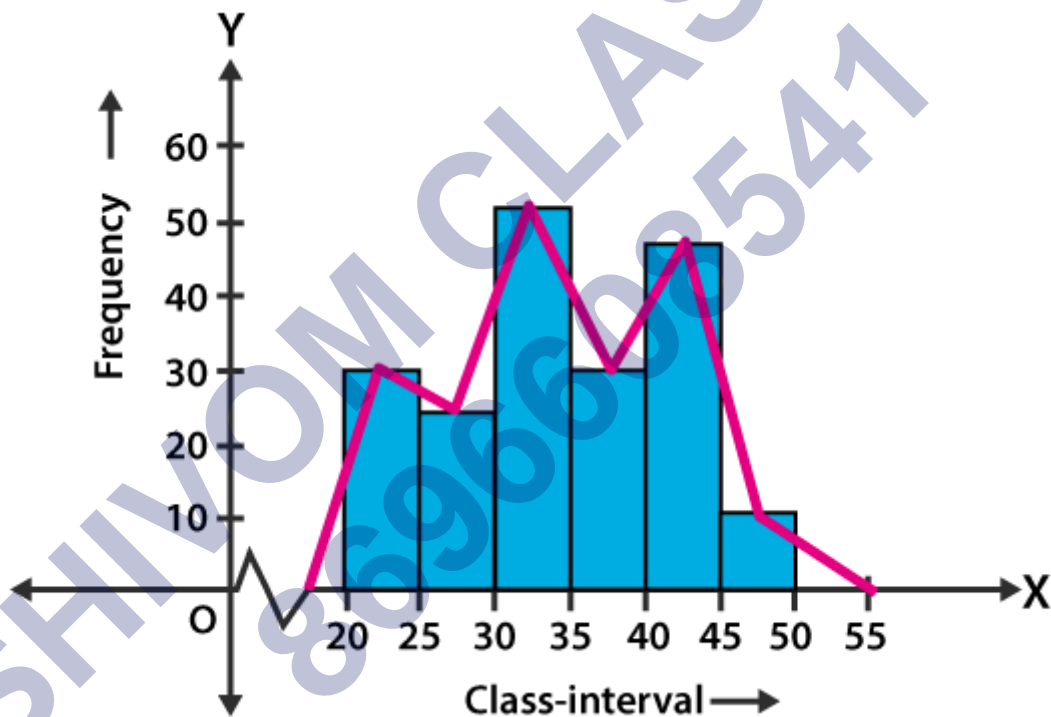
Midpoint of class interval

The midpoint of the class interval is called a class mark

Class mark = (Upper limit + Lower limit)/2

CENTRAL TENDENCY

```
              Central Tendency
         ┌──────────┼──────────┐
       Mean       Median      Mode
```

Equality of areas

Addition of two class intervals with zero frequency preceding the lowest class and succeeding the highest-class intervals enables to equate the area of the frequency polygon to that of the histogram (Using congruent triangles.)

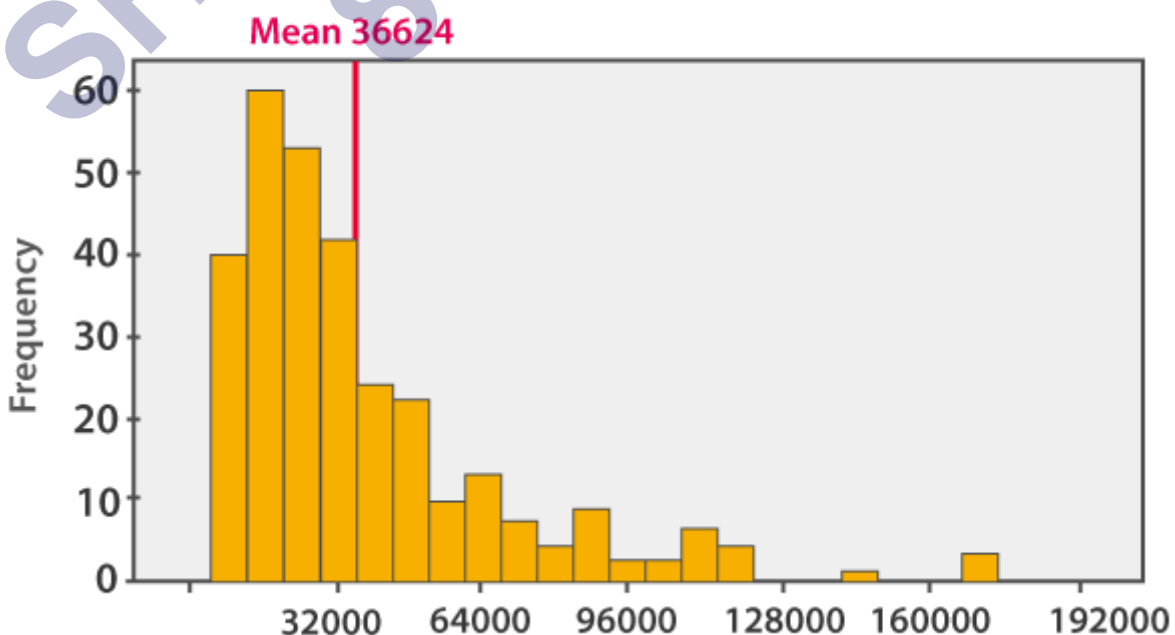**Measures of Central Tendency**

Average

The average of a number of observations is the sum of the values of all the observations divided by the total number of observations.

Mean

Mean for ungrouped frequency distribution, $\bar{x} = \frac{\sum x_i f_i}{f_i}$

where f_i is the frequency of ith observation x_i

Histogram of skewed continuous

Mean 36624

Histogram of symmetric continuous
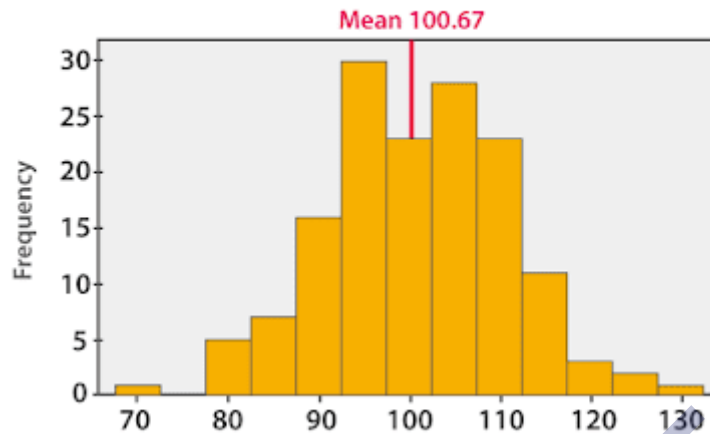
Mode

- The most frequently occurring observation is called the mode.

- The class interval with the highest frequency is the modal class

Median

- Value of the middlemost observation.

- If n(number of observations) is odd, Median $=[(n+1)/2]^{th}$ observation.

- If n is even, the Median is the mean or average of $(n/2)^{th}$ and $[(n+1)/2]^{th}$ observation.

Median odd
23
21
18
16
15
13
12
10
9
7
6
5
2

Median even
40
38
35
33
32
30
29
27
26
24
23
22
19
17

28

Class : 9th mathematics
Chapter- 14: Statistics

$$\text{Mean}, \bar{x} = \dfrac{\sum\limits_{i=1}^{n} x_i}{n}$$

Calculated by adding all the values and dividing it by total number of observations.

Area of study dealing with the presentation, analysis and interpretation of data

Set of values of qualitative or quantitative information

Items	Quantities
A	20
B	30
C	50
D	60

Value of the middle most observation.

Median

Mean

Statistics

Data

Observation even number

Observation odd number

Central Tendency Ungrouped data

Statistics

$$\text{Median} = \text{value of}\left(\dfrac{n}{2}\right)^{th}\text{observation}$$

$$\text{Median} = \dfrac{\text{value of}\left(\dfrac{n}{2}\right)^{th}\text{observation} + \left(\dfrac{n}{2}+1\right)^{th}\text{observation}}{2}$$

$$\text{Median} = \text{value of}\left(\dfrac{n+1}{2}\right)^{th}\text{observation}$$

Mode

Tally marks

Graphical representation grouped data

Distance (in km) of 20 students from their residence to school is given as -
6　7　5　7　7　8　7　6　9　7
4　10　6　8　8　9　5　6　4　8
Construct a grouped frequency distribution table

Distance	Tally	Frequency
4	II	2
5	II	2
6	IIII	4
7	IIII	5
8	IIII	4
9	II	2
10	I	1

Frequency distribution table

Most frequently occurred observation

Bar graphs

Frequency polygons

Histograms

Important Questions

Multiple Choice questions-

Question 1. The class mark of the class 90-130 is:

(a) 90

(b) 105

(c) 115

(d) 110

Question 2. The range of the data:

25, 81, 20, 22, 16, 6, 17,15,12, 30, 32, 10, 91, 8, 11, 20 is

(a) 10

(b) 75

(c) 85

(d) 26

Question 3. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The upper limit of the class is:

(a) 6

(b) 7

(c) 10

(d) 13

Question 4. The width of each of five continuous classes in a frequency distribution is 5 and the lower class-limit of the lowest class is 10. The lower class-limit of the highest class is:

(a) 15

(b) 30

(c) 35

(d) 40

Question 5. Let m be the mid-point and 1 be the lower-class limit of a class in a continuous frequency distribution. The upper-class limit of the class is:

(a) 2m + l

(b) 2m – l

(c) m – l

(d) m – 2l

Question 6. The class marks of a frequency distribution are given as follows:

15, 20, 25, …

The class corresponding to the class mark 15 is:

(a) 12.5 – 17.5

(b) 17.5 – 22.5

(c) 18.5 – 21.5

(d) 19.5 – 20.5

Question 7. In the class intervals 10-20, 20-30, the number 20 is included in:

(a) 10-20

(b) 20-30

(c) Both the intervals

(d) None of these intervals

Question 8. A grouped frequency table with class intervals of equal sizes using 250-270 (270 not included in this interval) as one of the class interval is constructed for the following data:

268, 220, 368, 258, 242, 310, 272, 342, 310, 290, 300, 320, 319, 304,402, 318, 406, 292, 354, 278, 210, 240, 330, 316, 406, 215, 258, 236.

The frequency of the class 370-390 is:

(a) 0

(b) 1

(c) 3

(d) 5

Question 9. A grouped frequency distribution table with classes of equal sizes using 63-72 (72 included) as one of the class is constructed for the following data:

30, 32, 45, 54, 74, 78, 108, 112, 66, 76, 88, 40, 14, 20, 15, 35, 44, 66, 75, 84, 95, 96, 102, 110, 88, 74, 112, 14, 34, 44.

The number of classes in the distribution will be:

(a) 9

(b) 10

(c) 11

(d) 12

Question 10. To draw a histogram to represent the following frequency distribution:

Class interval	5–10	10–15	15–25	25–45	45–75
Frequency	6	12	10	8	15

the adjusted frequency for the class 25-45 is:

(a) 6

(b) 5

(c) 3

(d) 2

Very Short:

1. The points scored by a basketball team in a series of matches are follows:

   17, 7, 10, 25, 5, 10, 18, 10 and 24. Find the range.

2. The points scored by a basketball team in a series of matches are as follows:

   17, 2, 7, 27, 25, 5, 14, 18, 10. Find the median.

3. The scores of an English test (out of 100) of 20 students are given below:

   75, 69, 88, 55, 95, 88, 73, 64, 75, 98, 88, 95, 90, 95, 88, 44, 59, 67, 88, 99. .:: Find the median and mode of the data.

4. Mean of 20 observations is 17. If in the observations, observation 40 is replaced by 12, find the new mean.

5. Mean of 36 observations is 12. One observation 47 was misread as 74. Find the correct

   mean.

6. The median of the data 26, 56, 32, 33, 60, 17, 34, 29, 45 is 33. If 26 is replaced by 62, then

   find the new median.

7. There are 50 numbers. Each number is subtracted from 53 and the mean of the numbers so obtained is found to be - 3.5. Find the mean of the given numbers

8. To draw a histogram to represent the following frequency distribution

Class interval	5-10	10-15	15-25	25-45	45-75
Frequency	6	12	10	8	15

   Find the adjusted frequency for the class 25-45

Short Questions:

1. For a particular year, following is the distribution of ages (in years) of primary

school teachers in a district:

Age (in years)	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50
No. of Teachers	10	30	50	50	30	6	4

(i) Write the lower limit of first-class interval.

(ii) Determine the class limits of the fourth-class interval.

(iii) Find the class mark of the class 45 – 50.

(iv) Determine the class size.

2. Find the mean of the following distribution:

x	5	10	15	20	25
f	4	12	20	28	36

3. In figure, there is a histogram depicting daily wages of workers in a factory. Construct the frequency distribution table.
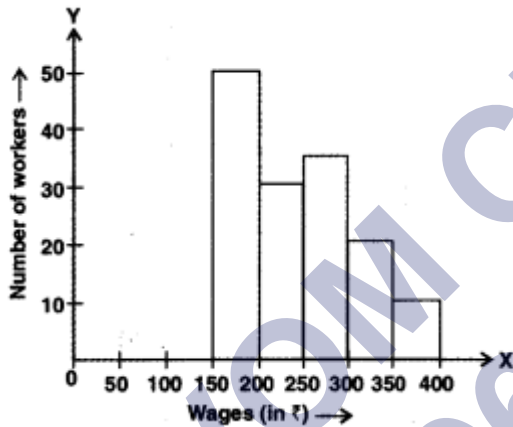
4. Ten observations 6, 14, 15, 17, x + 1, 2x – 13, 30, 32, 34, 43 are written in ascending

   order. The median of the data is 24. Find the value of x.

5. Draw a histogram for the given data:

Class Interval	Frequency
20 – 25	21
25 – 30	22
30 – 35	50
35 – 40	75
40 – 45	67
45 – 50	51
50 – 55	18

6. Given are the scores (out of 25) of 9 students in a Monday test:

   14, 25, 17, 22, 20, 19, 10, 8 and 23

   Find the mean score and median score of the data.

Long Questions:

1. Find the mean salary of 60 workers of a factory from the following table:

Salary (in ₹)	Number of Workers
3000	16
4000	12
5000	10
6000	8
7000	6
8000	4
9000	3
10000	1
Total	60

2. In a school marks obtained by 80 students are given in the table. Draw a histogram. Also,

make frequency polygon

Marks obtained (Mid Value)	Number of students
305	12
315	18
325	28
335	15
345	5
355	2

3. The following two tables gives the distribution of students of two sections according to the marks obtained by them:

Section-A		Section-B	
Marks	Frequency	Marks	Frequency
0 – 10	3	0 – 10	5
10 – 20	9	10 – 20	19
20 – 30	17	20 – 30	15
30 – 40	12	30 – 40	10
40 – 50	9	40 – 50	1

Represent the marks of the students of both the sections on the same graph by two frequency polygons. From the two polygons compare the performance of the two sections.

4. The mean weight of 60 students of a class is 52.75 kg. If mean weight of 25 students of this class is 51 kg, find the mean weight of remaining 35 students of the class.

5. Find the missing frequencies in the following frequency distribution. If it is known that the mean of the distribution is 50.16 and the total number of items is 125

x	10	30	50	70	90
f	17	f_1	32	f_2	19

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: The range of the first 6 multiples of 6 is 9.

Reason: Range = Maximum value – Minimum value

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: The median of the following observation 0, 1, 2, 3, x , x + 2, 8, 9, 11, 12 arranged in ascending order is 63, then the value of x is 62.

Reason: Median of n even observations is $\dfrac{(\frac{n}{2})^{th}\ term+(\frac{n}{2}+1)^{th}\ term}{2}$

Answer Key:

MCQ:

1. (d) 110

2. (c) 85

3. (d) 13

4. (b) 30

5. (b) 2m – l

6. (a) 12.5 – 17.5

7. (b) 20-30

8. (a) 0

9. (b) 10

10. (d) 2

Very Short Answer:

1. Here, maximum points = 25 and

   minimum points = 5

   Range = Maximum value - Minimum value

   = 25 - 5 = 20

2. Here, points scored in ascending order are 2, 5, 7, 10, 14, 17, 18, 25, 27, we have n = 9 terms

   $$\therefore \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ term} = \left(\frac{9+1}{2}\right)^{th} \text{ term} = 5^{th} \text{ term} = 14$$

3. The scores of an English test (out of 100) in ascending order are

   44, 55, 59, 64, 67, 69, 73, 75, 75, 88, 88, 88, 88, 88, 90, 95, 95, 95, 98, 99

   Here, n = 20

   $$\therefore \text{Median} = \text{Mean of } \left(\frac{n}{2}\right)^{th} \text{ term and } \left(\frac{n}{2}+1\right)^{th} \text{ term}$$

   = Mean of 10th and 11th term Median

   = Mean of 88 and 88 = 88

   Mode = 88 [∵ 88 occured max. no. of times i.e., 5 times]

4. Since mean of 20 observations is 17

   ∴ Sum of the 20 observations = 17 × 20 = 340

   New sum of 20 observations = 340 - 40 + 12 = 312

   New mean = $\frac{312}{20}$ = 15.6

5. Mean of 36 observations = 12

   Total of 36 observations = 36 × 12 = 432

   Correct sum of 36 observations = 432 - 74 + 47 = 405

   Correct mean of 36 observations = $\frac{405}{36}$ = 11.25

6. Here, the given data in ascending order is 17, 29, 32, 33, 34, 45, 56, 60, 62

Now, median is $\left(\dfrac{9+1}{2}\right)^{th}$ term i.e., 5th term.

Hence, new median is 34.

7. There are 50 numbers. Each number is subtracted from 53 and the mean of the numbers so obtained is found to be – 3.5. Find the mean of the given numbers.

Solution:

Let x be the mean of 50 numbers.

i. Sum of 50 numbers = 50x

Since each number is subtracted from 53.

According to question, we have

$$\dfrac{53 \times 50 - 50x}{50} = -3.5$$

$$\Rightarrow \quad 2650 - 50x = -175 \Rightarrow 50x = 2825$$

$$\Rightarrow \quad x = \dfrac{2825}{50} = 56.5$$

8. Adjusted frequency of a class

$$= \dfrac{\text{Minimum class size of frequency distribution} \times \text{Frequency of given class}}{\text{Class size of given class}}$$

$\therefore$ Adjusted frequency for the class 25-45 $= \dfrac{5 \times 8}{20} = 2$

Short Answer:

Ans: 1. (i) First class interval is 15 – 20 and its lower limit is 15.

(ii) Fourth class interval is 30 – 35

Lower limit is 30 and upper limit is 35.

(iii) Class mark of the class 45 – 50 $= \dfrac{45 + 502}{2} = \dfrac{95}{2} = 47.5$

(iv) Class size = Upper limit of each class interval – Lower limit of each class interval

$\therefore$ Here, class size = 20 – 15 = 5

Ans: 2.

x	f	fx
5	4	20
10	12	120
15	20	300
20	28	560
25	36	900
Total	$\Sigma f = 100$	$\Sigma fx = 1900$

Now, mean $(\bar{x}) = \dfrac{\Sigma fx}{\Sigma f} = \dfrac{1900}{100} = 19$

Ans: 3.

Class interval	Frequency
150-200	50
200-250	30
250-300	35
300-350	20
350-400	10
Total	**145**

Ans: 4. Here, the arranged data is 6, 14, 15, 17, x + 1, 2x – 13, 30, 32, 34, 43

Total number of observations = 10

Here, 10 is an even number, therefore, median will be the mean of $\left(\dfrac{10}{2}\right)$th and $\left(\dfrac{10}{2}+1\right)$th observation.

$\therefore$

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

$$= \frac{x+1+2x-13}{2} = \frac{3x-12}{2}$$

But median of data is 24 (given)

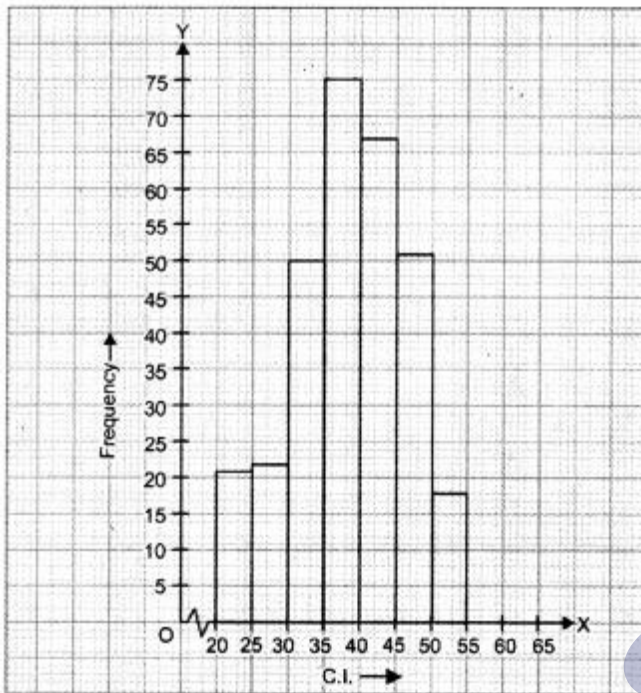$\Rightarrow \dfrac{3x-122}{2} = 24$

$\Rightarrow 3x - 12 = 48$

$\Rightarrow 3x = 60$

$\Rightarrow x = 20$

$\therefore$ The value of x = 20

Ans: 5. Let us represent class-intervals along x-axis and corresponding frequencies along y-axis on

a suitable scale, the required histogram is as under:

Ans: 6. Ascending order of scores is:

8, 10, 14, 17, 19, 20, 22, 23, 25

$$\text{Now, mean score} = \frac{8+10+14+17+19+20+22+23+25}{9} = \frac{158}{9} = 17.5 \text{ marks}$$

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation because } n \text{ is odd}$$

$$= \left(\frac{9+1}{2}\right)^{th} \text{ observation} = 5^{th} \text{ observation} = 19 \text{ marks}$$

Long Answer:

Ans: 1.

Salary (in ₹) (x_i)	Number of Workers (f_i)	$f_i x_i$
3000	16	48000
4000	12	48000
5000	10	50000
6000	8	48000
7000	6	42000
8000	4	32000
9000	3	27000
10000	1	10000
Total	$\Sigma f_i = N = 60$	$\Sigma f_i x_i = 305000$

$$\therefore \quad \text{Mean} = \bar{x} = \frac{\sum\limits_{i=1}^{n} f_i x_i}{\sum\limits_{i=1}^{n} f_i}$$

$$\Rightarrow \quad \bar{x} = \frac{305000}{60} \quad \Rightarrow \quad \bar{x} = 5083.33$$

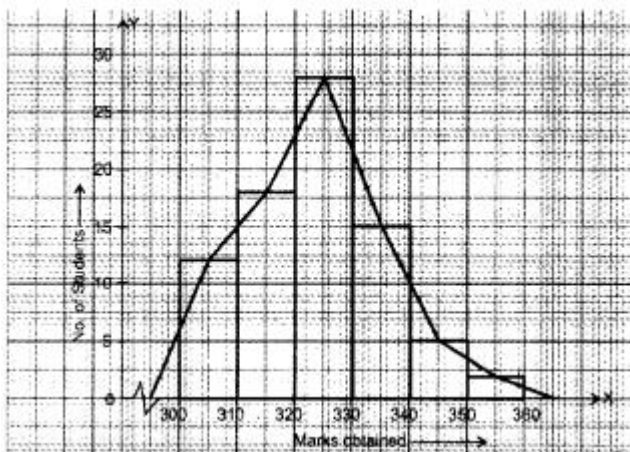Hence, mean salary of 60 workers is ₹ 5083.33

Ans: 2. $\therefore$ Lower limit of first-class interval is 305 - 102 = 300

Upper limit of first-class interval is 305 + 102 = 310

Thus, first class interval is 300 – 310

| Marks obtained	Number of students
300 – 310	12
310 – 320	18
320 – 330	28
330 – 340	15
340 – 350	5
350 – 360	2

Required histogram and frequency polygon is given on the graph paper

Ans: 3. The class marks are as under:

Marks	Class Marks	Section-A Frequency	Section-B Frequency
0 – 10	5	3	5
10 – 20	15	9	19
20 – 30	25	17	15
30 – 40	35	12	10
40 – 50	45	9	1

Let us take class marks on X-axis and frequencies on Y-axis. To plot frequency polygon of Section-A, we plot the points (5, 3), (15, 9), (25,17), (35,12), (45, 9) and join these points by (15,19). line segments. To plot frequency polygon of Section-B, we plot the points (5, 5), (15, 19), (25, 15), (35, 10), (45, 1) on the same scale and join these points by dotted line segments.
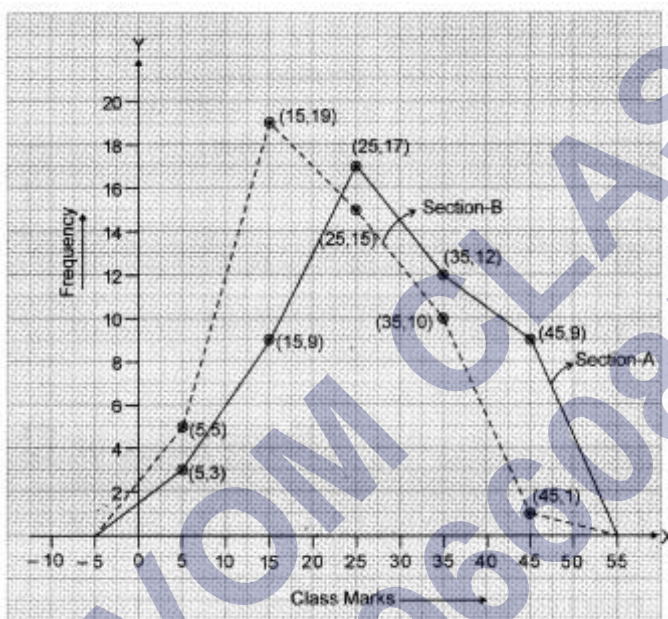
From the above two polygons, clearly the performance of Section A is better.

Ans: 4. Total weight of 60 students = 60 × 52.75kg = 3165kg

Total weight of 25 students = 25 × 51kg = 1275kg

∴ Total weight of 35 students = (3165 – 1275) kg = 1890kg

∴ Mean weight of 35 students = 189035 = 54kg

Ans: 5. Since total number of items = 125

∴ $17 + f_1 + 32 + f_1 + 19 = 125$

$f_1 + f_2 = 125 - 17 - 32 - 19$

$f_1 + f_2 = 57$ …..(i)

Now, mean of data = 50.16

We know that

$$\frac{\Sigma f_i x_i}{\Sigma f_i} = 50.16$$

$$\Rightarrow \quad \frac{10 \times 17 + 30 \times f_1 + 50 \times 32 + 70 \times f_2 + 90 \times 19}{125} = 50.16$$

$$\Rightarrow \quad 170 + 30f_1 + 1600 + 70f_2 + 1710 = 125 \times 50.16$$

$$\Rightarrow \quad 3480 + 30f_1 + 70f_2 = 6270$$

$$\Rightarrow \quad 30f_1 + 70f_2 = 6270 - 3480$$

$$\Rightarrow \quad 30f_1 + 70f_2 = 2790$$

$$\Rightarrow \quad 3f_1 + 7f_2 = 279 \qquad \dots (ii)$$

Multiplying (i) by 3, we have

$$3f_1 + 3f_2 = 171 \qquad \dots (iii)$$

Subtracting (iii) from (ii) we have

$$7f_2 - 3f_2 = 279 - 171$$

$$\Rightarrow \quad 4f_2 = 108 \qquad \Rightarrow f_2 = \frac{108}{4} = 27$$

Now, put $f_2 = 27$ in (i), we have

$$f_1 + 27 = 57$$

$$f_1 = 57 - 27 = 30$$

Hence,

$$f_1 = 30 \text{ and } f_2 = 27$$

Assertion and Reason Answers-

1. d)   Assertion is wrong statement but reason is correct statement.

Explanation:

Know that the first 5 multiples of 4 are

$$\Rightarrow 4, 8, 12, 16, 20$$

The range is given as the difference between the maximum value and the minimum value.

Therefore, the range of multiples of 4 is

$$\Rightarrow 20 - 4$$
$$\Rightarrow 16$$

Hence, (A) is wrong but (R) is true.

2. a)   Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation:

Number of terms = 10 (even)

Median of n even number of terms

$$= \frac{(\frac{n}{2})^{th} \text{ term} + (\frac{n}{2}+1)^{th} \text{ term}}{2}$$

$$= \frac{5^{th} \text{ term} + 6^{th} \text{ term}}{2} = \frac{x + x + 2}{2} = 63$$

⇒2x+2=126

⇒x=62