

## 14. Statistics

### Exercise 14A

#### 1. Question

Define statistics as a subject.

#### Answer

Statistics is a science which deals with collection, presentation, analysis and finally interpretation of numerical data.

#### 2. Question

Define some fundamental characteristics of statistics.

#### Answer

Fundamental characteristics of statistics are:-

- i) Data given or collected for a definite purpose can't be used for another purpose.
- ii) Numerical facts always constitute a specific data.
- iii) A single observation does not form data. Data should be aggregate of facts.
- iv) Qualitative characteristics cannot be measured numerically. Hence, they do not form Data.

#### 3. Question

What are primary data and secondary data? Which of the two is more reliable and why?

#### Answer

**Primary Data:** A Data collected by the investigator himself with a definite plan in mind is called primary data.

**Secondary Data:** A data collected by someone, other than investigator is called secondary data.

Primary data are highly reliable than secondary data because they are collected by investigator himself with a definite plan in mind so they are more relevant. While secondary data are not being fully relevant to the investigation.

#### 4. Question

Explain the meaning of each of the following terms:

- (i) Variate
- (ii) Class interval
- (iii) Class size
- (iv) Class mark
- (v) Class limit
- (vi) True class limits
- (vii) Frequency of a class
- (viii) Cumulative frequency of a class

#### Answer

- (i) Variate:- Any character which consists of several values is called Variate.
- (ii) Class interval:- A Group in which Raw data is condensed is called class-interval.

(iii) Class size:- The difference between true upper limit and true lower limit is termed as class-size.

(iv) Class mark:- it is given as  $\frac{\text{upper limit} + \text{lower limit}}{2}$

(v) Class limit:- each class is bounded by two figures which termed as class limits.

(vi) True class limits:- in exclusive form of distribution, true lower limit of a class is obtained by subtracting from lower limit and true upper limit is obtained by adding 0.5 to the upper limit.

(vii) Frequency of a class:- Number of data values that fall in the range specified by that class is called frequency of that class.

(viii) Cumulative frequency of a class:- The cumulative Frequency corresponding to that class is the sum of all frequencies up to and including that class.

## 5. Question

Following data gives the number of children in 40 families:

1, 2, 6, 5, 1, 5, 1, 3, 2, 6, 2, 3, 4, 2, 0, 4, 4, 3, 2, 2, 0, 0, 1, 2, 2, 4, 3, 2, 1, 0, 5, 1, 2, 4, 3, 4, 1, 6, 2, 2.

Represent it in the form of a frequency distribution, taking classes 0-2, 1-4, etc.

## Answer

Minimum observation = 0

Maximum observation = 6

The classes of equal size covering the given data are:

0-2, 2-4, 4-6, 6-8

So, frequency distribution table will be as given below,

| Class | Frequency |
|-------|-----------|
| 0 - 2 | 11        |
| 2 - 4 | 17        |
| 4 - 6 | 9         |
| 6 - 8 | 3         |

## 6. Question

The marks obtained by 40 students of a class in an examination are given below.

3, 20, 13, 1, 21, 13, 3, 23, 16, 13, 18, 12, 5, 12, 5, 24, 9, 2, 7, 18, 20, 3, 10, 12, 7, 18, 2, 5, 7, 10, 16, 8, 16, 17, 8, 23, 24, 6, 23, 15.

Present the data in the form of a frequency distribution using equal class size, one such class being 10 – 15 (15 not included).

**Answer**

Minimum observation = 1

Maximum observation = 24

The classes of equal size covering the given data are:

0-5, 5-10, 10-20, 20-25

So, frequency distribution table will be as given below,

| Class   | Frequency |
|---------|-----------|
| 0 – 5   | 6         |
| 5 – 10  | 10        |
| 10 – 15 | 8         |
| 15 – 20 | 8         |
| 20 – 25 | 8         |

**7. Question**

Construct a frequency table for the following ages (in years) of 30 students using equal class intervals, one of them being 9-12, where 12 is not included.

18, 12, 7, 6, 11, 15, 21, 9, 8, 13, 15, 17, 22, 19, 14, 21, 23, 8, 12, 17, 15, 6, 18, 23, 22, 16, 9, 21, 11, 16.

**Answer**

Minimum observation = 6

Maximum observation = 23

The classes of equal size covering the given data are:

6-9, 9-12, 12-15, 15-18, 18-21, 21-24, 24-27

So, grouped frequency table will be as given below,

| Class   | Frequency |
|---------|-----------|
| 6 - 9   | 5         |
| 9 - 12  | 5         |
| 12 - 15 | 4         |
| 15 - 18 | 6         |
| 18 - 21 | 3         |
| 21 - 24 | 7         |

### 8. Question

Construct a frequency table with equal class intervals from the following data on the monthly wages (in rupees) of 28 labourers working in a factory, taking one of the class intervals as 210-230 (230 not included).

220, 268, 258, 242, 210, 268, 272, 242, 311, 290, 300, 319, 304, 302, 318, 306, 292, 254, 278, 210, 240, 280, 316, 306, 215, 256, 236.

### Answer

Minimum observation = 210

Maximum observation = 320

The classes of equal size covering the given data are:

210-230, 230-250, 250-270, 270-290, 290-310, and 310-330

So, frequency table will be as given below,

| Class     | Frequency |
|-----------|-----------|
| 210 - 230 | 4         |
| 230 - 250 | 4         |
| 250 - 270 | 5         |
| 270 - 290 | 3         |
| 290 - 310 | 7         |
| 310 - 330 | 5         |

### 9. Question

The weights (in grams) of 40 oranges picked at random from a basket are as follows:

40, 50, 60, 65, 45, 55, 30, 90, 75, 85, 75, 80, 100, 110, 70, 55, 30, 35, 45, 70, 80, 85, 95, 70, 60, 70, 75, 40, 100, 65, 60, 40, 100, 75, 110, 30, 45, 84.

Construct a frequency table as well as a cumulative frequency table.

### Answer

Minimum observation = 30

Maximum observation = 120

Frequency Table :-

| Class     | Frequency |
|-----------|-----------|
| 30 - 40   | 4         |
| 40 - 50   | 6         |
| 50 - 60   | 3         |
| 60 - 70   | 5         |
| 70 - 80   | 9         |
| 80 - 90   | 6         |
| 90 - 100  | 2         |
| 100 - 110 | 3         |
| 110 - 120 | 2         |

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Cumulative frequency table: -

| Class     | Frequency | Cumulative frequency |
|-----------|-----------|----------------------|
| 30 - 40   | 4         | 4                    |
| 40 - 50   | 6         | 10                   |
| 50 - 60   | 3         | 13                   |
| 60 - 70   | 5         | 18                   |
| 70 - 80   | 9         | 27                   |
| 80 - 90   | 6         | 33                   |
| 90 - 100  | 2         | 35                   |
| 100 - 110 | 3         | 38                   |
| 110 - 120 | 2         | 40                   |

#### 10. Question

The weekly wages (in rupees) of 30 workers in a factory are given below: 830, 835, 890, 810, 835, 836, 869, 845, 898, 890, 820, 860, 832, 833, 855, 845, 804, 808, 812, 840, 885, 835, 836, 878, 840, 868, 890, 806, 840, 890.

Represent the data in the form of a frequency distribution with class size 10.

#### Answer

Minimum observation = 800

Maximum observation = 900

$\therefore$  Range =  $900 - 800 = 100$

Class size = 10

Number of classes =  $\frac{100}{10} = 10$

| Class     | Frequency |
|-----------|-----------|
| 800 - 810 | 3         |
| 810 - 820 | 2         |
| 820 - 830 | 1         |
| 830 - 840 | 8         |
| 840 - 850 | 5         |
| 850 - 860 | 1         |
| 860 - 870 | 3         |
| 870 - 880 | 1         |
| 880 - 890 | 1         |
| 890 - 900 | 5         |

### 11. Question

The electricity bills (in rupees) of 40 houses in a locality are given below:



116, 127, 107, 100, 80, 82, 91, 101, 65, 95, 87, 81, 105, 129, 92, 75, 89, 78, 87, 81, 59, 52, 65, 101, 115, 108, 95, 65, 98, 62, 84, 76, 63, 128, 121, 61, 118, 108, 116, 130.

Construct a grouped frequency table.

**Answer**

Minimum data = 52

Maximum data = 130

Range =  $130 - 52 = 78$

Let the class size = 10

$\therefore$  Number of classes =  $\frac{78}{10} = 7.8$  or 8 classes

| Class     | Frequency |
|-----------|-----------|
| 52 - 62   | 2         |
| 62 - 72   | 6         |
| 72 - 82   | 6         |
| 82 - 92   | 6         |
| 92 - 102  | 7         |
| 102 - 112 | 4         |
| 112 - 122 | 5         |
| 122 - 132 | 4         |

**12. Question**

Following are the ages (in years) of 360 patients, getting medical treatment in a hospital:

| Age (in years)     | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|--------------------|-------|-------|-------|-------|-------|-------|
| Number of patients | 90    | 50    | 60    | 80    | 50    | 30    |

Construct the cumulative frequency table for the above data.

**Answer**

The Cumulative frequency table can be drawn as given below:

| Age (in year) | No. of patients | Cumulative frequency |
|---------------|-----------------|----------------------|
| 10 - 20       | 90              | 90                   |
| 20 - 30       | 50              | 140                  |
| 30 - 40       | 60              | 200                  |
| 40 - 50       | 80              | 280                  |
| 50 - 60       | 50              | 330                  |
| 60 - 70       | 30              | 360                  |

**13. Question**

Present the following as an ordinary grouped frequency table:

|                    |    |    |    |    |    |    |
|--------------------|----|----|----|----|----|----|
| Marks (below)      | 10 | 20 | 30 | 40 | 50 | 60 |
| Number of students | 5  | 12 | 32 | 40 | 45 | 48 |

**Answer**

Grouped frequency table can be drawn as shown below;

| Marks   | No. of students |
|---------|-----------------|
| 0 - 10  | 5               |
| 10 - 20 | 7               |
| 20 - 30 | 20              |
| 30 - 40 | 8               |
| 40 - 50 | 5               |
| 50 - 60 | 3               |

**14. Question**

Given below is a cumulative frequency table:

| Marks    | Number of students |
|----------|--------------------|
| Below 10 | 17                 |
| Below 20 | 22                 |
| Below 30 | 29                 |
| Below 40 | 37                 |
| Below 50 | 50                 |
| Below 60 | 60                 |

Extract a frequency table from the above.

**Answer**

Frequency table can be represented as below;

| Marks   | No. of students |
|---------|-----------------|
| 0 - 10  | 17              |
| 10 - 20 | 22              |
| 20 - 30 | 29              |
| 30 - 40 | 37              |
| 40 - 50 | 50              |
| 50 - 60 | 60              |

**15. Question**

Make a frequency table from the following:

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| Marks obtained | Number of students |
|----------------|--------------------|
| More than 60   | 0                  |
| More than 50   | 16                 |
| More than 40   | 40                 |
| More than 30   | 75                 |
| More than 20   | 87                 |
| More than 10   | 92                 |
| More than 0    | 100                |

**Answer**

The frequency table can be represented as below:

| Marks obtained | No. of students |
|----------------|-----------------|
| 0 - 10         | 8               |
| 10 - 20        | 5               |
| 20 - 30        | 12              |
| 30 - 40        | 35              |
| 40 - 50        | 24              |
| 50 - 60        | 16              |

### Exercise 14B

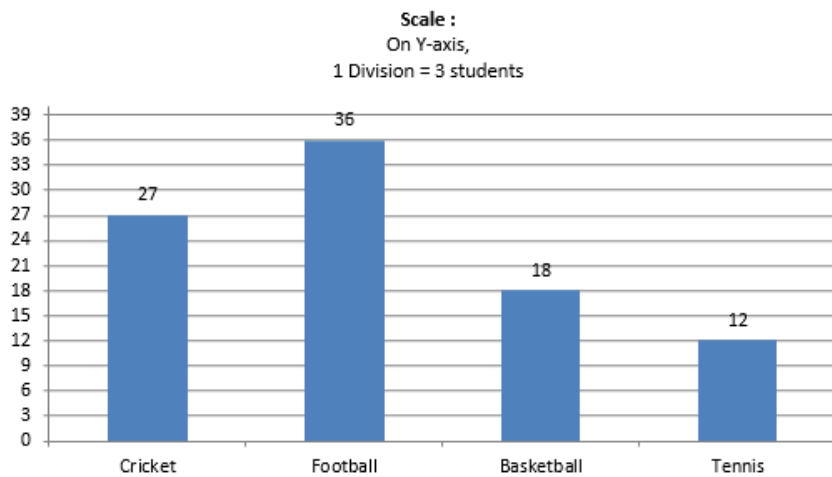
#### 1. Question

The following table shows the number of students participating in various in a school.

| Game               | Cricket | Football | Basketball | Tennis |
|--------------------|---------|----------|------------|--------|
| Number of students | 27      | 36       | 18         | 12     |

Draw a bar graph to represent the above data.

**Answer**



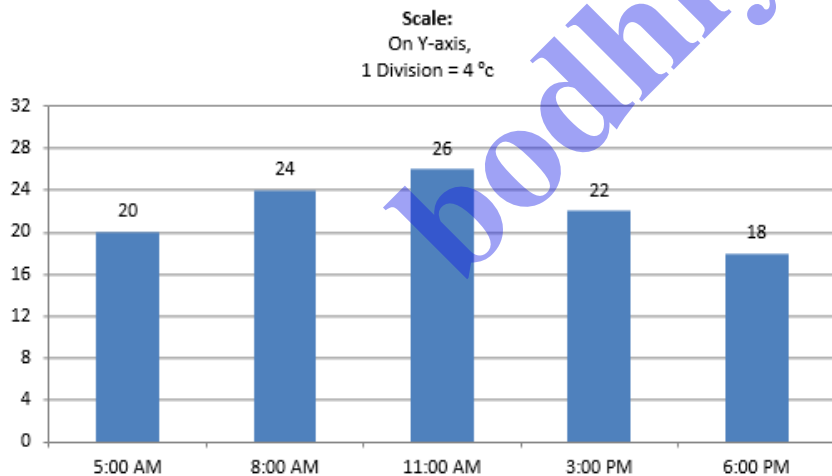
## 2. Question

On a certain day, the temperature in a city was recorded as under:

| Time                | 5 a.m. | 8 a.m. | 11 a.m. | 3 p.m. | 6 p.m. |
|---------------------|--------|--------|---------|--------|--------|
| Temperature (in °C) | 20     | 24     | 26      | 22     | 18     |

Illustrate the data by a bar graph.

## Answer



## 3. Question

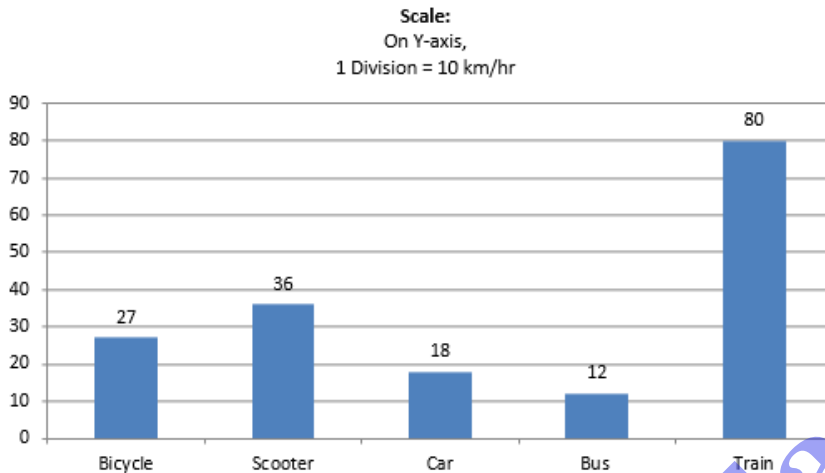
The approximate velocities of some vehicles are given below:



| Name of vehicle     | Bicycle | Scooter | Car | Bus | Train |
|---------------------|---------|---------|-----|-----|-------|
| Velocity (in km/hr) | 27      | 36      | 18  | 12  | 80    |

Draw a bar graph to represent the above data.

**Answer**

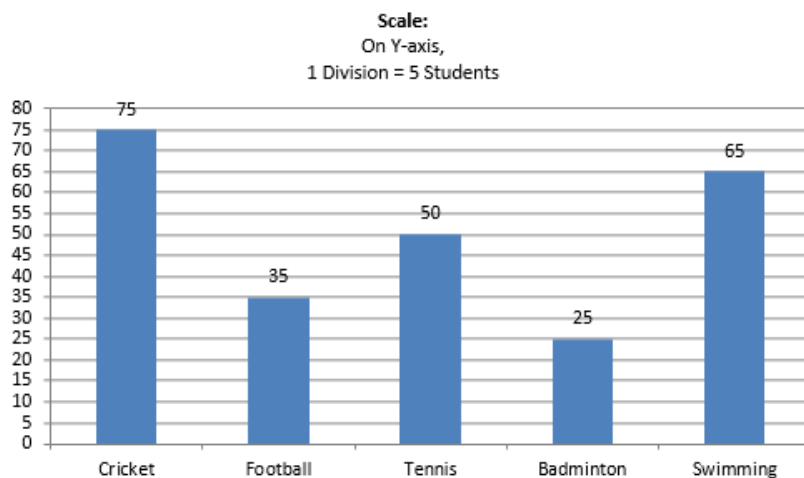


#### 4. Question

The following table shows the favorite sports of 250 students of a school. Represent the data by a bar graph.

| Sports          | Cricket | Football | Tennis | Badminton | Swimming |
|-----------------|---------|----------|--------|-----------|----------|
| No. of students | 75      | 35       | 50     | 25        | 65       |

**Answer**

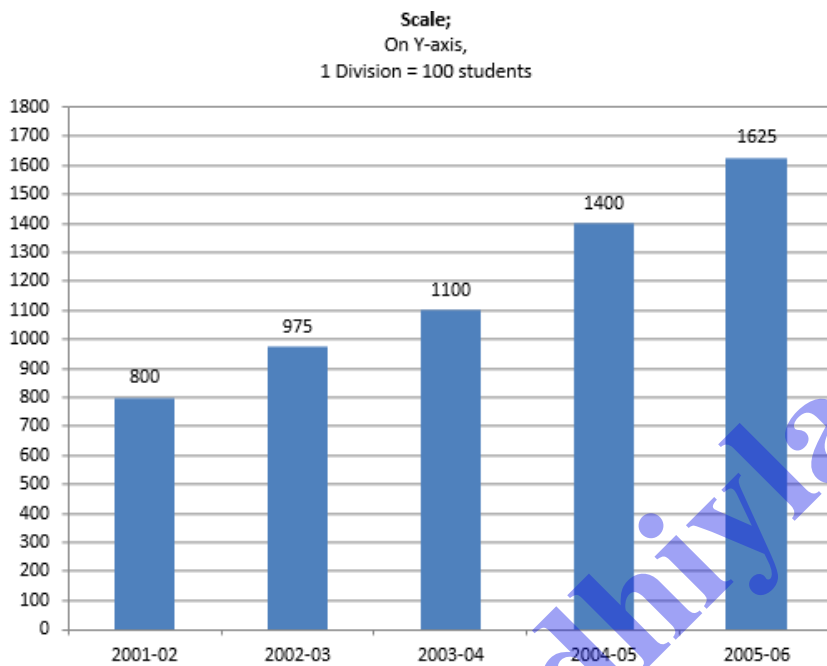


### 5. Question

Given below is a table which shows the year wise strength of a school. Represent this data by a bar graph.

| Year            | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|-----------------|---------|---------|---------|---------|---------|
| No. of students | 800     | 975     | 1100    | 1400    | 1625    |

### Answer



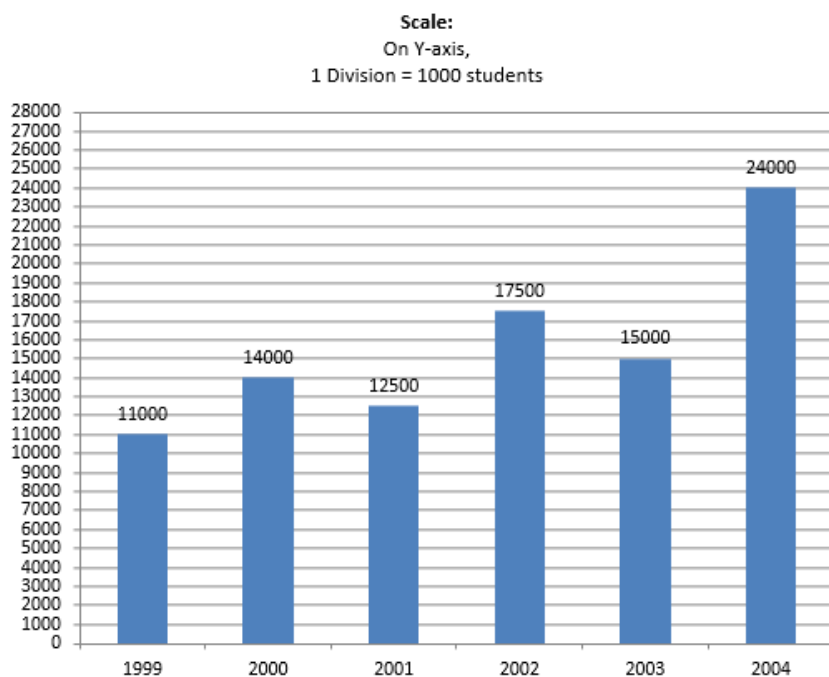
### 6. Question

The following table shows the number of scooters produced by a company during six consecutive years. Draw a bar graph

| Year            | 1999  | 2000  | 2001  | 2002  | 2003  | 2004  |
|-----------------|-------|-------|-------|-------|-------|-------|
| No. of students | 11000 | 14000 | 12500 | 17500 | 15000 | 24000 |

to represent this data.

### Answer



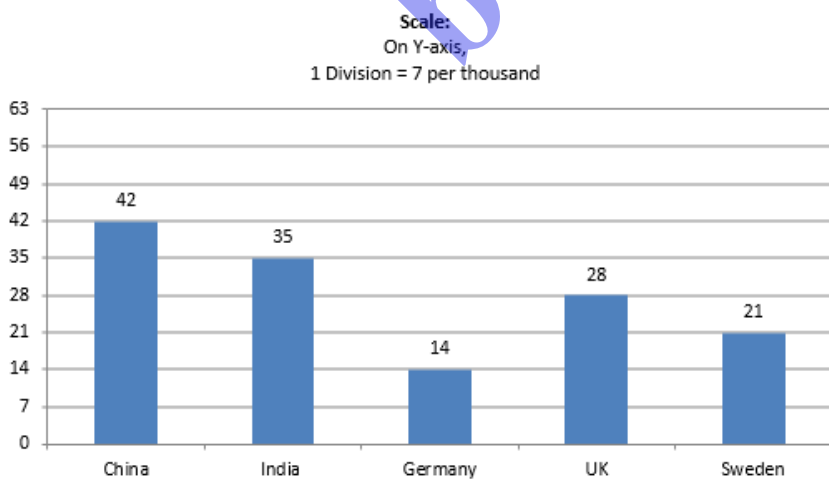
## 7. Question

The birth rate per thousand in five countries over a period of time is shown below:

| Country                 | China | India | Germany | UK | Sweden |
|-------------------------|-------|-------|---------|----|--------|
| Birth rate per thousand | 42    | 35    | 14      | 28 | 21     |

Represent the above data by a bar graph.

**Answer**



## 8. Question

The following table shows the interest paid by India (in thousand crore rupees) on external debts during the period 1998-99 to 2002-03. Represent the data by a bar graph.

| Year                                | 1998-99 | 1999-2000 | 2000-01 | 2001-02 | 2002-03 |
|-------------------------------------|---------|-----------|---------|---------|---------|
| Interest (in thousand crore rupees) | 70      | 84        | 98      | 106     | 120     |

### Answer



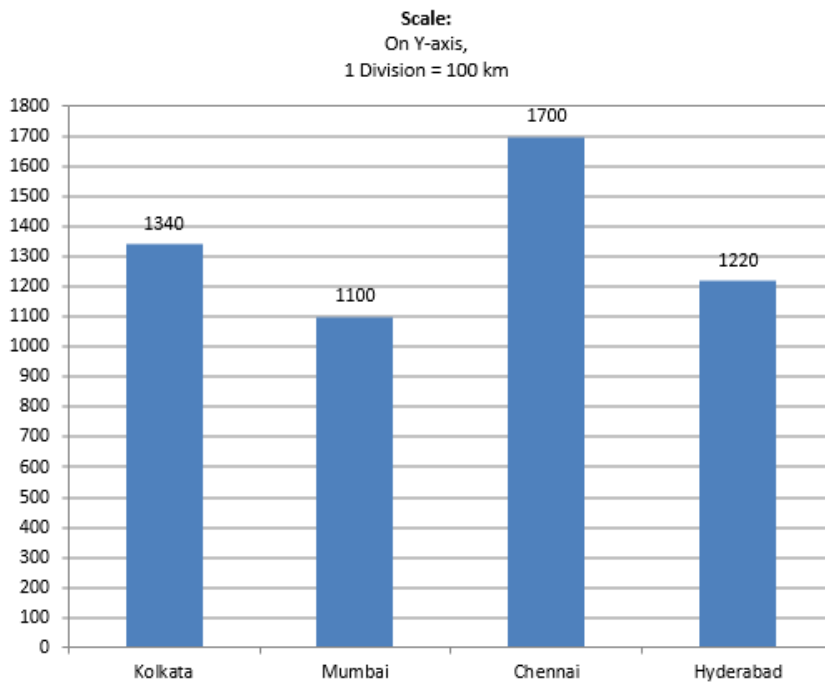
### 9. Question

The air distances of four cities from Delhi (in km) are given below:

| City                        | Kolkata | Mumbai | Chennai | Hyderabad |
|-----------------------------|---------|--------|---------|-----------|
| Distance from Delhi (in km) | 1340    | 1100   | 1700    | 1220      |

Draw a bar graph to represent the above data.

### Answer



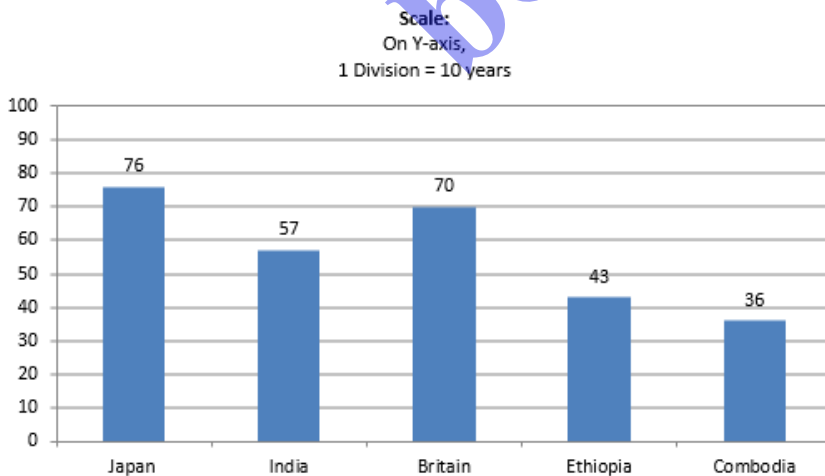
### 10. Question

The following table shows the life expectancy (average age to which people live) in various countries in a particular year.

Represent this data by a bar graph.

| Country                    | Japan | India | Britain | Ethiopia | Cambodia |
|----------------------------|-------|-------|---------|----------|----------|
| Life expectancy (in years) | 76    | 57    | 70      | 43       | 36       |

### Answer



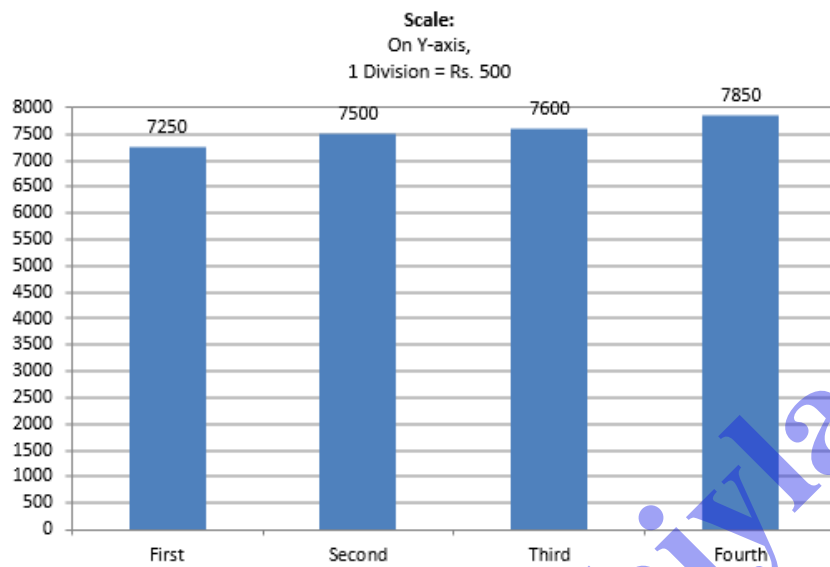
### 11. Question

Gold prices on 4 consecutive Tuesdays were as under:

| Week                  | First | Second | Third | Fourth |
|-----------------------|-------|--------|-------|--------|
| Rate per 10 g (in Rs) | 7250  | 7500   | 7600  | 7850   |

Draw a bar graph to show this information.

**Answer**



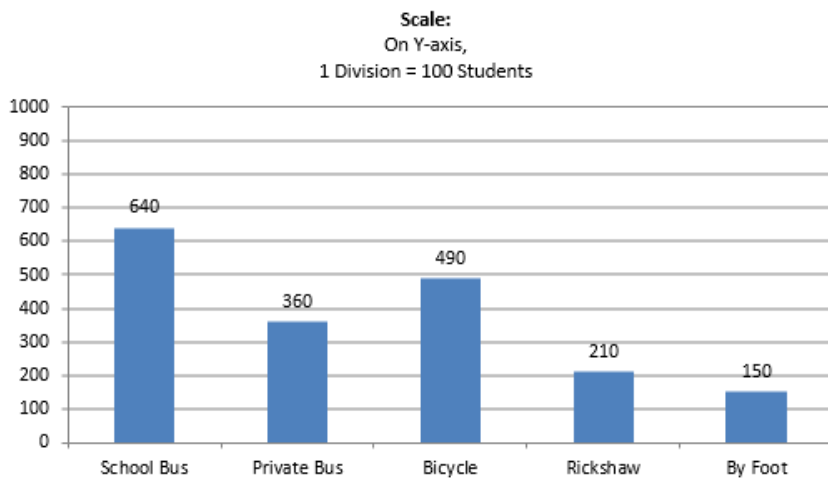
## 12. Question

Various modes of transport used by 1850 students of a school are given below.

| School bus | Private bus | Bicycle | Rickshaw | By foot |
|------------|-------------|---------|----------|---------|
| 640        | 360         | 490     | 210      | 150     |

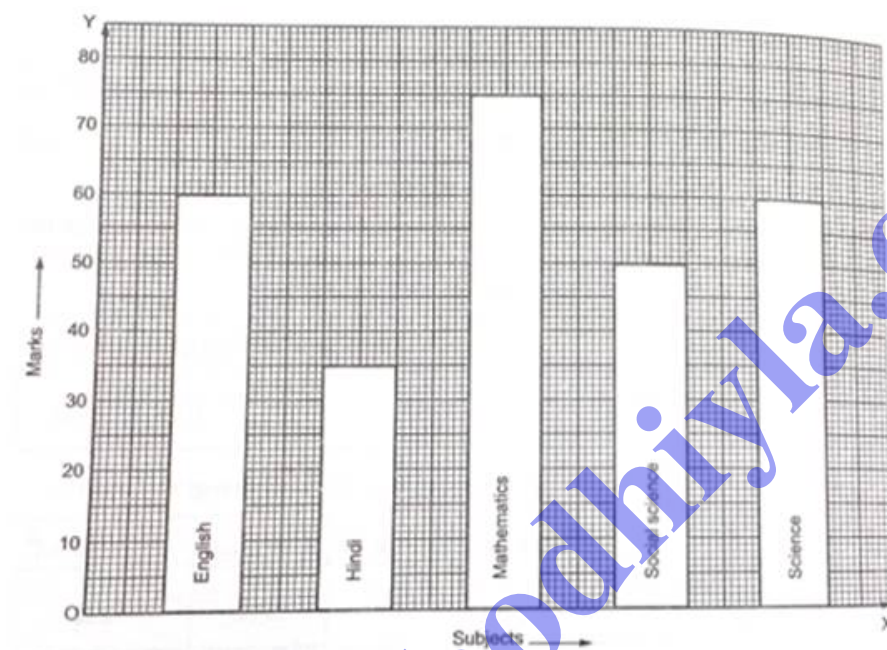
Draw a bar graph to represent the above data.

**Answer**



### 13. Question

Look at the bar graph given below.



Bar Graph Showing the marks obtained by a student in an examination

Read it carefully and answer the following questions.

- What information does the bar graph give?
- In which subject is the student very good?
- In which subject is he poor?
- What is the average of his marks?

### Answer

- The bar graph shows the marks obtained by a student in various subjects in an examination.
- The student scores very good in mathematics, as the height of the corresponding bar is the highest.
- The student scores least marks in Hindi, as the height of the corresponding bar is the lowest.

$$(iv) \text{ Average marks} = \frac{\text{sum of marks}}{\text{no. of subjects}} = \frac{60 + 35 + 75 + 50 + 60}{5} = \frac{280}{5} = 56.$$

### Exercise 14C

### 1. Question

The daily wages of 50 workers in a factory are given below:

| Daily wages (in rupees) | 140-180 | 180-220 | 220-260 | 260-300 | 300-340 | 340-380 |
|-------------------------|---------|---------|---------|---------|---------|---------|
| Number of workers       | 16      | 9       | 12      | 2       | 7       | 4       |

Construct a histogram to represent the above frequency distribution.

### Answer

The given frequency distribution is in exclusive form, we will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

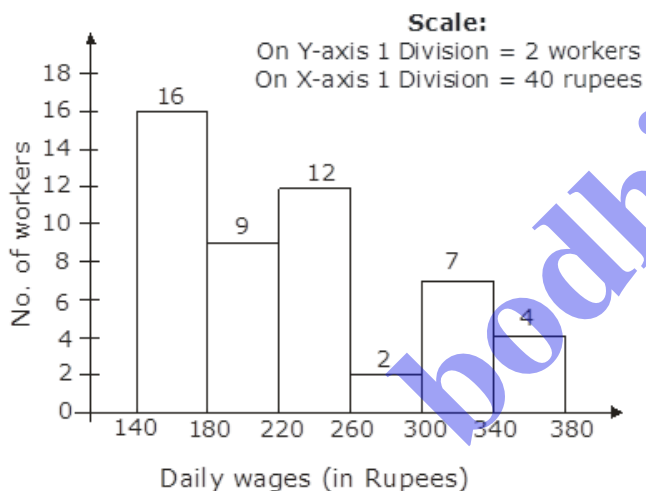
Now take the scale of,

1 big division = 40 rupees on X-axis,

1 big division = 2 workers on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

Thus, we get the following histogram.



### 2. Question

The following table shows the average daily earnings of 40 general stores in a market, during a certain week.



| Daily earnings (in rupees) | 600-650 | 650-700 | 700-750 | 750-800 | 800-850 | 850-900 |
|----------------------------|---------|---------|---------|---------|---------|---------|
| Number of stores           | 6       | 9       | 2       | 7       | 11      | 5       |

Draw a histogram to represent the above data.

### Answer

The given frequency distribution is in exclusive form, we will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

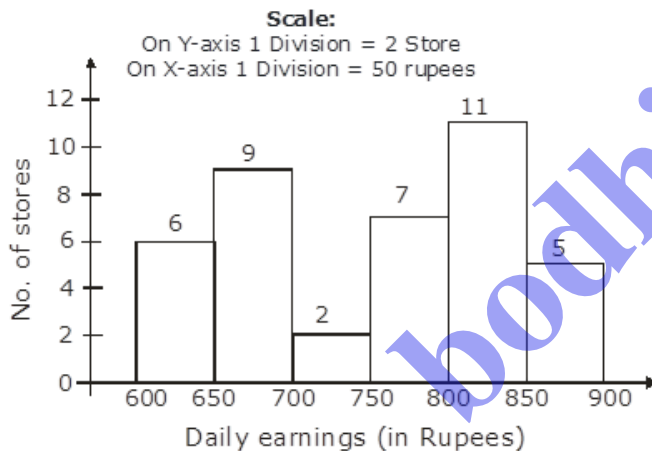
Now take the scale of,

1 big division = 50 rupees on X-axis,

1 big division = 1 store on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

Thus, we get the following histogram.



### 3. Question

The heights of 75 students in a school are given below:

| Height (in cm)     | 130-136 | 136-142 | 142-148 | 148-154 | 154-160 | 160-166 |
|--------------------|---------|---------|---------|---------|---------|---------|
| Number of students | 9       | 12      | 18      | 23      | 10      | 3       |

Draw a histogram to represent the above data.

### Answer

The given frequency distribution is in exclusive form, we will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

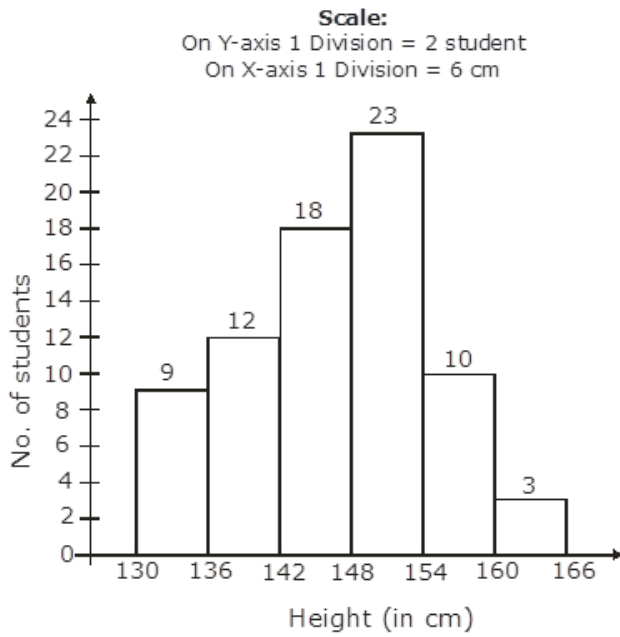
Now take the scale of,

1 big division = 6cm on X-axis,

1 big division = 2 students on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

Thus, we get the following histogram.



#### 4. Question

Draw a histogram for the frequency distribution of the following data.

|                |      |       |       |       |       |       |       |
|----------------|------|-------|-------|-------|-------|-------|-------|
| Class interval | 8-13 | 13-18 | 18-23 | 23-28 | 28-33 | 33-38 | 38-43 |
| Frequency      | 320  | 780   | 160   | 540   | 260   | 100   | 80    |

#### Answer

The given frequency distribution is in exclusive form, we will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

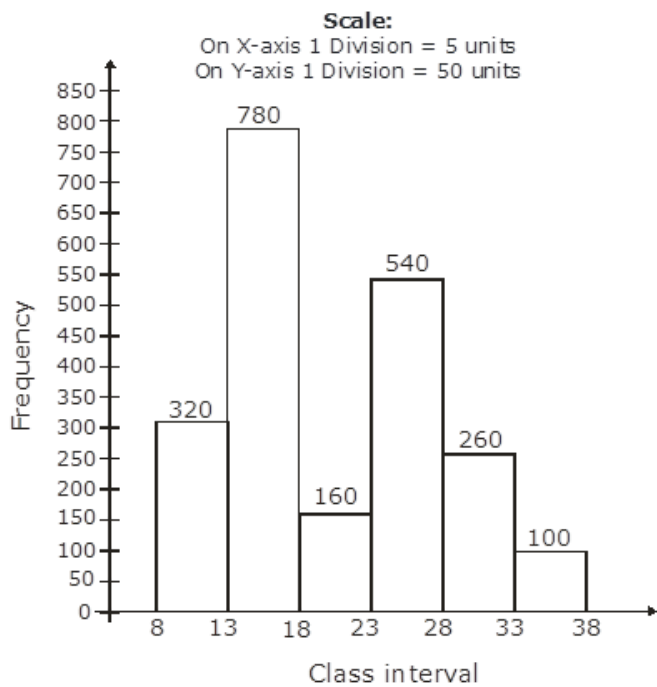
Now take the scale of,

1 big division = 5 units on X-axis,

1 big division = 50 units on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

Thus, we get the following histogram.



### 5. Question

Construct a histogram for the following frequency distribution.

|                |      |       |       |       |       |       |
|----------------|------|-------|-------|-------|-------|-------|
| Class interval | 5-12 | 13-20 | 21-28 | 29-36 | 37-44 | 45-52 |
| Frequency      | 6    | 15    | 24    | 18    | 4     | 9     |

### Answer

The given frequency distribution is in inclusive form. So, convert it in Exclusive form.

| Class interval | Frequency |
|----------------|-----------|
| 4.5-12.5       | 6         |
| 12.5-20.5      | 15        |
| 20.5 - 28.5    | 24        |
| 28.5 - 36.5    | 18        |
| 36.5 - 44.5    | 4         |
| 44.5 - 52.5    | 9         |

We will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

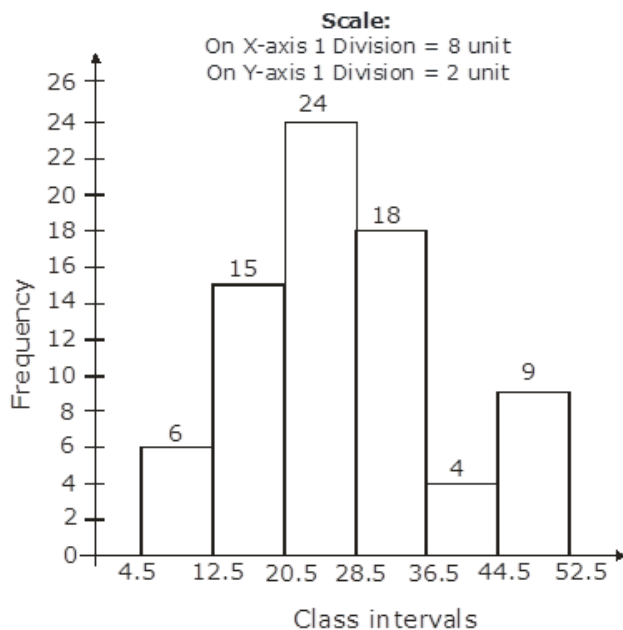
Now take the scale of,

1 big division = 8 units on X-axis,

1 big division = 2 units on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

Now, we get following Histogram:



## 6. Question

The following table shows the number of illiterate persons in the age group (10-58 years) in a town:

| Age group (in years)         | 10-16 | 17-23 | 24-30 | 31-37 | 38-44 | 45-51 | 52-58 |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Number of illiterate persons | 175   | 325   | 100   | 150   | 250   | 400   | 525   |

Draw a histogram to represent the above data.

## Answer

We will represent the class intervals along the X-axis and the corresponding frequency on the Y axis.

Now take the scale of,

1 big division = 7 years on X-axis,

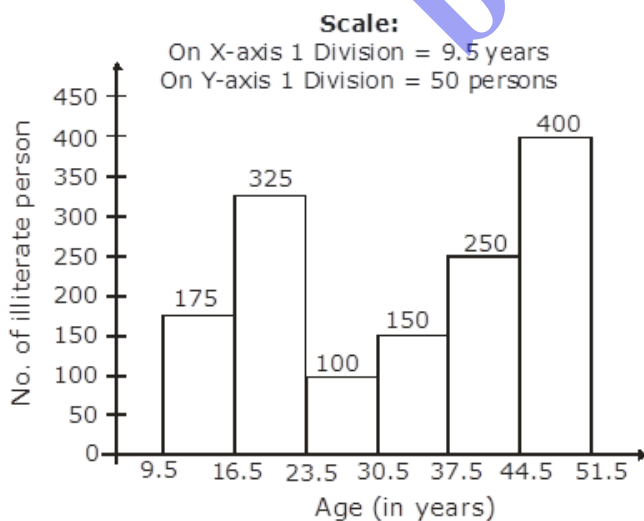
1 big division = 50 person on Y axis

We will draw the rectangles with the class intervals as basis and the corresponding frequency as the height.

The given frequency distribution is in inclusive form. So, convert it in Exclusive form.

| Age (in years) | No. of illiterate person |
|----------------|--------------------------|
| 9.5 - 16.5     | 175                      |
| 16.5 - 23.5    | 325                      |
| 23.5 - 30.5    | 100                      |
| 30.5 - 37.5    | 150                      |
| 37.5 - 44.5    | 250                      |
| 44.5 - 51.5    | 400                      |
| 51.5 - 58.5    | 525                      |

Histogram as shown below:



## 7. Question

Draw a histogram to represent the following data.

|                |       |       |       |       |       |
|----------------|-------|-------|-------|-------|-------|
| Class interval | 10-14 | 14-20 | 20-32 | 32-52 | 52-80 |
| Frequency      | 5     | 6     | 9     | 25    | 21    |

### Answer

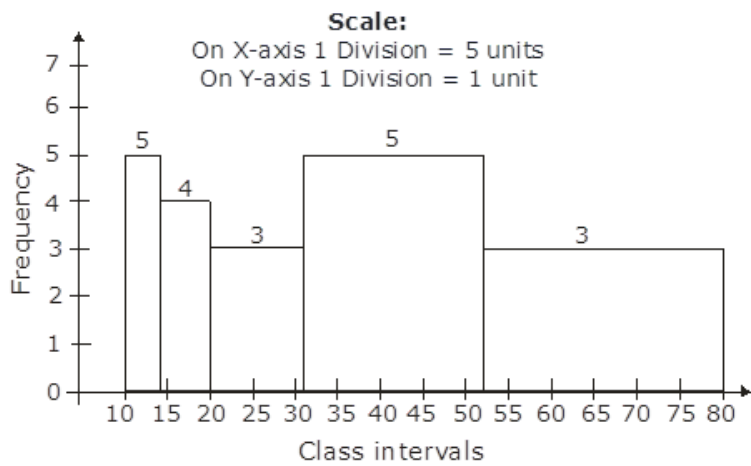
In the given frequency distribution, Class sizes are different.

So, we calculate adjusted frequency for each class, As, minimum class size = 4

Adjusted frequency of a class =  $\frac{\text{Minimum class size}}{\text{class size of the class}} \times \text{its frequency}$

| Class interval | Frequency | Adjusted Frequency           |
|----------------|-----------|------------------------------|
| 10 - 14        | 5         | $\frac{4}{4} \times 5 = 5$   |
| 14 - 20        | 6         | $\frac{4}{6} \times 6 = 6$   |
| 20 - 32        | 9         | $\frac{4}{12} \times 9 = 3$  |
| 32 - 52        | 25        | $\frac{4}{20} \times 25 = 5$ |
| 52 - 80        | 21        | $\frac{4}{28} \times 21 = 3$ |

Histogram is as follows:



### 8. Question

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 |
|--------------------|-------|-------|-------|-------|-------|-------|
| Number of patients | 2     | 5     | 12    | 19    | 9     | 4     |

Represent the above data by a frequency polygon.

### Answer

Let's take two classes interval, first at beginning (0-10) and second at the end (70-80) each with frequency zero.

Now we can draw the frequency table with the help of these two classes,



| Age in years | Class marks | Frequency |
|--------------|-------------|-----------|
| 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         |

Now plot the following points on the graph,

A (5,0)

B (15,2)

C (25, 5)

D (35, 12)

E (45, 19)

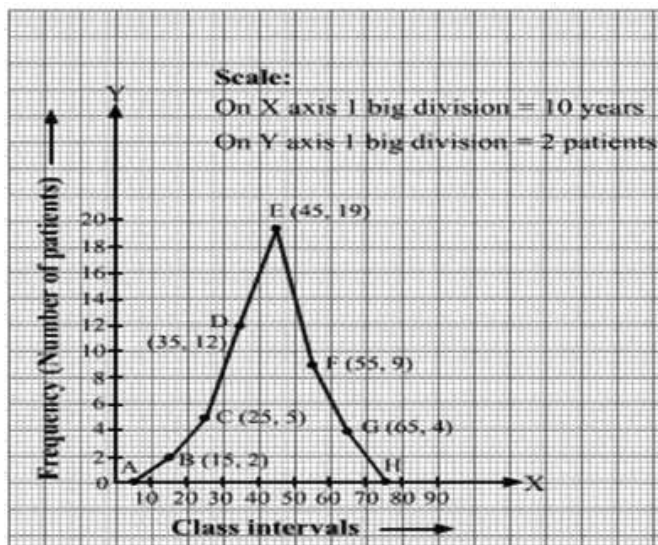
F (55, 9)

G (65, 4)

H (75,0)

Join the points with line segments

AB, BC, CD, DE, EF, FG, GH, to obtain required frequency polygon. As shown in the figure.



### 9. Question

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 |
|--------------------|-------|-------|-------|-------|-------|-------|
| Number of patients | 90    | 40    | 60    | 20    | 120   | 30    |

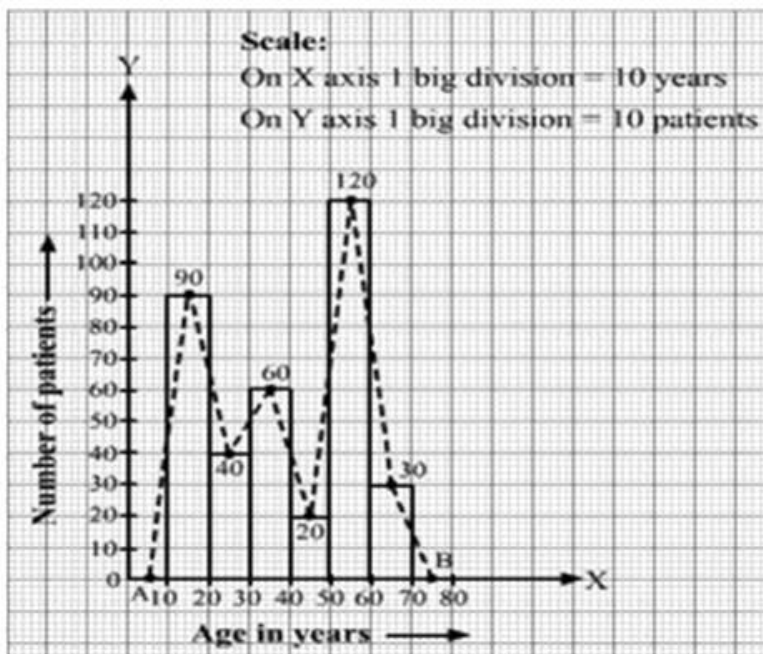
Draw a histogram and a frequency polygon on the same graph to represent the above data.

### Answer

We take imagined class 0 – 10 and 70 – 80, each with frequency zero. The class marks of above classes are 5 and 75 respectively.

So, we plot the points A (5,0) and B (75,0). We join A with the midpoint of the top of the first rectangle and B with the mid-point of the last rectangle.

Thus we obtain a complete frequency polygon,



### 10. Question

Draw a histogram and the frequency polygon from the following data.

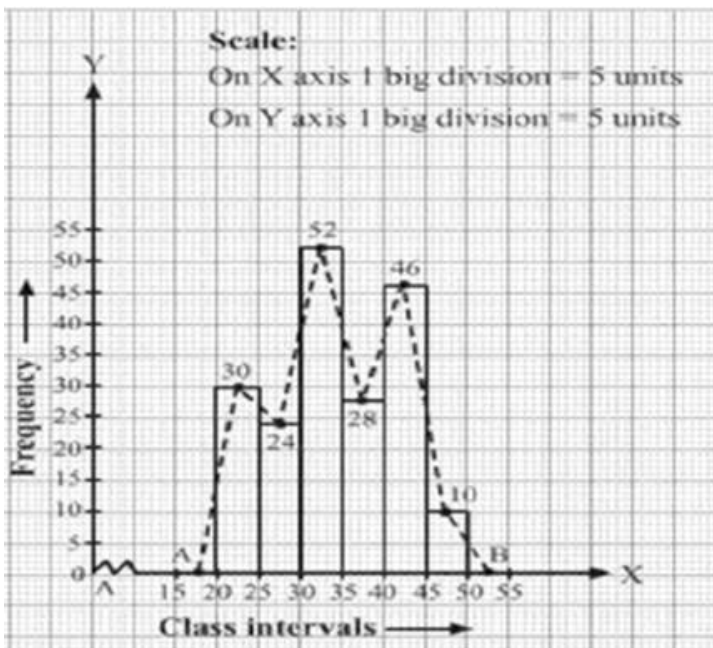
|                |       |       |       |       |       |       |
|----------------|-------|-------|-------|-------|-------|-------|
| Class interval | 20-25 | 25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
| Frequency      | 30    | 24    | 52    | 28    | 46    | 10    |

### Answer

We take imagined class 15-20 and 0-55, each with frequency 0. The class marks of above classes are 17.5 and 52.5 respectively.

So, we plot the points A (17.5, 0) and B (52.5, 0). We join A with the midpoint of the top of the first rectangle and B with the mid-point of the last rectangle.

Thus we obtain a complete frequency polygon,



### 11. Question

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.

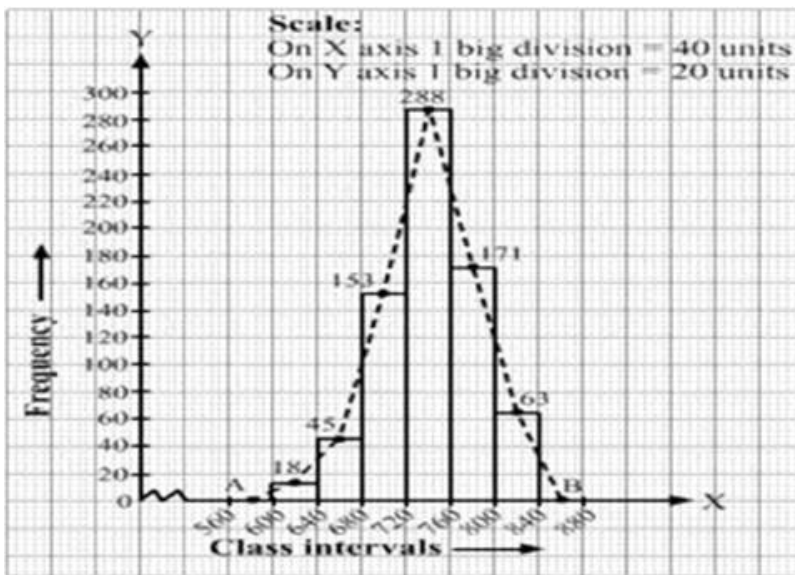
### Answer

We take imagined class 560-600 and 840-880, each with frequency 0. The class marks of above classes are 5 and 75 respectively.

As we can see in the figure the x-axis starts at 560, a break is indicated near the origin to show that the graph is drawn with a scale beginning at 560, not at origin.

So, we plot the points A (580, 0) and B (860, 0). We join A with the midpoint of the top of the first rectangle and B with the mid-point of the last rectangle.

Thus we obtain a complete frequency polygon,



## 12. Question

Draw a frequency polygon for the following frequency distribution.

|                |      |       |       |       |       |       |
|----------------|------|-------|-------|-------|-------|-------|
| Class interval | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 |
| Frequency      | 8    | 3     | 6     | 12    | 2     | 7     |

## Answer

We take the imagined classes  $(-9, 0)$  at the beginning and  $(61-70)$  at the end, each of the frequency 0.

Thus we have,

| Class interval | Class marks | Frequency |
|----------------|-------------|-----------|
| -9 - 0         | -4.5        | 0         |
| 1 - 10         | 5.5         | 8         |
| 11 - 20        | 15.5        | 3         |
| 21 - 30        | 25.5        | 6         |
| 31 - 40        | 35.5        | 12        |
| 41 - 50        | 45.5        | 2         |
| 51 - 60        | 55.5        | 7         |
| 61 - 70        | 65.5        | 0         |

We plot the following points on the graph,

A (-4.5, 0)

B (5.5, 8)

C (15.5, 3)

D (25.5, 6)

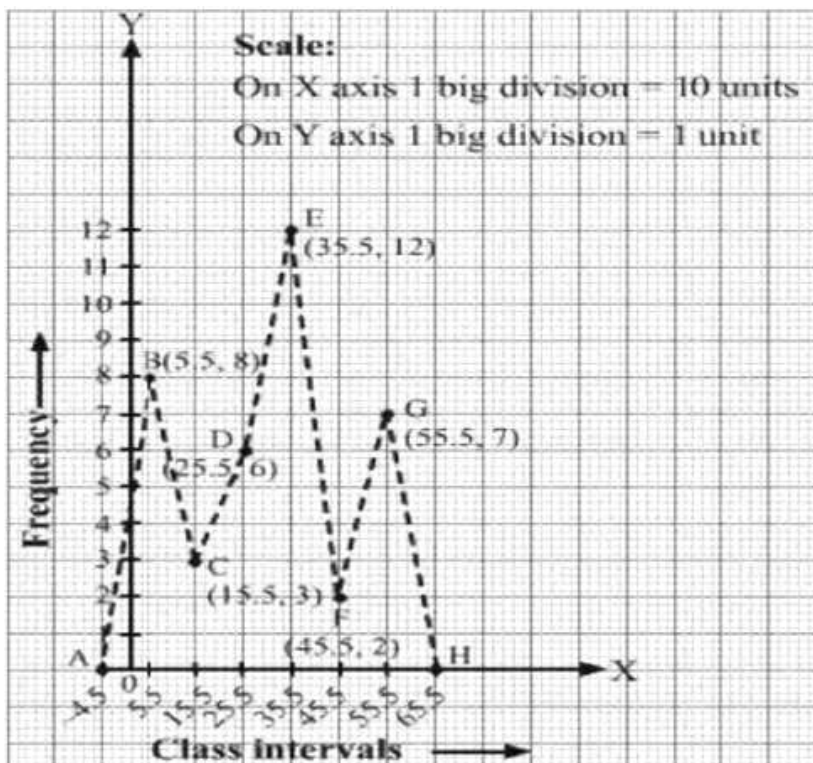
E (35.5, 12)

F (45.5, 2)

G (55.5, 7)

H (65.5, 0)

Now we draw the line segment AB, BC, CD, DE, EF, FG, GH, to obtain the frequency polygon.



## Exercise 14D

### 1. Question

Find the arithmetic mean of

- the first eight natural numbers
- the first ten odd numbers
- the first five prime numbers
- the first six even numbers
- the first seven multiples of 5
- all the factors of 20

### Answer

(i) First eight natural no's are = 1, 2, 3, 4, 5, 6, 7, 8

Sum of these numbers =  $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36$

$$\text{Arithmetic Mean} = \frac{\text{sum of eight natural numbers}}{\text{total numbers}} = \frac{36}{8} = 4.5.$$

(ii) First ten odd numbers are = 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Sum of these numbers =  $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 100$

$$\text{Arithmetic Mean} = \frac{\text{sum of these odd numbers}}{\text{total numbers}} = \frac{100}{10} = 10.$$

(iii) First five prime numbers are = 2, 3, 5, 7, 11

Sum of these numbers =  $2 + 3 + 5 + 7 + 11 = 28$

$$\text{Arithmetic Mean} = \frac{\text{sum of numbers}}{\text{total number}} = \frac{28}{5} = 5.6$$

(iv) First six even numbers are = 2, 4, 6, 8, 10, 12

Sum of these numbers =  $2 + 4 + 6 + 8 + 10 + 12 = 42$

$$\text{Arithmetic Mean} = \frac{\text{sum of numbers}}{\text{total numbers}} = \frac{42}{6} = 7.$$

(v) First seven multiples of 5 are = 5,10,15,20,25,30,35

Sum of these numbers =  $5 + 10 + 15 + 20 + 25 + 30 + 35 = 140$

$$\text{Arithmetic Mean} = \frac{\text{sum of numbers}}{\text{total numbers}} = \frac{140}{7} = 20$$

(vi) All factors of 20 are = 1,2,4,5,10,20

Sum of numbers =  $1 + 2 + 4 + 5 + 10 + 20 = 42$

$$\text{Arithmetic Mean} = \frac{\text{sum of numbers}}{\text{total numbers}} = \frac{42}{6} = 7$$

## 2. Question

The number of children in 10 families of a locality are

2, 4, 3, 4, 2, 0, 3, 5, 1, 6.

Find the mean number of children per family.

### Answer

Sum of numbers of children in families =  $2 + 4 + 3 + 4 + 2 + 0 + 3 + 5 + 1 + 6 = 30$

Total number of family = 10

$$\text{Mean number of children per family} = \frac{\text{sum of numbers of children}}{\text{total no. of family}} = \frac{30}{10} = 3.$$

## 3. Question

The following are the number of books issued in a school library during a week:

105, 216, 322, 167, 273, 405 and 346.

Find the average number of books issued per day.

### Answer

Sum of numbers of books issued in a week =  $105 + 216 + 322 + 167 + 273 + 405 + 346 = 1632$

Total number of days = 7

$$\text{No. of books issued per day} = \frac{\text{sum of numbers of books in a week}}{\text{no. of days in week}} = \frac{1632}{7} = 262.$$

## 4. Question

The daily minimum temperature recorded (in degree F) at a place during a week was as under:

| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|--------|---------|-----------|----------|--------|----------|
| 35.5   | 30.8    | 27.3      | 32.1     | 23.8   | 29.9     |

Find the mean temperature.



**Answer**

Sum of temperature during whole week =  $35.5 + 30.8 + 27.3 + 32.1 + 23.8 + 29.9 =$

Total number of days = 6

$$\text{Mean temperature} = \frac{\text{sum of temperature during whole week}}{\text{no. of days}} = \frac{179.4}{6} = 29.9^\circ\text{F.}$$

**5. Question**

The percentage of marks obtained by 12 students of a class in mathematics are

64, 36, 47, 23, 0, 19, 81, 93, 72, 35, 3, 1.

Find the mean percentage of marks.

**Answer**

Sum of percentage of marks =  $64 + 36 + 47 + 23 + 0 + 19 + 81 + 93 + 72 + 35 + 3 + 1 = 474$

Number of students = 12

$$\text{Mean percentage of marks} = \frac{\text{sum of marks}}{\text{no. of student}} = \frac{474}{12} = 39.5.$$

**6. Question**

If the arithmetic mean of 7, 9, 11, 13, x, 21 is 13, find the value of x.

**Answer**

Sum of numbers =  $7 + 9 + 11 + 13 + x + 21 = 61 + x$

Number of observation = 6

$$\text{Arithmetic Mean} = \frac{\text{sum of numbers}}{\text{no. of observations}}$$

$$= 13 = \frac{61 + x}{6}$$

$$= 61 + x = 13 \times 6 = 78$$

$$= x = 78 - 61 = 17.$$

**7. Question**

The mean of 24 numbers is 35. If 3 is added to each number, what will be the new mean?

**Answer**

Given,

Mean of 24 numbers = 35

Sum of these numbers =  $24 \times 35 = 840$ .

Every number is increased by 3,

Total increment =  $24 \times 3 = 72$

New sum =  $840 + 72 = 912$

$$\text{New Mean} = \frac{\text{new sum}}{\text{total numbers}} = \frac{912}{24} = 38.$$

**8. Question**

The mean of 20 numbers is 43. If 6 is subtracted from each of the numbers, what will be the new mean?

**Answer**

Given,

Mean of 20 numbers = 43

Sum of these numbers =  $20 \times 43 = 860$

When, every number is decreased by 6,

Total decrease in sum =  $20 \times 6 = 120$

New sum will be =  $860 - 120 = 740$

$$\text{New Mean} = \frac{\text{New sum}}{\text{total numbers}} = \frac{740}{20} = 37.$$

### 9. Question

The man of 15 numbers is 27. If each number is multiplied by 4, what will be the mean of the new numbers?

#### Answer

Given,

Mean of 15 numbers = 27

Sum of these numbers =  $15 \times 27 = 405$

When, every number is multiplied by 4,

The new sum becomes =  $405 \times 4 = 1620$

$$\text{New Mean} = \frac{\text{New sum}}{\text{total numbers}} = \frac{1620}{15} = 108.$$

### 10. Question

The mean of 12 numbers is 40. If each number is divided by 8, what will be the mean of the new numbers?

#### Answer

Given,

Mean of 12 numbers = 40

Sum of these numbers =  $12 \times 40 = 480$

When each number is divided by 8

$$\text{The new sum becomes} = \frac{480}{8} = 60.$$

$$\text{New mean} = \frac{\text{new sum}}{\text{total numbers}} = \frac{60}{12} = 5.$$

### 11. Question

The mean of 20 numbers is 18. If 3 is added to each of the first ten numbers, find the mean of the new set of 20 numbers.

#### Answer

Given,

Mean of 20 numbers = 18.

Sum of these numbers =  $20 \times 18 = 360$ .

When 3 is added to each of the first ten numbers,

Total increment in sum =  $10 \times 3 = 30$ .

New sum becomes =  $360 + 30 = 390$

$$\text{Mean of New set of numbers} = \frac{\text{New sum of numbers}}{\text{total numbers}} = \frac{390}{20} = \frac{39}{2} = 19.5.$$

## 12. Question

The mean weight of 6 boys in a group is 48 kg. The individual weights of five of them are 51 kg, 45 kg, 49 kg, 46 kg and 44 kg. Find the weight of the sixth boy.

### Answer

Given,

Mean weight of 6 boys = 48 kg

Sum of their weights =  $6 \times 48 = 288$  kg

Sum of weight of 5 boys =  $51 + 45 + 49 + 46 + 44 = 235$  kg

Hence,

Weight of sixth boy = total weight – weight of 5 boys =  $288 - 235 = 53$  kg.

## 13. Question

The mean of the marks scored by 50 students was found to be 39. Later on it was discovered that a score of 43 was misread as 23. Find the correct mean.

### Answer

Given,

Mean of marks of 50 students = 39

Sum of marks =  $50 \times 39 = 1950$

It is given that he misread 43 as 23, so,

Correct sum = Sum obtained +  $(43 - 23) = 1950 + 20 = 1970$ .

$$\text{Correct Mean} = \frac{\text{correct sum}}{\text{total number of students}} = \frac{1970}{50} = 39.4$$

## 14. Question

The mean of 100 items was found to be 64. Later on it was discovered that two items were misread as 26 and 9 instead of 36 and 90 respectively. Find the correct mean.

### Answer

Given,

Mean of 100 items = 64

Sum of items =  $100 \times 64 = 6400$ .

It is given that 26 and 9 were misread as 36 and 90, so,

Correct sum =  $6400 + (36 - 26) + (90 - 9) = 6400 + 91 = 6491$

$$\text{Correct Mean} = \frac{\text{correct sum}}{\text{total numbers of items}} = \frac{6491}{100} = 64.91.$$

## 15. Question

The mean of six numbers is 23. If one of the numbers is excluded, the mean of the remaining numbers is 20. Find the excluded number.

### Answer

Given,

Mean of 6 numbers = 23

$$\text{Sum of numbers} = 23 \times 6 = 138$$

$$\text{Mean of 5 numbers} = 20 \text{ (Given)}$$

$$\text{Sum of 5 numbers} = 20 \times 5 = 100$$

So,

$$\text{The excluded number} = \text{Sum of 6 numbers} - \text{Sum of 5 numbers} = 138 - 100 = 38.$$

## Exercise 14E

### 1. Question

The mean mark obtained by 7 students in a group is 226. If the marks obtained by six of them are 340, 180, 260, 56, 275 and 307 respectively, find the marks obtained by the seventh student.

#### Answer

Given,

$$\text{Mean marks of 7 students} = 226$$

$$\text{Total marks of 7 students} = 7 \times 226 = 1582$$

$$\text{Total marks of 6 students} = (340 + 180 + 260 + 56 + 275 + 307)$$

$$\text{Marks of the 7}^{\text{th}} \text{ students} = (\text{total marks of 7 students}) - (\text{total marks of 6 students})$$

$$= 1582 - 1418 = 164$$

Hence the marks of the 7<sup>th</sup> student are 164.

### 2. Question

The mean weight of a class of 34 students is 46.5 kg. If the weight of the teacher is included, the mean rises by 500 g. Find the weight of the teacher.

#### Answer

$$\text{Mean weight of 34 students} = 46.5 \text{ kg}$$

$$\text{Total weight of 34 students} = 34 \times 46.5 = 1581 \text{ kg}$$

$$\text{If the weight of a teacher is included then mean arises} = 500 \text{ gm} = 0.5 \text{ kg}$$

$$\text{So new mean} = 46.5 + 0.5 = 47 \text{ kg}$$

$$\text{Total weight} = 47 \times 35 = 1645 \text{ kg}$$

$$\text{Weight of a teacher} = 1645 - 1581 = 64 \text{ kg}$$

Hence the weight of a teacher is 64 kg.

### 3. Question

The mean weight of a class of 36 students is 41 kg. If one of the students leaves the class then the mean is decreased by 200 g. Find the weight of the student who left.

#### Answer

$$\text{Mean weight of 36 students} = 41 \text{ kg}$$

$$\text{Total weight of 36 students} = 36 \times 41 = 1476 \text{ kg}$$

$$\text{If one student leaves the class then mean decreases} = 200 \text{ gm} = 0.2 \text{ kg}$$

$$\text{So new mean} = 41 - 0.2 = 40.8 \text{ kg}$$

$$\text{Total weight of 35 students} = 40.8 \times 35 = 1428 \text{ kg}$$

$$\text{Weight of the student} = 1476 - 1428 = 48 \text{ kg}$$

Hence the weight of the student who left the class is 48 kg.

#### 4. Question

The average weight of a class of 39 students is 40 kg. When a new student is admitted to the class, the average decreases by 200 g. Find the weight of the new student.

#### Answer

Mean weight of 39 students = 40kg

Total weight of 39 students =  $39 \times 40 = 1560$  kg

If a new student is admitted to the class, the average decrease by = 200g = 0.2 kg

So new average weight =  $40 - 0.2 = 39.8$ kg

Total weight of 39 students and 1 new student =  $39.8 \times 40 = 1592$  kg

Weight of new student =  $1592 - 1560 = 32$ kg

Hence the weight of the new student is 32 kg.

#### 5. Question

The average monthly salary of 20 workers in an office is ₹ 7650. if the manager's salary is added, the average salary becomes ₹ 8200 per month. What is the manager's salary per month?

#### Answer

Average monthly salary of 20 workers = 7650 Rs

Total salary of 20 workers per month =  $20 \times 7650 = 153000$ Rs

The wage of one member of the group = 8100 Rs

New average salary of 20 workers and manager = 8200 per month

Let suppose salary of manager is x

The new average (20 workers + manager) =  $\frac{153000 + x}{21} = 8200$  (given)

$= 153000 + x = 8200 \times 21$

$153000 + x = 172200$

$x = 172200 - 153000$

$x = 19200$  Rs

Hence salary of manager is 19200Rs.

#### 6. Question

The average monthly wage of a group of 10 persons is ₹ 9000. One member of the group, whose monthly wage is ₹ 8100, leaves the group and is replaced by a new member whose monthly wage is ₹ 7200. Find the new monthly average wage.

#### Answer

Average monthly wage of 10 persons = 9,000Rs

Total wage of 10 person =  $10 \times 9000 = 90,000$  Rs

The wage of one member of the group = 8100 Rs

When one member leaves the group then total wage of 9 person =  $90000 - 8100$  Rs

The wage of new member = 7200 Rs

When new member join to the group then total wage of 10 person =  $81900 + 7200 = 89100$ Rs

$$\text{New monthly average} = \frac{\text{new total wage of 10 person}}{\text{no. of persons}} = \frac{89100}{10} = 8910 \text{ Rs}$$

Hence new monthly average is 8910 Rs.

## 7. Question

The average monthly consumption of petrol for a car for the first 7 months of a year is 330 litres, and for the next 5 months is 270 liters. What is the average consumption per month during the whole year?

### Answer

Average monthly consumption of petrol for 7 months = 330 liters

Total consumption for 7 months =  $7 \times 330 = 2310$  liters

Average consumption for next 5 months = 270 liters

Total consumption for next 5 months =  $5 \times 270 = 1350$  liters

Total consumption during whole year =  $2310 + 1350 = 3660$  liters

Now,

$$\text{Average consumption per month during whole year} = \frac{\text{Total consumption during whole year}}{\text{no. of months in a year}}$$

$$= \frac{3660}{12} = 305 \text{ liter/per month}$$

## 8. Question

Find the mean of 25 numbers if the mean of 15 of them is 18 and the mean of the remaining numbers is 13.

### Answer

Mean of 15 numbers = 18

Sum of 15 numbers =  $18 \times 15 = 270$

Mean of remaining 10 numbers = 13

Sum of remaining 10 numbers =  $10 \times 13 = 130$

$$\text{Mean of 25 numbers} = \frac{\text{sum of 15 numbers} + \text{sum of 10 number}}{25}$$

$$= \frac{270 + 130}{25} = \frac{400}{25} = 16$$

Hence mean of 25 numbers is 16.

## 9. Question

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

### Answer

Mean weight of 60 students = 52.75 kg

Sum of weight of 60 students =  $60 \times 52.75 = 3165$  kg

Mean weight of 25 students of them = 51kg

Sum of weight of 25 students =  $51 \times 25 = 1275$  kg

Sum of weight of remaining 35 students = Sum of weight of 60 students - Sum of weight of 25 students  
 $= 3165 - 1275 = 1890$  kg

$$\text{Mean of remaining 35 students} = \frac{\text{Sum of weight of 35 students}}{35} = \frac{1890}{35} = 54\text{kg}$$

Hence mean of remaining students is 54kg.

### 10. Question

The average weight of 10 oarsmen in a boat is increased by 1.5 kg when one of the crew who weights 58 kg is replaced by a new man. Find the weight of the new man.

### Answer

Let the average weight of 10 oarsmen be x kg

Sum of weight of 10 oarsmen = 10x kg

When new man is added to the crew in place of another man then the average increases by = 1.5 kg

So, new average weight = (x + 1.5)kg

$$\text{New average weight} = \frac{\text{sum of weight of 10 oarsmen} - 58 \text{ kg} + \text{weight of new man}}{10}$$

$$x + 1.5 = \frac{10x - 58 + \text{weight of new man}}{10}$$

$$10x - 58 + \text{weight of new mean} = 10(x + 1.5)$$

$$10x - 58 + \text{weight of new mean} = 10x + 15$$

$$\text{Weight of new mean} = 15 + 10x - 10x + 58$$

$$\text{Weight of new mean} = 73 \text{ kg}$$

Hence Weight of the new man in the crew is 73kg.

### 11. Question

The mean of 8 numbers is 35. If a number is excluded then the mean is reduced by 3. Find the excluded number.

### Answer

Mean of 8 numbers = 35

Sum of 8 numbers = 8×35 = 280

New mean = 35-3 = 32

Sum of 7 numbers = 32×7 = 224

Excluded number = sum of 8 numbers – sum of 7 numbers

$$= 280 - 224 = 56$$

So, the excluded number is 56.

### 12. Question

The mean of 150 items was found to be 60. Later on, it was discovered that the values of two items were misread as 52 and 8 instead of 152 and 88 respectively. Find the correct mean.

### Answer

Calculated mean of 150 items = 60

Incorrect sum of 150 items = 60×150 = 9000

Correct sum of 150 items = (incorrect sum) - (incorrect items) + (correct items)

$$= 9000 - (52 + 8) + (152 + 88)$$

$$= 9000 - 60 + 240$$

$$= 9240 - 60 = 9180$$

$$\text{Correct mean} = \frac{\text{correct sum}}{150} = \frac{9180}{150} = \frac{918}{15} = 61.2$$

So, correct mean is 61.2.

### 13. Question

The mean of 31 results is 60. If the mean of the first 16 results is 58 and that of the last 16 results is 62, find the 16<sup>th</sup> results.

#### Answer

Mean of 31 results = 60

$$\text{Sum of 31 results} = 31 \times 60 = 1860$$

Mean of first 16 results = 58

$$\text{Sum of first 16 results} = 58 \times 16 = 928$$

Mean of last 16 results = 62

$$\text{Sum of last 16 results} = 62 \times 16 = 992$$

$$16^{\text{th}} \text{ result} = \text{sum of first 16 results} + \text{sum of last 16 results} - \text{sum of 31 results}$$

$$= 992 + 928 - 1860 = 60$$

So, 16<sup>th</sup> result is 60.

### 14. Question

The mean of 11 numbers is 42. If the mean of the first 6 numbers is 37 and that of the last 6 numbers is 46, find the 6<sup>th</sup> number.

#### Answer

Given,

Mean of 11 number = 42

$$\text{So, Sum of numbers} = 11 \times 42 = 462.$$

Mean of first 6 numbers = 37.

$$\text{Hence, sum of first six numbers} = 6 \times 37 = 222.$$

Mean of last 6 numbers = 46

$$\text{Sum of last 6 numbers} = 6 \times 46 = 276.$$

So,

$$\text{The 6}^{\text{th}} \text{ number} = (\text{sum of first 6 numbers and last 6 numbers}) - (\text{Sum of 11 numbers})$$

$$= (222 + 276) - 462 = 498 - 462 = 36.$$

The 6<sup>th</sup> number is 36.

### 15. Question

The mean weight of 25 students of a class is 52 kg. If the mean weight of the first 13 students of the class is 48 kg and that of the last 13 students is 55 kg. find the weight of the 13<sup>th</sup> student.

#### Answer

Given,

$$\text{Mean weight of 25 students} = 52 \text{ kg}$$



Total weight of 25 students =  $25 \times 52 = 1300$  kg

Mean weight of first 13 students = 48 kg

Total weight of First 13 students =  $13 \times 48 = 624$  kg

Mean weight of last 13 students = 55 kg

Total weight of last 13 students =  $13 \times 55 = 715$  kg

So,

Weight of 13<sup>th</sup> student = (sum of weight of first 13 and last 13 students) – (wt. of 25 students)

=  $(624 + 715) - 1300 = 1339 - 1300 = 39$  kg

Hence, Weight of 13<sup>th</sup> student = 39 kg.

### 16. Question

The mean score of 25 observations is 80 and the mean score of another 55 observations is 60. Determine the mean score of the whole set of observations.

#### Answer

Given,

Mean score of 25 observations = 80

Total score of 25 observations =  $25 \times 80 = 2000$ .

Mean score of another 55 observations = 60

Total score of 55 observations =  $55 \times 60 = 3300$ .

Total observations =  $55 + 25 = 80$

Mean score of whole set of observations =  $\frac{\text{total score of 25 observations \& 55 observations}}{\text{total number of observations}}$

$$= \frac{2000 + 3300}{80} = \frac{5300}{80} = \frac{530}{8} = 66.25.$$

Hence, Mean score of whole set is 66.25.

### 17. Question

Arun scored 36 marks in English, 44 marks in Hindi, 75 marks in mathematics and x marks in science. If he has secured an average of 50 marks, find the value of x.

#### Answer

Given,

Marks obtained in English = 36

Marks obtained in Hindi = 44

Marks obtained in Maths = 75

Marks obtained in Science = x

Average marks of all subjects = 50

We know that,

$$\text{Average marks} = \frac{\text{sum of marks in all subjects}}{\text{No. of subjects}} = \frac{36 + 44 + 75 + x}{4}$$

$$= 50 = \frac{36 + 44 + 75 + x}{4}$$

$$= 50 \times 4 = 155 + x$$

$$= x = 200 - 155 = 45.$$

Hence, Marks in science = 45.

### 18. Question

The mean monthly salary paid to 75 workers in a factory is ₹ 5680. The mean salary of 25 of them is ₹ 5400 and that of 30 others is ₹ 5700. Find the mean salary of the remaining workers.

### Answer

Given,

Mean salary of 75 workers = Rs.5680

Total salary of 75 workers =  $75 \times 5680 = \text{Rs.}426000$

Mean salary of 25 workers of them = Rs.5400

Total salary of 25 workers =  $25 \times 5400 = \text{Rs.}135000$

Mean salary of 30 workers in them = Rs.5700

Total salary of 30 workers =  $30 \times 5700 = \text{Rs.}171000$

Let Mean salary of remaining 20 workers = Rs. X

Total salary of 20 workers will be = Rs.20x

So, we have,

Salary of 75 workers = salary of (25 workers + 30 workers + 20 workers)

$$426000 = 135000 + 171000 + 20x$$

$$= 20x = 426000 - 306000 = 120000$$

$$= x = \frac{120000}{20} = 6000.$$

Hence, Salary of 20 workers = Rs.6000.

### 19. Question

A ship sails out to an island at the rate of 15 km/h and sails back to the starting point at 10 km/h. Find the average sailing speed for the whole journey.

### Answer

Given,

Speed of ship in sailing direction (x) = 15 km/h

Speed of ship in sailing back (y) = 10 km/h

So, By using direct formula,

$$\text{Average speed of ship in whole journey} = \frac{2xy}{x+y} = \frac{2 \times 15 \times 10}{25} = \frac{300}{25} = 12 \text{ km/h}$$

Hence, Average speed of ship = 12 km/h

### 20. Question

There are 50 students in a class, of which 40 are boys. The average weight of the class is 44 kg and that the girls is 40 kg. Find the average weight of the boys.

### Answer

Given,

Average weight of 50 students in class = 44 kg

Total weight of 50 students =  $50 \times 44 = 2200$  kg

Number of girls = 50 – number of boys =  $50 - 40 = 10$

Average weight of 10 girls = 40 kg

Total weight of 10 girls =  $10 \times 40 = 400$  kg

Hence,

Total weight of 40 boys in class = total weight of class – weight of girls

=  $2200 - 400 = 1800$  kg

Average weight of boys =  $\frac{\text{total weight}}{\text{number of boys}} = \frac{1800}{40} = 45 \text{ kg}$

Hence, Average weight of 40 boys = 45 kg.

### Exercise 14F

#### 1. Question

Find the mean of daily wages of 60 workers in a factory as per data given below:

|                     |    |     |     |     |     |
|---------------------|----|-----|-----|-----|-----|
| Daily wages (in Rs) | 90 | 110 | 120 | 130 | 150 |
| No. of workers      | 12 | 14  | 13  | 11  | 10  |

#### Answer

Let's draw the table and calculate the total frequency.

To calculate mean we need the relative value of variables which is  $x_i \times f_i$ . To attain  $x_i \times f_i$  we have to multiply the value of variables ( $x_i$ ) to the frequency of the value ( $f_i$ ).

| Daily wages (in Rs) ( $x_i$ ) | No. of workers ( $f_i$ ) | ( $x_i \times f_i$ )           |
|-------------------------------|--------------------------|--------------------------------|
| 90                            | 12                       | 1080                           |
| 110                           | 14                       | 1540                           |
| 120                           | 13                       | 1560                           |
| 130                           | 11                       | 1430                           |
| 150                           | 10                       | 1500                           |
|                               | $\Sigma f_i = 60$        | $\Sigma x_i \times f_i = 7110$ |

By putting the formula of;

$$\text{Mean} = \frac{\Sigma f_i \times x_i}{\Sigma f_i}$$

$$= \frac{7110}{60} = \frac{711}{6}$$

$$= 118.50$$

## 2. Question

The following table shows the weights of 12 workers in a factory.

| Weight (in kg) | 60 | 63 | 66 | 69 | 72 |
|----------------|----|----|----|----|----|
| No. of workers | 4  | 3  | 2  | 2  | 1  |

Find the mean weight of the workers.

**Answer**

Let's draw the table and calculate the relative value of variables.

| Weight (in kg) ( $x_i$ ) | No. of workers ( $f_i$ ) | ( $x_i \times f_i$ )          |
|--------------------------|--------------------------|-------------------------------|
| 60                       | 4                        | 240                           |
| 63                       | 3                        | 189                           |
| 66                       | 2                        | 132                           |
| 69                       | 2                        | 138                           |
| 72                       | 1                        | 72                            |
|                          | $\Sigma f_i = 12$        | $\Sigma x_i \times f_i = 771$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\Sigma f_i \times x_i}{\Sigma f_i} = \frac{771}{12}$$

$$= 64.25 \text{ kg}$$

So the mean weight of the workers will be 64.25kg.

### 3. Question

The following data give the number of boys of a particular age in a class of 40 students.

| Age (in years)      | 15 | 16 | 17 | 18 | 19 | 20 |
|---------------------|----|----|----|----|----|----|
| Frequency ( $f_i$ ) | 3  | 8  | 9  | 11 | 6  | 3  |

Calculate the mean age of the students.

**Answer**

Let's draw the table and calculate the relative value of variables  $\sum x_i \times f_i$

| Age (in years) ( $x_i$ ) | Frequency ( $f_i$ ) | ( $x_i \times f_i$ )        |
|--------------------------|---------------------|-----------------------------|
| 15                       | 3                   | 45                          |
| 16                       | 8                   | 128                         |
| 17                       | 9                   | 153                         |
| 18                       | 11                  | 198                         |
| 19                       | 6                   | 114                         |
| 20                       | 3                   | 60                          |
|                          | $\sum f_i = 40$     | $\sum x_i \times f_i = 698$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\sum f_i \times x_i}{\sum f_i} = \frac{698}{40}$$

$$= 17.45 \text{ years}$$

So the mean age of the students will be 17.45 years.

#### 4. Question

Find the mean of the following frequency distribution:

|                     |    |    |    |    |    |
|---------------------|----|----|----|----|----|
| Variable ( $x_i$ )  | 10 | 30 | 50 | 70 | 89 |
| Frequency ( $f_i$ ) | 7  | 8  | 10 | 15 | 10 |

### Answer

Let's draw the table and calculate the relative value of variables.

| Variables ( $x_i$ ) | frequency ( $f_i$ ) | ( $x_i \times f_i$ )           |
|---------------------|---------------------|--------------------------------|
| 10                  | 7                   | 70                             |
| 30                  | 8                   | 240                            |
| 50                  | 10                  | 500                            |
| 70                  | 15                  | 1050                           |
| 89                  | 10                  | 890                            |
|                     | $\Sigma f_i = 50$   | $\Sigma x_i \times f_i = 2750$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\Sigma f_i \times x_i}{\Sigma f_i} = \frac{2750}{50} = \frac{275}{5}$$

$$= 55$$

So the mean of the given distribution will be 55.

### 5. Question

If the mean of the following frequency distribution is 8, find the value of p.

|   |   |   |    |   |    |    |
|---|---|---|----|---|----|----|
| X | 3 | 5 | 7  | 9 | 11 | 13 |
| F | 6 | 8 | 15 | P | 8  | 4  |

### Answer

Let's draw the table and calculate the relative value of variables  $\sum x_i \times f_i$

| $(x_i)$ | $(f_i)$             | $(x_i \times f_i)$               |
|---------|---------------------|----------------------------------|
| 3       | 6                   | 18                               |
| 5       | 8                   | 40                               |
| 7       | 15                  | 105                              |
| 9       | P                   | 9P                               |
| 11      | 8                   | 88                               |
| 13      | 4                   | 52                               |
|         | $\sum f_i = 41 + P$ | $\sum x_i \times f_i = 303 + 9P$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\sum f_i \times x_i}{\sum f_i} = 8(\text{given})$$

So we have,



$$\frac{303 + 9P}{41 + P} = 8$$

$$303 + 9P = 8(41 + P)$$

$$303 + 9P = 328 + 8P$$

$$9P - 8P = 328 - 303$$

$$P = 25$$

Hence the value of the P is 25.

### 6. Question

Find the missing frequency p for the following frequency distribution whose mean is 28.25.

|   |    |    |    |    |    |    |
|---|----|----|----|----|----|----|
| X | 15 | 20 | 25 | 30 | 35 | 40 |
| F | 8  | 7  | P  | 14 | 15 | 6  |

### Answer

Let's draw the table and calculate the relative value of variables  $\sum x_i \times f_i$

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| $(x_i)$ | $(f_i)$               | $(x_i \times f_i)$                   |
|---------|-----------------------|--------------------------------------|
| 15      | 8                     | 120                                  |
| 20      | 7                     | 140                                  |
| 25      | P                     | 25P                                  |
| 30      | 14                    | 420                                  |
| 35      | 15                    | 525                                  |
| 40      | 6                     | 240                                  |
|         | $\Sigma f_i = 50 + P$ | $\Sigma x_i \times f_i = 1445 + 25P$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\Sigma f_i \times x_i}{\Sigma f_i} = 28.25 \text{ (given)}$$

$$28.25 = \frac{1445 + 25P}{50 + P}$$

$$28.25(50 + P) = 1445 + 25P$$

$$28.25 \times 50 + 28.25 \times P = 1445 + 25P$$

$$1412.50 + 28.25P = 1445 + 25P =$$

$$28.25P - 25P = 1445 - 1412.50$$

$$3.25P = 32.5$$

$$P = \frac{32.5}{3.25} \times \frac{100}{10}$$

$$= \frac{3250}{325} = 10$$

Hence the value of P is 10.

### 7. Question

Find the value of  $p$  for the following frequency distribution whose mean is 16.6.

|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| X | 8  | 12 | 15 | P  | 20 | 25 | 30 |
| F | 12 | 16 | 20 | 24 | 16 | 8  | 4  |

### Answer

| $x_i$ | $f_i$              | $x_i \times f_i$                     |
|-------|--------------------|--------------------------------------|
| 8     | 12                 | 96                                   |
| 12    | 16                 | 192                                  |
| 15    | 20                 | 300                                  |
| P     | 24                 | 24P                                  |
| 20    | 16                 | 320                                  |
| 25    | 8                  | 200                                  |
| 30    | 4                  | 120                                  |
|       | $\Sigma f_i = 100$ | $\Sigma x_i \times f_i = 1228 + 24P$ |

By putting the formula of mean we get;

$$\text{Mean} = \frac{\sum f_i \times x_i}{\sum f_i} = 16.6 \text{ (given)}$$

$$16.6 = \frac{1228 + 24P}{100}$$

$$16.6 \times 100 = 1228 + 24P$$

$$\frac{166 \times 100}{10} = 1228 + 24P$$

$$1660 = 1228 + 24P$$

$$24P = 1660 - 1228$$

$$24P = 432$$

$$P = \frac{432}{24} = 18$$

So, the value of P is 18.

### 8. Question

Find the missing frequencies in the following frequency distribution, whose mean is 50.

|   |    |       |    |       |    |       |
|---|----|-------|----|-------|----|-------|
| X | 10 | 30    | 50 | 70    | 90 | Total |
| Y | 17 | $f_1$ | 32 | $f_2$ | 19 | 120   |

### Answer

Let's draw the table and calculate the relative value of variables  $\sum x_i \times f_i$

| $(x_i)$ | $(f_i)$                       | $(x_i \times f_i)$                             |
|---------|-------------------------------|--|
| 10      | 17                            | 170  |
| 30      | $f_1$                         | $30f_1$  |
| 50      | 32                            | 1600   |
| 70      | $f_2$                         | $70f_2$  |
| 90      | 19                            | 1710   |
|         | $\Sigma f_i = 68 + f_1 + f_2$ | $\Sigma x_i \times f_i = 3480 + 30f_1 + 70f_2$ |

We have,

$$\Sigma f_i = 120 \text{ (given)}$$

$$\Sigma f_i = 68 + f_1 + f_2 = 120$$

$$f_1 + f_2 = 120 - 68$$

$$f_1 + f_2 = 52 \dots \text{Equation (i)}$$

Now we have,

$$\text{Mean} = 50 \text{ (given)}$$

$$\text{Mean} = \frac{\Sigma f_i \times x_i}{\Sigma f_i} = 50$$

$$50 = \frac{3480 + 30f_1 + 70f_2}{68 + f_1 + f_2}$$

$$50 \times 68 + f_1 + f_2 = 3480 + 30f_1 + 70f_2$$

$$3400 + 50f_1 + 50f_2 = 3480 + 30f_1 + 70f_2$$

$$50f_1 - 30f_1 + 50f_2 - 70f_2 = 3480 - 3400$$

$$20f_1 - 20f_2 = 80$$

$$20(f_1 - f_2) = 80$$

$$f_1 - f_2 = \frac{80}{20} = 4 \dots \dots \text{Equation (ii)}$$

by adding equation (i) and (ii) we get,

$$\Sigma f_1 = 56$$

$$f_1 = \frac{56}{2} = 28$$

From equation (ii)

$$f_1 - f_2 = 4$$

$$28 - f_2 = 4$$

$$f_2 = 28 - 4 = 24$$

Hence missing frequencies are  $f_1 = 28$  and  $f_2 = 24$ .

### 9. Question

Use the *assumed-mean method* to find the mean weekly wages from the data given below.

|                      |     |     |     |     |     |     |      |
|----------------------|-----|-----|-----|-----|-----|-----|------|
| Weekly wages (in Rs) | 800 | 820 | 860 | 900 | 920 | 980 | 1000 |
| No. of workers       | 7   | 14  | 19  | 25  | 20  | 10  | 5    |

### Answer

Let assume mean be  $A = 900$

Now we can arrange data in below format

| Weekly wages (in Rs) ( $x_i$ ) | No. of workers ( $f_i$ ) | $d_i = x_i - A$ | $f_i \times d_i$                |
|--------------------------------|--------------------------|-----------------|---------------------------------|
| 800                            | 7                        | -100            | -700                            |
| 820                            | 14                       | -80             | -1120                           |
| 860                            | 19                       | -40             | -760                            |
| 900                            | 25                       | 0               | 0                               |
| 920                            | 20                       | 20              | 400                             |
| 980                            | 10                       | 80              | 800                             |
| 1000                           | 5                        | 100             | 500                             |
|                                | $\Sigma f_i = 100$       |                 | $\Sigma(d_i \times f_i) = -880$ |

We have,

$$\text{Mean} = A + \frac{\Sigma f_i \times d_i}{\Sigma f_i} = 900 + \frac{-880}{100}$$

$$= 900 - \frac{880}{100}$$

$$= 900 - 8.80$$

$$= 891.21$$

Hence the mean is 891.21

#### 10. Question

Use the *assumed-mean method* to find the mean height of the plants from the following frequency-distribution table.

|                         |    |    |    |    |    |
|-------------------------|----|----|----|----|----|
| Height in cm ( $x_i$ )  | 61 | 64 | 67 | 70 | 73 |
| No. of plants ( $f_i$ ) | 5  | 18 | 42 | 27 | 8  |

### Answer

Let the assumed mean be  $A = 67$

So, we arrange the given data as under :

| Height (in cm)<br>( $x_i$ ) | No. of plants<br>( $f_i$ ) | $=d_i = x_i - A$ | $= d_i \times f_i$    |
|-----------------------------|----------------------------|------------------|-----------------------|
| 61                          | 5                          | -6               | -30                   |
| 64                          | 18                         | -3               | -54                   |
| 67                          | 42                         | 0                | 0                     |
| 70                          | 27                         | 3                | 81                    |
| 73                          | 8                          | 6                | 48                    |
|                             | $\Sigma f_i = 100$         |                  | $\Sigma x_i f_i = 45$ |

We know,

$$\text{Mean} = A + \frac{\Sigma f_i \times d_i}{\Sigma f_i} = 67 + \frac{45}{100} = 67 + 0.45 = 67.45.$$

Hence, The mean height of the plants = 67.45 cm.



**11. Question**

Use the *step-deviation method* to find the arithmetic mean from the following data.

|   |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|
| X | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| F | 170 | 320 | 530 | 700 | 230 | 140 | 110 |

**Answer**

Let the assumed mean be  $A = 21$

$$= h = x_2 - x_1 = 19 - 18 = 1$$

Thus, we prepare the table given below:

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| $x_i$ | $f_i$               | $u_i = \frac{x_i - A}{1}$ | $u_i \times f_i$               |
|-------|---------------------|---------------------------|--------------------------------|
| 18    | 170                 | -3                        | -510                           |
| 19    | 320                 | -2                        | -640                           |
| 20    | 530                 | -1                        | -330                           |
| 21    | 700                 | 0                         | 0                              |
| 22    | 230                 | 1                         | 230                            |
| 23    | 140                 | 2                         | 280                            |
| 24    | 110                 | 3                         | 330                            |
|       | $\Sigma f_i = 2200$ |                           | $\Sigma u_i \times f_i = -840$ |

We Know that,

$$\text{Mean} = A + \frac{\Sigma f_i \times u_i}{\Sigma f_i} \times h = 21 + \frac{-840}{2200} \times 1 = 21 - \frac{84}{220} = \frac{4620-84}{220} = \frac{4536}{220} = 20.62.$$

Hence, The Mean value of given distribution = 20.62.

## 12. Question

The table given below gives the distribution of villages and their heights from the sea level in a certain region.

|                    |     |     |      |      |      |      |
|--------------------|-----|-----|------|------|------|------|
| Height (in meters) | 200 | 600 | 1000 | 1400 | 1800 | 2200 |
| No. of villages    | 142 | 265 | 560  | 271  | 89   | 16   |

Compute the mean height, using the *step-deviation method*.

**Answer**

Let the assumed Mean be  $A = 1400$

$$= h = x_2 - x_1 = 600 - 200 = 400$$

Thus, we prepare the table as below:

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| Height (in meter) | No. of villages     | $u_i = \frac{x_i - 1400}{400}$ | $u_i \times f_i$                |
|-------------------|---------------------|--------------------------------|---------------------------------|
| $x_i$             | $f_i$               |                                |                                 |
| 200               | 142                 | -3                             | -426                            |
| 600               | 265                 | -2                             | -530                            |
| 1000              | 560                 | -1                             | -560                            |
| 1400 = A          | 271                 | 0                              | 0                               |
| 1800              | 89                  | 1                              | 89                              |
| 2200              | 16                  | 2                              | 32                              |
|                   | $\Sigma f_i = 1343$ |                                | $\Sigma u_i \times f_i = -1395$ |

We know that,

$$\text{Mean} = A + \frac{\Sigma f_i \times u_i}{\Sigma f_i} \times h = 1400 + \frac{(-1395)}{1343} \times 400$$

$$= 1400 - \frac{558000}{1343} = \frac{1322200}{1343} = 984.51$$

Hence, The Mean height is 984.51.

## Exercise 14G

### 1. Question

Find the median of

(i) 2, 10, 9, 9, 5, 2, 3, 7, 11

(ii) 15, 6, 16, 8, 22, 21, 9, 18, 25

(iii) 20, 13, 18, 25, 6, 15, 21, 9, 16, 8, 22

(iv) 7, 4, 2, 5, 1, 4, 0, 10, 3, 8, 5, 9, 2

### Answer

To find median first we must arrange the data in either ascending order or descending order. (i) By arranging the data in ascending order

We have;

2, 2, 3, 5, 7, 9, 9, 10, 11

Total number of observations,  $N = 9$  (Odd number)

Since the No. 9 is odd so we apply the formula as

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

$$= \frac{9+1}{2} = \frac{10}{2} = 5$$

= value of 5<sup>th</sup> term

Median = 7

(ii) By arranging the data in ascending order

We have;

6, 8, 9, 15, 16, 18, 21, 22, 25

$N = 9$  (odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

$$= \frac{9+1}{2} = \frac{10}{2} = 5$$

= value of 5<sup>th</sup> term

Median = 16

(iii) By arranging the data in ascending order

We have;

6, 8, 9, 13, 15, 16, 18, 20, 21, 22, 25

$N = 11$  (Odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

$$= \frac{11+1}{2} = \frac{12}{2} = 6$$

= value of 6<sup>th</sup> term

Median = 16

(iv) By arranging the data in ascending order

We have;

0, 1, 2, 2, 3, 4, 4, 5, 5, 7, 8, 9, 10

$N = 13$  (Odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

$$= \frac{13+1}{2} = \frac{14}{2} = 7$$

= value of 7<sup>th</sup> term

Median = 4

## 2. Question

Find the median of

(i) 17, 19, 32, 10, 22, 21, 9, 35

(ii) 72, 63, 29, 51, 35, 60, 55, 91, 85, 82

(iii) 10, 75, 3, 15, 9, 47, 12, 48, 4, 81, 17, 27

## Answer

(i) By arranging the data in ascending order

9, 10, 17, 19, 21, 22, 32, 35

We have;

N = 8 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left(\frac{N}{2}\right)^{th} \text{ term} + \text{size of the } \left(\frac{N}{2} + 1\right)^{th} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 4th term} + \text{size of the 5th term}]$$

$$= \frac{1}{2} (19 + 21) = \frac{40}{2}$$

Median = 20

(ii) By arranging the data in ascending order

29, 35, 51, 55, 60, 63, 72, 82, 85, 91

We have;

N = 10 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left(\frac{N}{2}\right)^{th} \text{ term} + \text{size of the } \left(\frac{N}{2} + 1\right)^{th} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 5th term} + \text{size of the 6th term}]$$

$$= \frac{1}{2} (60 + 63) = \frac{123}{2}$$

Median = 61.5

(iii) By arranging the data in ascending order

3, 4, 9, 10, 12, 15, 17, 27, 47, 48, 75, 81

We have;

N = 12 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left(\frac{N}{2}\right)^{th} \text{ term} + \text{size of the } \left(\frac{N}{2} + 1\right)^{th} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 6th term} + \text{size of the 7th term}]$$

$$= \frac{1}{2} (15 + 17) = \frac{32}{2}$$

Median = 16

### 3. Question

The marks of 15 students in an examination are:

25, 19, 17, 24, 23, 29, 31, 40, 19, 20, 22, 26, 17, 35, 21.

Find the median score.

### Answer

By arranging the data in ascending order

We have;

17, 17, 19, 19, 20, 21, 22, 23, 24, 25, 26, 29, 31, 35, 40

N = 15 (odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)$ th term

$$= \frac{15+1}{2} = \frac{16}{2} = 8$$

= value of 8<sup>th</sup> term

= 23

**Hence the Median marks are 23.**

### 4. Question

The heights (in cm) of 9 girls are:

144.2, 148.5, 143.7, 149.6, 150, 146.5, 145, 147.3, 152.1.

Find the median height.

### Answer

By arranging the data in ascending order

We have;

143.7, 144.2, 145, 146.5, 147.3, 148.5, 149.6, 150, 152.1

N = 9 (Odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)$ th term

$$= \frac{9+1}{2} = \frac{10}{2} = 5$$

= value of 5<sup>th</sup> term

Median height = 147.3 cm

### 5. Question

The weights (in kg) of 8 children are:

13.4, 10.6, 12.7, 17.2, 14.3, 15, 16.5, 9.8.

Find the median weight.

**Answer**

By arranging the weight in ascending order,

9.8, 10.6, 12.7, 13.4, 14.3, 15, 16.5, 17.2

We have;

$N = 8$  (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 4th term} + \text{size of the 5th term}]$$

$$= \frac{1}{2} (13.4 + 14.3) = \frac{27.7}{2}$$

Median weight = 13.85 kg

**6. Question**

The ages (in years) of 10 teachers in a school are:

32, 44, 53, 47, 37, 54, 34, 36, 40, 50.

Find the median age.

**Answer**

By arranging the ages of teachers in ascending order

32, 34, 36, 37, 40, 44, 47, 50, 53, 54

We have;

$N = 10$  (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 5th term} + \text{size of the 6th term}]$$

$$= \frac{1}{2} (40 + 44) = \frac{84}{2}$$

Median age = 42 years

**7. Question**

If 10, 13, 15, 18,  $x + 1$ ,  $x + 3$ , 30, 32, 35, 41 are ten observations in an ascending order with median 24, find the value of  $x$ .

**Answer**

By arranging the data in ascending order,

10, 13, 15,  $x + 1$ ,  $x + 3$ , 30, 32, 35, 41

We have;

$N = 10$  (even number)

Median = 24 (given)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$24 = \frac{1}{2} [\text{size of the 5th term} + \text{size of the 6th term}]$$



$$24 = \frac{1}{2}[(x + 1) + (x + 3)]$$

$$48 = 2x + 4$$

$$2x = 44$$

$$x = 22$$

Hence the value of  $x = 22$

### 8. Question

Find the median weight for the following data.

|                    |    |    |    |    |    |    |    |
|--------------------|----|----|----|----|----|----|----|
| Weight (in kg)     | 45 | 46 | 48 | 50 | 52 | 54 | 55 |
| Number of students | 8  | 5  | 6  | 9  | 7  | 4  | 2  |

### Answer

By arranging the data in ascending order,

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| Weight (in kg) (x) | Number of students (f) | Cumulative frequency |
|--------------------|------------------------|----------------------|
| 45                 | 8                      | 8                    |
| 46                 | 5                      | 13                   |
| 48                 | 6                      | 19                   |
| 50                 | 9                      | 28                   |
| 52                 | 7                      | 35                   |
| 54                 | 4                      | 39                   |
| 55                 | 2                      | 41                   |
|                    | N = 41                 |                      |

N = 41 (odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

$$= \frac{41+1}{2} = \frac{42}{2} = 21$$

Median is the 21<sup>st</sup> term which is 50.

As we can see student from 20<sup>th</sup> to 28<sup>th</sup> comes under the weight of 50 so the median weight of the student is 50 kg.

### 9. Question

Find the median for the following frequency distribution.

|           |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|
| Variate   | 17 | 20 | 22 | 15 | 30 | 25 |
| Frequency | 5  | 9  | 4  | 3  | 10 | 6  |

### Answer

By arranging the data in the following format,

| Variate (x) | Frequency (f) | Cumulative frequency |
|-------------|---------------|----------------------|
| 17          | 3             | 3                    |
| 20          | 5             | 8                    |
| 22          | 9             | 17                   |
| 15          | 4             | 21                   |
| 30          | 6             | 27                   |
| 25          | 10            | 37                   |
|             | N = 37        |                      |

N = 37 (odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)th$  term

$$= \frac{37+1}{2} = \frac{38}{2} = 19$$

Median is the 19<sup>th</sup> observation, which comes under the observations from 18<sup>th</sup> to 21<sup>st</sup>.

So the median value of observations is 22.

#### 10. Question

Calculate the median for the following data.

|                    |    |   |    |    |    |    |
|--------------------|----|---|----|----|----|----|
| Marks              | 20 | 9 | 25 | 50 | 40 | 80 |
| Number of students | 6  | 4 | 16 | 7  | 8  | 2  |

#### Answer

By arranging the data in table form,

| Marks (x) | Number of students(f) | Cumulative frequency |
|-----------|-----------------------|----------------------|
| 9         | 4                     | 4                    |
| 20        | 6                     | 10                   |
| 25        | 16                    | 26                   |
| 40        | 8                     | 34                   |
| 50        | 7                     | 41                   |
| 80        | 2                     | 43                   |
|           | N = 43                |                      |

N = 43 (odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)th$  term

$$= \frac{43+1}{2} = \frac{44}{2} = 22$$

Median is the marks of 22<sup>nd</sup> student as we know students from 11<sup>th</sup> to 26<sup>th</sup> got 25 marks.

So the median value of observations is 25.

### 11. Question

The heights (in cm) of 50 students of a class are given below:

|                    |     |     |     |     |     |     |     |
|--------------------|-----|-----|-----|-----|-----|-----|-----|
| Height (in cm)     | 156 | 154 | 155 | 151 | 157 | 152 | 153 |
| Number of students | 8   | 4   | 10  | 6   | 7   | 3   | 12  |

Find the median for the following height.

### Answer

By arranging the data in ascending order,

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| Height (in cm) (x) | No. of students (f) | Cumulative frequency |
|--------------------|---------------------|----------------------|
| 151                | 6                   | 6                    |
| 152                | 3                   | 9                    |
| 153                | 12                  | 21                   |
| 154                | 4                   | 25                   |
| 155                | 10                  | 35                   |
| 156                | 8                   | 43                   |
| 157                | 7                   | 50                   |
|                    | N = 50              |                      |

We have,

N = 50 (even number)

$$\begin{aligned} \text{Median} &= \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right] \\ &= \frac{1}{2} [\text{size of the 25th student} + \text{size of the 26th student}] \end{aligned}$$

As we can see height of 25<sup>th</sup> student is 154 and 26<sup>th</sup> student has the height of 155 cm

$$= \frac{1}{2} (154 + 155) = \frac{309}{2} = 154.5$$

So the median height is 154.5cm

## 12. Question

Find the median for the following data:

|           |    |    |    |    |    |    |    |    |
|-----------|----|----|----|----|----|----|----|----|
| Variate   | 23 | 26 | 20 | 30 | 28 | 25 | 18 | 16 |
| Frequency | 4  | 6  | 13 | 5  | 11 | 4  | 8  | 9  |

**Answer**

By arranging data in ascending order,

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| Variate (x) | Frequency (f) | Cumulative frequency |
|-------------|---------------|----------------------|
| 16          | 9             | 9                    |
| 18          | 8             | 17                   |
| 20          | 13            | 30                   |
| 23          | 4             | 34                   |
| 25          | 4             | 38                   |
| 26          | 6             | 44                   |
| 28          | 11            | 55                   |
| 30          | 5             | 60                   |
|             | N = 60        |                      |

We have,

N = 60 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 30th term} + \text{size of the 31st term}]$$

As we can see variate from 18<sup>th</sup> to 30<sup>th</sup> has the size of 20 and from 31<sup>st</sup> to 34<sup>th</sup> has the size of 23.

$$= \frac{1}{2} (20 + 23) = \frac{43}{2} = 21.5$$



Hence median is 21.5.

## Exercise 14H

### 1. Question

Find the mode of the following items.

0, 6, 5, 1, 6, 4, 3, 0, 2, 6, 5, 6

#### Answer

By assigning the given data in ascending order

0, 0, 1, 2, 3, 4, 5, 6, 6, 6, 6

As we can clearly see that 6 has occurred maximum times, and we know that mode is the most appeared value in the set of data values, so 6 is the mode of the given data.

### 2. Question

Determine the mode of the following values of variables.

23, 15, 25, 40, 27, 25, 22, 25, 20

#### Answer

By arranging the given data in ascending order,

15, 20, 22, 23, 25, 25, 27, 40

As we can clearly see that 25 has occurred maximum times, so 25 is the mode of the given data.

### 3. Question

Calculate the mode of the following sizes of shoes sold by a shop on a particular day.

5, 9, 8, 6, 9, 4, 3, 9, 1, 6, 3, 9, 7, 1, 2, 5, 9

#### Answer

By arranging the given data in ascending order,

1, 1, 2, 3, 3, 4, 5, 5, 6, 6, 7, 8, 9, 9, 9, 9, 9

As we can clearly see that 9 has occurred maximum times, so 9 is the mode of the given data.

### 4. Question

A cricket player scored the following runs in 12 one-day matches:

50, 30, 9, 32, 60, 50, 28, 50, 19, 50, 27, 35.

Find his modal score.

#### Answer

By arranging the given data in ascending order,

9, 19, 27, 28, 30, 32, 35, 50, 50, 50, 50, 60

As we can clearly see that the player has scored 50 maximum times, so 50 is the modal of the given data.

To calculate mode by empirical method we have to arrange the data in the form of frequency table,

| Values | Frequency |
|--------|-----------|
| 9      | 1         |
| 19     | 1         |
| 27     | 1         |
| 28     | 1         |
| 30     | 1         |
| 32     | 1         |
| 35     | 1         |
| 50     | 4         |
| 60     | 1         |

As we can see 50 has occurred the maximum times so 50 is the mode of the given data.

### 5. Question

Calculate the mode of each of the following using the empirical formula: 17, 10, 12, 11, 10, 15, 14, 11, 12, 13

### Answer

By arranging the given data in ascending order we will get,

10, 10, 11, 11, 12, 12, 13, 14, 15, 17

| Values (x) | Frequency (f) | Cumulative frequency | fx                |
|------------|---------------|----------------------|-------------------|
| 10         | 2             | 2                    | 20                |
| 11         | 2             | 4                    | 22                |
| 12         | 2             | 6                    | 24                |
| 13         | 1             | 7                    | 13                |
| 14         | 1             | 8                    | 14                |
| 15         | 1             | 9                    | 15                |
| 17         | 1             | 10                   | 17                |
|            | N = 10        |                      | $\Sigma fx = 125$ |

We have;

N = 10 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 5th term} + \text{size of the 6th term}]$$

$$= \frac{1}{2} (12 + 12)$$

$$\text{median} = \frac{24}{2} = 12$$

Now,

$$\Sigma fx = 125 \text{ and } \Sigma f = N = 10$$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{125}{10} = 12.5$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 12 - 2 \times 12.5$$

$$= 36 - 25$$

$$= 11$$

## 6. Question

|                    |    |    |    |    |    |    |    |    |
|--------------------|----|----|----|----|----|----|----|----|
| Marks              | 10 | 11 | 12 | 13 | 14 | 16 | 19 | 20 |
| Number of students | 3  | 5  | 4  | 5  | 2  | 3  | 2  | 1  |

**Answer**

We can draw the table in the given format

[bodhiyla.com](http://bodhiyla.com)

| Marks (x) | Number of students (f) | Cumulative frequency | Fx                |
|-----------|------------------------|----------------------|-------------------|
| 10        | 3                      | 3                    | 30                |
| 11        | 5                      | 8                    | 55                |
| 12        | 4                      | 12                   | 48                |
| 13        | 5                      | 17                   | 65                |
| 14        | 2                      | 19                   | 38                |
| 16        | 3                      | 22                   | 48                |
| 19        | 2                      | 24                   | 38                |
| 20        | 1                      | 25                   | 20                |
|           | N = 25                 |                      | $\Sigma fx = 332$ |

We have;

N = 25 (odd number)

Median = *value of  $\left(\frac{N+1}{2}\right)$ th term*

= value of 13<sup>th</sup> term

= 13

Now,

$\Sigma fx = 332$  and  $\Sigma f = N = 25$

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{332}{25} = 13.28$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 13 - 2 \times 13.28$$

$$= 39 - 26.56$$

$$= 12.44$$

## 7. Question

|               |   |   |   |    |    |    |    |    |
|---------------|---|---|---|----|----|----|----|----|
| Item (x)      | 5 | 7 | 9 | 12 | 14 | 17 | 19 | 21 |
| Frequency (f) | 6 | 5 | 3 | 6  | 5  | 3  | 2  | 4  |

## Answer

Draw the table as below,

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| Items (x) | Frequency (f) | Cumulative frequency | Fx                |
|-----------|---------------|----------------------|-------------------|
| 5         | 6             | 6                    | 30                |
| 7         | 5             | 11                   | 35                |
| 9         | 3             | 14                   | 27                |
| 12        | 6             | 20                   | 72                |
| 14        | 5             | 25                   | 70                |
| 17        | 3             | 28                   | 51                |
| 19        | 2             | 30                   | 38                |
| 21        | 4             | 34                   | 84                |
|           | N = 34        |                      | $\Sigma fx = 407$ |

We have;

N = 34 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 17th term} + \text{size of the 18th term}]$$

$$= \frac{1}{2} (12 + 12)$$

$$\text{median} = \frac{24}{2} = 12$$

Now,

$$\Sigma fx = 407 \text{ and } \Sigma f = N = 34$$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{407}{34} = 11.97$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 12 - 2 \times 11.97$$

$$= 36 - 23.94$$

$$= 12.06$$

### 8. Question

|   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| X | 18 | 20 | 25 | 30 | 34 | 38 | 40 |
| F | 6  | 7  | 3  | 7  | 7  | 5  | 5  |

### Answer

Draw the table as below,

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| (x) | (f)    | Cumulative frequency | Fx                 |
|-----|--------|----------------------|--------------------|
| 18  | 6      | 6                    | 108                |
| 20  | 7      | 13                   | 140                |
| 25  | 3      | 16                   | 75                 |
| 30  | 7      | 23                   | 210                |
| 34  | 7      | 30                   | 238                |
| 38  | 5      | 35                   | 190                |
| 40  | 5      | 40                   | 200                |
|     | N = 40 |                      | $\Sigma fx = 1161$ |

We have;

N = 40 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 20th term} + \text{size of the 21st term}]$$

$$= \frac{1}{2} (30 + 30)$$

$$\text{median} = \frac{60}{2} = 30$$

Now,

$$\Sigma fx = 1161 \text{ and } \Sigma f = N = 40$$

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{1161}{40} = 29.025$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 30 - 2 \times 29$$

$$= 90 - 68$$

$$= 32$$

### 9. Question

The table given below shows the weights (in kg) of 50 persons:

|                   |    |    |    |    |    |    |    |
|-------------------|----|----|----|----|----|----|----|
| Weight (in kg)    | 42 | 47 | 52 | 57 | 62 | 67 | 72 |
| Number of persons | 3  | 8  | 6  | 8  | 11 | 5  | 9  |

Find the mean, median and mode.

### Answer

Draw the table as below,

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| Weight in kg (x) | No. of person (f) | Cumulative frequency | Fx                 |
|------------------|-------------------|----------------------|--------------------|
| 42               | 3                 | 3                    | 126                |
| 47               | 8                 | 11                   | 376                |
| 52               | 6                 | 17                   | 312                |
| 57               | 8                 | 25                   | 456                |
| 62               | 11                | 36                   | 682                |
| 67               | 5                 | 41                   | 335                |
| 72               | 9                 | 50                   | 648                |
|                  | N = 50            |                      | $\Sigma fx = 2935$ |

We have;

N = 50 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 25th term} + \text{size of the 26th term}]$$

$$= \frac{1}{2} (57 + 62)$$

$$\text{median} = \frac{119}{2} = 59.5$$

Now,

$$\Sigma fx = 2935 \text{ and } \Sigma f = N = 50$$

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{2935}{50} = 58.7$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 59.7 - 2 \times 58.7$$

$$= 179.1 - 117.4$$

$$= 61.1 \text{ kg}$$

#### 10. Question

The marks obtained by 80 students in a test are given below:

|                    |   |    |    |    |    |    |
|--------------------|---|----|----|----|----|----|
| Marks              | 4 | 12 | 20 | 28 | 36 | 44 |
| Number of students | 8 | 10 | 16 | 24 | 15 | 7  |

Find the modal marks.

#### Answer

We can draw the table as below,

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| Marks (x) | Number of students (f) | Cumulative frequency | Fx                 |
|-----------|------------------------|----------------------|--------------------|
| 4         | 8                      | 8                    | 32                 |
| 12        | 10                     | 18                   | 120                |
| 20        | 16                     | 36                   | 320                |
| 28        | 24                     | 60                   | 672                |
| 36        | 15                     | 75                   | 540                |
| 44        | 7                      | 80                   | 308                |
|           | N = 80                 |                      | $\Sigma fx = 1992$ |

We have;

N = 80 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 40th term} + \text{size of the 41 term}]$$

$$= \frac{1}{2} (28 + 28)$$

$$\text{median} = \frac{56}{2} = 28$$

Now,

$$\Sigma fx = 1992 \text{ and } \Sigma f = N = 80$$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{1992}{80} = 24.9$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 28 - 2 \times 24.9$$

$$= 84 - 49.8$$

$$= 34.2$$

### 11. Question

The ages of the employees of a company are given below:

|                   |    |    |    |    |    |    |    |
|-------------------|----|----|----|----|----|----|----|
| Age (in years)    | 19 | 21 | 23 | 25 | 27 | 29 | 31 |
| Number of persons | 13 | 15 | 16 | 18 | 16 | 15 | 13 |

Find the mean, median and mode for the above data.

### Answer

Draw the tables as given below,

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| Age in years (x) | No. of person (f) | Cumulative frequency | Fx                 |
|------------------|-------------------|----------------------|--------------------|
| 19               | 13                | 13                   | 247                |
| 21               | 15                | 28                   | 315                |
| 23               | 16                | 44                   | 368                |
| 25               | 18                | 62                   | 450                |
| 27               | 16                | 78                   | 432                |
| 29               | 15                | 93                   | 435                |
| 31               | 13                | 106                  | 403                |
|                  | N = 106           |                      | $\Sigma fx = 2650$ |

We have;

N = 106 (even number)

$$\text{Median} = \frac{1}{2} \left[ \text{size of } \left( \frac{N}{2} \right)^{\text{th}} \text{ term} + \text{size of the } \left( \frac{N}{2} + 1 \right)^{\text{th}} \text{ term} \right]$$

$$= \frac{1}{2} [\text{size of the 53rd term} + \text{size of the 54th term}]$$

$$= \frac{1}{2} (25 + 25)$$

$$\text{median} = \frac{50}{2} = 25$$

Now,

$$\Sigma fx = 2650 \text{ and } \Sigma f = N = 106$$

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{2650}{106} = 25$$

Hence,

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 25 - 2 \times 25$$

$$= 75 - 50$$

$$= 25$$

## 12. Question

The following table shows the weights of 12 students.

|                    |    |    |    |    |    |
|--------------------|----|----|----|----|----|
| Weight (in kg)     | 47 | 50 | 53 | 56 | 60 |
| Number of students | 4  | 3  | 2  | 2  | 4  |

## Answer

Draw the table as below,

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| Weight in kg (x) | No. of students (f) | Cumulative frequency | Fx                |
|------------------|---------------------|----------------------|-------------------|
| 47               | 4                   | 4                    | 188               |
| 50               | 3                   | 7                    | 150               |
| 53               | 2                   | 9                    | 106               |
| 56               | 2                   | 11                   | 112               |
| 60               | 4                   | 15                   | 240               |
|                  | N = 15              |                      | $\Sigma fx = 796$ |

We have;

N = 15 (Odd number)

Median = value of the  $\left(\frac{N+1}{2}\right)^{th}$  term

= value of 8<sup>th</sup> term

= 53

Now,

$\Sigma fx = 796$  and  $\Sigma f = N = 15$

Mean =  $\frac{\Sigma fx}{\Sigma f} = \frac{796}{15} = 53.06$

Hence,

Mode = 3(median) – 2 (mean)

= 3×53 - 2×53.06

= 159 - 106.12

= 52.88

So, Mean, median and mode are 53, 53.06 and 52.88

### CCE Questions

### 1. Question

The range of the data

12, 25, 15, 18, 17, 20, 22, 6, 16, 11, 8, 19, 10, 30, 20, 32 is

- A. 10
- B. 15
- C. 18
- D. 26

### Answer

Range = maximum value – minimum value

$$= 32 - 12 = 20$$

∴ **Range = 20**

### 2. Question

The class mark of the class 100-120 is

- A. 100
- B. 110
- C. 115
- D. 120

### Answer

Class interval = 100 – 120 (given)

We know that,

Class marks =  $\frac{1}{2}$  (upper class limit + lower class limit)

$$= \frac{1}{2} (100 + 120) = \frac{1}{2} \times 220 = 110$$

So, Class marks = 110.

### 3. Question

In the class intervals 10-20, 20-30, the number 20 is included in

- A. 10-20
- B. 20-30
- C. in each of 10-20 and 20-30
- D. in none of 10-20 and 20-30

### Answer

The number 20 is included in class-interval 20 – 30,

Because,

Class interval 20 – 30 contains values, which are either equal to 20 or less than 30.

### 4. Question

The class marks of a frequency distribution are 15, 20, 25, 30.....

The class corresponding to the class mark 20 is

- A. 12.5-17.5

B. 17.5-22.5

C. 18.5-21.5

D. 19.5-20.5

**Answer**

Class marks = 20 (given)

Class size =  $20 - 15 = 5$

Lower class limit =  $(20 - 5/2) = 20 - 2.5 = 17.5$

Upper class limit =  $(20 + 5/2) = 20 + 2.5 = 22.5$ .

Hence,

Class mark 20 will lie in class 17.5 – 22.5

**5. Question**

In a frequency distribution, the mid-value of a class is 10 and width of each class is 6. The lower limit of the class is

A. 6

B. 7

C. 8

D. 12

**Answer**

Let the upper limit of class =  $u$

Let lower limit of class =  $l$

Mid value = 10 (given)

We know that,

Mid value =  $1/2 (u + l)$

$10 = 1/2 (u + l)$

$= u + l = 20 \dots\dots\dots(i)$

Width of class = 6 (given)

$= u - l = 6 \dots\dots\dots(ii)$

Subtracting equation (ii) from equation (i), we get,

$2l = 14$

$= l = 14/2 = 7$ .

$\therefore$  lower limit = 7.

**6. Question**

Let  $m$  be the midpoint and  $u$  be the upper class limit of a class in a continuous distribution. The lower class limit of the class is

A.  $2m - u$

B.  $2m + u$

C.  $m - u$

D.  $m + u$

**Answer**

We know that,

$$\text{Mid-point} = \frac{1}{2} (\text{upper class limit} + \text{lower class limit})$$

$$m = \frac{1}{2} (\text{upper class limit} + \text{lower class limit})$$

$$\text{upper class limit} = u \text{ (given)}$$

$$u + \text{lower class limit} = 2m$$

$$\text{lower class limit} = 2m - u .$$

**7. Question**

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

- A. 45
- B. 25
- C. 35
- D. 40

**Answer**

$$\text{Width of each class} = 5 \text{ (given)}$$

$$\text{Total no. Of classes} = 5 \text{ (given)}$$

$$\text{Lower class limit of lowest class} = 10 \text{ (given)}$$

$$\therefore \text{Total width of class} = 5 \times 5 = 25$$

$$\therefore \text{upper class limit of highest class} = 10 + 25 = 35.$$

**8. Question**

Let  $L$  be the lower class boundary of a class in a frequency distribution and  $m$  be the midpoint of the class. Which one of the following is the upper class boundary of the class?

A.  $m + \frac{(m + L)}{2}$

B.  $L + \frac{m + L}{2}$

C.  $2m - L$

D.  $m - 2L$

**Answer**

Given,

$$\text{Mid-point of class} = m$$

We know that,

$$\text{Mid-point} = \frac{1}{2} (\text{upper class limit} + \text{lower class limit})$$

$$m = \frac{1}{2} (\text{upper class limit} + \text{lower class limit})$$

$$\text{lower class limit} = l \text{ (given)}$$

upper class limit + l = 2m

upper class limit = 2m - l .

### 9. Question

The mid-value of a class interval is 42 and the class size is 10. The lower and upper limits are

- A. 37-47
- B. 37.5-47.5
- C. 36.5-47.5
- D. 36.5-46.5

### Answer

Given,

Mid value of class interval = 42

Class size = 10

Let the upper limit of class = u

Let lower limit of class = l

We know that,

Mild value =  $\frac{1}{2} (u + l)$

$$42 = \frac{1}{2} (u + l)$$

$$= u + l = 84 \dots \dots \dots (i)$$

Class size = u - l

$$= u - l = 10 \text{ (given)}$$

Adding equation (ii) & equation (i), we get,

$$2u = 94$$

$$\Rightarrow u = 94/2 = 47.$$

From equation (ii)

$$u - l = 10$$

$$l = 47 - 10 = 37.$$

### 10. Question

If the mean of five observations x, x + 2, x + 4, x + 6 and x + 8 is 11, then the value of x is

- A. 5
- B. 6
- C. 7
- D. 8

### Answer

Mean of 5 observations =  $\frac{\text{sum of observations}}{\text{no.of observation}}$

$$\Rightarrow \text{Mean} = \frac{x + x + 2 + x + 4 + x + 6 + x + 8}{5}$$

Mean = 11 (given)

$$\Rightarrow \frac{x+x+2+x+4+x+6+x+8}{5} = 11$$

$$\Rightarrow 5x + 20 = 55$$

$$\Rightarrow 5x = 55 - 20 = 35$$

$$\Rightarrow x = \frac{35}{5} = 7.$$

### 11. Question

If the mean of  $x, x + 3, x + 5, x + 7, x + 10$  is 9, the mean of the last three observation is

A.  $10\frac{1}{3}$

B.  $10\frac{2}{3}$

C.  $11\frac{1}{3}$

D.  $11\frac{2}{3}$

### Answer

$$\text{Mean of 5 observations} = \frac{\text{sum of observations}}{\text{no. of observation}}$$

$$\Rightarrow \text{Mean of 5 observations} = \frac{x+x+3+x+5+x+7+x+10}{5}$$

$$\Rightarrow \text{Mean} = 9 \text{ (given)}$$

$$\Rightarrow \frac{x+x+3+x+5+x+7+x+10}{5} = 9$$

$$\Rightarrow 5x + 25 = 45$$

$$\Rightarrow 5x = 45 - 25 = 20$$

$$\Rightarrow x = \frac{20}{5} = 4.$$

Now,

$$\text{Mean of three observations} = \frac{(x+5) + (x+7) + (x+10)}{3}$$

$$\Rightarrow \text{Mean} = \frac{(4+5) + (4+7) + (4+10)}{3}$$

$$\Rightarrow \text{Mean} = \frac{34}{3}$$

$$\Rightarrow \text{Mean} = 11\frac{1}{3}.$$

### 12. Question

If  $\bar{X}$  is the mean of  $x_1, x_2, x_3, \dots, x_n$ , then  $\sum_{i=1}^n (x_i - \bar{X}) = ?$

A. -1

- B. 0
- C. 1
- D. n-1

**Answer**

$$\text{Mean of } x_1, x_2, x_3, \dots, x_n = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

$$\Rightarrow \text{Mean of } x_1, x_2, x_3, \dots, x_n = \bar{X} \dots\dots\dots(i)$$

Now,

$$\Rightarrow \sum_{i=1}^n (x_i - \bar{X})$$

$$\Rightarrow \sum_{i=1}^n x_i - \bar{X} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} - \bar{X}$$

$$\Rightarrow \bar{X} - \bar{X} = 0.$$

**13. Question**

If each observation of a data is increased by 5, then their mean

- A. remains the same
- B. becomes 5 times the original mean
- C. is decreased by 5
- D. is increased by 5

**Answer**

Let the observations be  $x_1, x_2, x_3, \dots, x_n$

$$\text{Mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \bar{X} \dots\dots(i)$$

If each observation is increased by 5, we get,

$$x_1 + 5, x_2 + 5, x_3 + 5, \dots, x_n + 5$$

$$\text{New mean} = \frac{x_1 + 5 + x_2 + 5 + x_3 + 5 + \dots + x_n + 5}{n}$$

$$\Rightarrow \text{New mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n + 5 \times n}{n}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} + \frac{5n}{n}$$

$$\Rightarrow \text{Mean} = \bar{X} + 5$$

Thus, the mean is also increased by 5.

**14. Question**

Let  $\bar{X}$  be the mean of  $x_1, x_2, \dots, x_n$  and  $\bar{Y}$  be the mean of  $y_1, y_2, \dots, y_n$ . If  $\bar{Z}$  is the mean of  $x_1, x_2, \dots, x_n, y_1, y_2, \dots, y_n$ , then  $\bar{Z} = ?$

- A.  $(\bar{X} + \bar{Y})$
- B.  $\frac{1}{2}(\bar{X} + \bar{Y})$

C.  $\frac{1}{n}(\bar{x} + \bar{y})$

D.  $\frac{1}{2n}(\bar{x} + \bar{y})$

**Answer**

$$\frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \bar{x} \text{ (given).....(i)}$$

$$\frac{y_1 + y_2 + y_3 + \dots + y_n}{n} = \bar{y} \text{ (given).....(ii)}$$

Now, their combined mean is,

$$\begin{aligned} &= \left( \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} + \frac{y_1 + y_2 + y_3 + \dots + y_n}{n} \right) \\ &= \frac{x_1 + x_2 + x_3 + \dots + x_n + y_1 + y_2 + y_3 + \dots + y_n}{2n} \\ &= \frac{1}{2} \left[ \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} + \frac{y_1 + y_2 + y_3 + \dots + y_n}{n} \right] \end{aligned}$$

From equation (i) and eq.(ii)..

$$= \frac{1}{2}(\bar{x} + \bar{y})$$

### 15. Question

If  $\bar{x}$  is the mean of  $x_1, x_2, \dots, x_n$  then for  $a \neq 0$ , the mean of  $ax_1, ax_2, \dots, ax_n, \frac{x_1}{a}, \frac{x_2}{a}, \dots, \frac{x_n}{a}$  is

A.  $\left(a + \frac{1}{a}\right)\bar{x}$

B.  $\left(a + \frac{1}{a}\right)\frac{\bar{x}}{2}$

C.  $\left(a + \frac{1}{a}\right)\frac{\bar{x}}{n}$

D.  $\frac{\left(a + \frac{1}{a}\right)\bar{x}}{2n}$

**Answer**

It is given that  $\frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \bar{x} \dots (i)$

$$\text{Required mean} = \frac{(ax_1 + ax_2 + ax_3 + \dots + ax_n) + \left(\frac{x_1}{a} + \frac{x_2}{a} + \frac{x_3}{a} + \dots + \frac{x_n}{a}\right)}{2n}$$

$$\Rightarrow \text{Mean} = \frac{(ax_1 + ax_2 + ax_3 + \dots + ax_n)}{2n}$$



$$\Rightarrow \text{Mean} = \frac{1}{2} \left[ \frac{a(x_1 + x_2 + x_3 + \dots + x_n)}{n} + \frac{x_1 + x_2 + x_3 + \dots + x_n}{an} \right]$$

From equation (i)

$$\Rightarrow \text{Mean} = \frac{1}{2} \left[ a\bar{x} + \frac{1}{a}\bar{x} \right]$$

$$\Rightarrow \text{Mean} = \frac{\bar{x}}{2} \left( a + \frac{1}{a} \right)$$

### 16. Question

If  $\bar{X}_1, \bar{X}_2, \dots, \bar{X}_n$  are the means of  $n$  groups with  $n_1, n_2, \dots, n_n$  number of observations respectively, then the mean  $\bar{X}$  of all the groups taken together is

A.  $\sum_{i=1}^n n_i \bar{X}_i$

B.  $\frac{\sum_{i=1}^n n_i \bar{X}_i}{n^2}$

C.  $\frac{\sum_{i=1}^n n_i \bar{X}_i}{\sum_{i=1}^n n_i}$

D.  $\frac{\sum_{i=1}^n n_i \bar{X}_i}{2n}$

### Answer

$$\text{Sum of all terms} = n_1 \bar{X}_1 + n_2 \bar{X}_2 + n_3 \bar{X}_3 + \dots + n_n \bar{X}_n$$

$$\text{Total number of factors} = n_1 + n_2 + n + \dots + n_n$$

$$\therefore \text{Required mean} = \frac{n_1 \bar{X}_1 + n_2 \bar{X}_2 + n_3 \bar{X}_3 + \dots + n_n \bar{X}_n}{n_1 + n_2 + n + \dots + n_n}$$

$$\frac{\sum_{i=1}^n n_i \bar{X}_i}{\sum_{i=1}^n n_i}$$

### 17. Question

The mean weight of six boys in a group is 48 kg. The individual weights of five of them are 51 kg, 45 kg, 46 kg and 44 kg. The weight of the 6<sup>th</sup> boy is

A. 52 kg

B. 52.8 kg

C. 53 kg

D. 47 kg

### Answer

Given:

Mean weight of 6 boys = 48 kg

Let the weight of the 6<sup>th</sup> boy = x kg

Mean weight =  $\frac{\text{sum of wieght}}{\text{number of boys}}$

$$\Rightarrow \text{Mean weight} = \frac{51 + 45 + 49 + 46 + 44 + x}{6}$$

$$\Rightarrow 48 = \frac{235 + x}{6}$$

$$\Rightarrow 235 + x = 48 \times 6 = 288$$

$$\Rightarrow x = 288 - 235 = 53 \text{ kg}$$

Hence, the weight of the 6<sup>th</sup> boy = 53 kg.

### 18. Question

The mean of the marks scored by 50 students was found to be 39. Later on it was discovered that a score of 43 was misread as 23. The correct mean is

- A. 38.6
- B. 39.4
- C. 39.8
- D. 39.2

### Answer

Given,

No. of students = 50

Mean marks secured by them = 39

$\therefore$  Incorrect sum of marks secured =  $39 \times 50 = 1950$ .

Correct sum = incorrect sum - (incorrect marks) + correct marks

$$= 1950 - 23 + 43 = 1970$$

$$\text{Correct mean} = \frac{1970}{50} = 39.4.$$

### 19. Question

The mean of 100 items was found to be 64. Later on it was discovered that two items were misread as 26 and 9 instead of 36 and 90 respectively. the correct mean is

- A. 64.86
- B. 65.31
- C. 64.91
- D. 64.61

### Answer

Given,

No. of items = 100

Mean of them = 64

∴ Incorrect sum of 100 items =  $64 \times 100 = 6400$ .

Correct sum = incorrect sum – (incorrect marks) + correct marks

$$= 6400 - (26 + 9) + (36 + 90)$$

$$6400 - 35 + 126 = 6491.$$

$$\text{Correct mean} = \frac{6491}{100} = 64.91.$$

## 20. Question

The mean of 100 observations is 50. If one of the observations 50 is replaced by 150, the resulting mean will be

- A. 50.5
- B. 51
- C. 51.5
- D. 52

## Answer

Given:

No. of observations = 100

Mean of them = 50

Sum of observations =  $100 \times 50 = 5000$

It is given that one of observation 50, is replaced by 150.

New sum =  $5000 - 50 + 150 = 5100$ .

$$\text{Resulting mean} = \frac{\text{new sum}}{100} = \frac{5100}{100} = 51$$

## 21. Question

The mean of 25 observations is 36. Out of these observations, the mean of first 13 is 32 and that of the last 13 is 40. The 13<sup>th</sup> observation is

- A. 23
- B. 36
- C. 38
- D. 40

## Answer

Mean of 25 observations 36.

Sum of 25 observations =  $25 \times 36 = 900$ .

Mean of first 13 observations = 32

Sum of first 13 observations =  $13 \times 32 = 416$ .

Means of last 13 observations = 40

Sum of last 13 observations =  $13 \times 40 = 520$ .

Hence,

13<sup>th</sup> observation = (sum of first 13 observation + sum of last 13 observations) – sum of 25 observations.

$$13^{\text{th}} \text{ observation} = 416 + 520 - 900 = 936 - 900 = 36$$

Hence, 13<sup>th</sup> observation = 36.

## 22. Question

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

- A. 46.5
- B. 49.5
- C. 53.5
- D. 56.5

## Answer

Let's take 50 numbers as =  $n_1, n_2, \dots, n_{50}$

And mean =  $x$

Then sum =  $50x$

Now each number is subtracted from 53,

We have,

$53 - n_1, 53 - n_2, \dots, 53 - n_{50}$

Sum becomes =  $53 \times 50 - (n_1 + n_2 + \dots + n_{50})$

Given Mean = - 3.5

So,

$$\frac{53 \times 50 - (n_1 + n_2, \dots, n_{50})}{50} = -3.5$$

$$= 2650 - 50x = 50 \times (-3.5) = -175$$

$$50x = 2875$$

$$x = \frac{2875}{50} = 56.5$$

So, mean of the given numbers will be 56.5

## 23. Question

The mean of the following data is 8.

|   |   |   |    |   |    |    |
|---|---|---|----|---|----|----|
| x | 3 | 5 | 7  | 9 | 11 | 13 |
| y | 6 | 8 | 15 | p | 8  | 4  |

The value of p is

- A. 23
- B. 24
- C. 25

D. 21

**Answer**

Given: Mean = 8

| X  | Y                   | $X \times Y$ |
|----|---------------------|--------------|
| 3  | 6                   | 18           |
| 5  | 8                   | 40           |
| 7  | 15                  | 105          |
| 9  | P                   | 9p           |
| 11 | 8                   | 88           |
| 13 | 4                   | 52           |
|    | $\Sigma y = 41 + p$ | $303 + 9p$   |

$$\text{Mean} = \frac{\Sigma xy}{\Sigma y}$$

$$\Rightarrow 8 = \frac{303 + 9p}{41 + p}$$

On cross multiplying both the sides we get,

$$\Rightarrow 303 + 9p = 8(41 + p)$$

$$\Rightarrow 303 + 9p = 328 + 8p$$

$$\Rightarrow 9p - 8p = 328 - 303$$

$$\Rightarrow p = 25$$

**24. Question**

The runs scored by 11 members of a cricket team are

15, 34, 56, 27, 43, 29, 31, 13, 50, 20, 0

The median score is

- A. 27
- B. 29
- C. 31
- D. 20

**Answer**

Arrange the scored runs in ascending order, we get,

0, 13, 15, 20, 27, 29, 31, 34, 43, 50, 56

Here,  $N = 11$  (odd)

Hence,

$$\text{Mean value} = \text{value of } \frac{N+1}{2} \text{ term} = \frac{11+1}{2} = 6^{\text{th}} \text{ term} = 29$$

**25. Question**

The weight of 10 students (in kgs) are

55, 40, 35, 52, 60, 38, 36, 45, 31, 44

The median weight is

- A. 40 kg
- B. 41 kg
- C. 42 kg
- D. 44 kg

**Answer**

Arrange the weights in ascending order, we get,

31, 35, 36, 38, 40, 44, 50, 52, 55, 60

Here,  $N = 10$  (even)

Hence,

$$\text{Mean weight} = \text{value of } \frac{1}{2} \left[ \text{value of } \frac{N}{2} \text{ term} + \text{value of } \left( \frac{N}{2} + 1 \right) \text{ term} \right]$$

$$= \frac{1}{2} [40 + 44]$$

$$\Rightarrow \text{Mean weight} = \frac{84}{2}$$

$$\therefore \text{Mean weight} = 42 \text{ kg}$$

**26. Question**

The median of the numbers 4, 4, 5, 7, 6, 7, 7, 12, 3 is

- A. 4
- B. 5
- C. 6
- D. 7

**Answer**

Arrange the numbers in ascending order, we get,

3, 4, 4, 5, 6, 7, 7, 7, 12.

Here,  $N = 9$  (odd)

Hence,

$$\text{Median} = \text{value of } \frac{N+1}{2} \text{ term} = \frac{11+1}{2}$$

$\Rightarrow$  5<sup>th</sup> term which is 6.

**27. Question**

The median of the numbers 84, 78, 54, 56, 68, 22, 34, 45, 39, 54 is

- A. 45
- B. 49.5
- C. 54
- D. 56

**Answer**

Arrange the given numbers in ascending order,

We get,

22, 34, 39, 45, 54, 54, 56, 68, 78, 84

Here,  $N = 10$  (even)

Hence,

$$\text{Median} = \frac{1}{2} [\text{value of 5th term} + \text{value of 6th term}]$$

$$= \frac{1}{2} [54 + 54] = \frac{108}{2} = 54$$

**28. Question**

Mode of the data 15, 17, 15, 19, 14, 18, 15, 14, 16, 15, 14, 20, 19, 14, 15 is

- A. 14
- B. 15
- C. 16
- D. 17

**Answer**

Let's prepare a table,

| x  | Frequency |
|----|-----------|
| 14 | 4         |
| 15 | 5         |
| 16 | 1         |
| 17 | 1         |
| 18 | 1         |
| 19 | 2         |
| 20 | 1         |

Mode is the number which appeared maximum numbers of times.

In this given series 15 has the highest frequency,

So,

Mode = 15

### 29. Question

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

- A. upper limits of the classes
- B. lower limits of the classes
- C. class marks of the classes
- D. upper limits of preceding classes

### Answer

When we draw a frequency polygon of a continuous frequency distribution, we need to plot the class marks of the given classes on the x-axis.



### 30. Question

The marks obtained by 17 students of a class in a test (out of 100) are given below:

90, 79, 76, 82, 46, 64, 72, 49, 68, 66, 48, 91, 82, 100, 96, 65, 84

The range data is

- A. 46
- B. 54
- C. 90
- D. 100

### Answer

Formula of range = maximum value – minimum value

So, we have,

Maximum marks = 100

Minimum marks = 46

Range = 100 – 46 = 54

### 31. Question

The class mark of the class 130-150 is

- A. 130
- B. 135
- C. 140
- D. 145

### Answer

Formula to calculate the class mark, =  $\frac{1}{2}$  [ Upper class limit + lower class limit]

Upper class = 150

Lower class = 130

So, we get,

$$= \frac{1}{2} [150 + 130] = \frac{280}{2}$$
$$= 140$$

### 32. Question

The mean of five numbers is 30. If one number is excluded, their mean becomes 28. The excluded number is

- A. 28
- B. 30
- C. 35
- D. 38

### Answer

Given,

The mean of five numbers = 30

Now to calculate the sum of these five numbers we have to multiply the mean by 5,

So, we get,

$$\text{Sum of five numbers} = 5 \times 30 = 150$$

Change in the mean when one number is excluded, it become = 28

$$\text{Sum of remaining four numbers} = 4 \times 28 = 112$$

Now to find out the excluded number we have to subtract the sum of four numbers from the sum of five numbers,

We get,

The excluded number = sum of five numbers - sum of four numbers

$$= 150 - 112 = 38$$

### 33. Question

The median of the data arranged in ascending order 8, 9, 12, 18,  $(x + 2)$ ,  $(x + 4)$ , 30, 31, 34, 39 is 24. The value of  $x$  is

A. 22

B. 21

C. 20

D. 24

### Answer

Given data = 8, 9, 12, 18,  $(x + 2)$ ,  $(x + 4)$ , 30, 31, 34, 39

We have  $n = 10$  (even)

Median =  $\frac{1}{2}$  [Value of  $(\frac{n}{2})$ th term +  $(\frac{n}{2} + 1)$ th term]

Now, Median = 24 (given)

$$24 = \frac{1}{2} [\text{Value of 5}^{\text{th}} \text{ term} + \text{Value of 6}^{\text{th}} \text{ term}]$$

$$24 \times 2 = (x + 2) + (x + 4)$$

$$48 = 2x + 6$$

$$48 - 6 = 2x$$

$$42 = 2x$$

So,

$$x = \frac{42}{2} = 21$$

### 34. Question

The question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

| Assertion (A)   | Reason (R)                  |
|---|-----------------------------|
| The mean of 15 numbers is 25. If 6 is subtracted from each number, the mean of new numbers is 19. | Mode = 3(median) - 2(mean). |

- A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).  
 B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).  
 C. Assertion (A) is true and Reason (R) is false.  
 D. Assertion (A) is false and Reason (R) is true.

**Answer**

Let suppose 15 numbers are =  $n_1, n_2, \dots, n_{15}$

$$\text{Mean} = \frac{n_1 + n_2 + \dots + n_{15}}{15}$$

Given mean = 25

$$25 = \frac{n_1 + n_2 + \dots + n_{15}}{15}$$

$$\Rightarrow n_1 + n_2 + \dots + n_{15} = 25 \times 15$$

$$\Rightarrow n_1 + n_2 + \dots + n_{15} = 375 \dots \text{[equation (i)]}$$

After subtracting 6 from each number the mean = 19

So, we have,

$$(n_1 - 6), (n_2 - 6), \dots, (n_{15} - 6)$$

$$\Rightarrow \text{Mean} = \frac{(n_1 - 6) + (n_2 - 6) + \dots + (n_{15} - 6)}{15}$$

$$\Rightarrow \text{Mean} = \frac{(n_1 + n_2 + \dots + n_{15}) - 6 \times 15}{15}$$

$$\Rightarrow \text{Mean} = \frac{n_1 + n_2 + \dots + n_{15}}{15} - \frac{6 \times 15}{15}$$

From equation (i)

$$\Rightarrow \text{Mean} = \frac{375}{15} - \frac{6 \times 15}{15}$$

$$\Rightarrow \text{Mean} = 25 - 6 = 19$$

It means assertion (A) is true,

Reason (R)  $\Rightarrow$  by empirical formula which is,

Mode = 3(median) - 2(mean) is true.

But Reason (R) is not correct explanation of assertion (A).

### 35. Question

The question consists of two statements, namely, Assertion (A) and Reason (R). Choose the correct option.

| Assertion (A)   | Reason (R)   |
|---|--|
| Median of 51, 70, 65, 82, 60, 68, 62, 95, 55, 64, 58, 75, 80, 85, 90 is 68. | When n observations are arranged in an ascending order and n is odd, then median = value of $\frac{1}{2}(n + 1)$ th observation. |

- A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).  
B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).  
C. Assertion (A) is true and Reason (R) is false.  
D. Assertion (A) is false and Reason (R) is true.

### Answer

By arranging the data in ascending form, we get,

51, 55, 58, 60, 62, 64, 65, 68, 70, 75, 80, 82, 85, 90, 95

Here,  $n = 15$  (odd)

Median = value of  $\frac{n+1}{2}$ th term

= Value of 8<sup>th</sup> term

= 68

Means assertion is correct

Reason (R) is true and it is also the correct explanation of assertion (A).

### 36. Question

The mode of the data 2, 3, 9, 16, 9, 3, 9 is 16.

### Answer

Arrange the data in ascending form, we get,

2, 3, 3, 9, 9, 9, 16

In this given data 9 appears maximum numbers of time.

Mode = 9

Given mode = 16

So, the given statement is false.

### 37. Question

The median of 3, 14, 18, 20, 5 is 18.

**Answer**

By arranging the data in ascending form, we get,

3, 5, 14, 18, 20

Median = value $[(n + 1)/2$  the term]

Median = value of 3<sup>rd</sup> term

Median = 14

Given median = 18

So, the given statement is false.

**38. Question**

The median of 1, 3, 2, 5, 8, 6, 1, 4, 7, 9 =  $\frac{1}{2}$  (5<sup>th</sup> term + 6<sup>th</sup> term)

$$= \frac{1}{2}(8 + 6) = 7.$$

**Answer**

By arranging the data in ascending form, we get,

1, 1, 2, 3, 4, 5, 6, 7, 8, 9

n = 10 (even)

Median =  $1/2$  [Value of (n/2)th term + (n/2 + 1)th term]

=  $1/2$  [value of 5th term + value of 6th term]

=  $1/2$  (4 + 5)

=  $9/2 = 4.5$

Given median = 7

So, the given statement is false.

**39. Question**

Match the following column.

| Column I                                    | Column II |
|---|-----------|
| A. The mean of first 10 odd numbers =       | (p) 11.2  |
| B. The mean of first 10 even numbers =      | (q) 10    |
| C. The mean of first 10 prime numbers =     | (r) 11    |
| D. The mean of first 10 composite numbers = | (s) 12.9  |

The correct answer is:

(a)-....., (b)-....., (c)-....., (d)-.....,

#### Answer

(A) → (q),

(B) → (r),

(C) → (s),

(D) → (p)

Explanation:

(A) First 10 odd numbers are = 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Sum of these numbers =  $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 100$

$n = 10$

Mean =  $100/10 = 10$

(B) First 10 even numbers are = 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Sum of these numbers =  $2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20 = 110$

$n = 10$

Mean =  $110/10 = 11.0$

(C) First 10 prime numbers are = 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

Sum of these numbers =  $2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29 = 129$

$n = 10$

Mean =  $129/10 = 12.9$

(D) First 10 composite numbers are = 4, 6, 8, 9, 10, 12, 14, 15, 16, 18

Sum of these numbers =  $4 + 6 + 8 + 9 + 10 + 12 + 14 + 15 + 16 + 18 = 112$

$$n = 10$$

$$\text{Mean} = 112/10 = 11.2$$

#### 40. Question

The class marks of a frequency distribution are 47, 52, 57, 62, 67, 72, 77. Determine the (i) class size (ii) class limits with respect to the class mark 52 (iii) true class limits for class mark 52.

#### Answer

Class marks of the given frequency distribution are = 47, 52, 57, 62, 67, 72, 77

$$(i) \text{ Class size} = 52 - 47 = 5$$

$$(ii) \text{ Class size} = 5$$

$$\text{Mid value} = \frac{5}{2} = 2.5$$

$$\text{Class marks} = 52$$

$$\text{Upper class limit} = 52 + 2.5 = 54.5$$

$$\text{Lower class limit} = 52 - 2.5 = 49.5$$

(iii) Here classes are in the exclusive form,

So true class limit for class mark 52 is 49.5 – 54.5

#### 41. Question

Which is false?

A. If  $n$  is odd, then median = value of  $\left(\frac{n+1}{2}\right)$ th item.

B. If  $n$  is even, then

$$\text{median} = \frac{1}{2} \times \left\{ \text{Value of } \frac{n}{2} \text{th item} + \text{value of } \left(\frac{n}{2} + 1\right) \text{th item} \right\}.$$

C. Mode is the item which occurs most often.

$$D. \text{ Mode} = \frac{1}{2}(\text{mean} + \text{median}).$$

#### Answer

(A) When  $n$  is odd then formula for median is = Value of  $\left(\frac{n}{2} + 1\right)$ th term

So, the given statement is true.

(B) When  $n$  is even then formula for median become;

$$\text{Median} = 1/2 [\text{value of } (n/2) \text{th term} + \text{value of } (n/2 + 1) \text{th term}]$$

So, the given statement is true.

(C) Mode is the number or item which occur maximum numbers of time or which have the highest frequency.

So, the given statement is true.

(D) The correct formula is;

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

So, the given statement is false.

#### 42. Question

Which is false?

A. If  $\bar{X}$  is the mean of  $\bar{X}_1, \bar{X}_2, \dots, \bar{X}_n$ ,

$$\text{then } \sum_{i=1}^n (x_i - \bar{X}) = 0.$$

B. If the mean of  $\bar{X}_1, \bar{X}_2, \dots, \bar{X}_n$  is  $\bar{X}$ ,

then the mean of  $(x_1 + a), (x_2 + a), \dots, (x_n + a)$  is  $(\bar{X} + a)$ .

C. If the mean of  $\bar{X}_1, \bar{X}_2, \dots, \bar{X}_n$  is  $\bar{X}$  and  $a \neq 0$ ,

then the mean of  $ax_1, ax_2, \dots, ax_n$  is  $a\bar{X}$ .

D. If M is the median of  $\bar{X}_1, \bar{X}_2, \dots, \bar{X}_n$  and  $a \neq 0$ ,

then  $aM$  is the median of  $ax_1, ax_2, \dots, ax_n$ .

#### Answer

(A) Given,

$$\bar{X} = \frac{x_1 + x_2 + \dots + x_n}{n} \dots (i)$$

Now take L.H.S

$$\Rightarrow \sum_{i=1}^n (x_i - \bar{X})$$

$$\Rightarrow (x_1 - \bar{X}) + (x_2 - \bar{X}) + \dots + (x_n - \bar{X})$$

$$\Rightarrow (x_1 + x_2 + \dots + x_n) - n\bar{X}$$

$$\Rightarrow n\bar{X} - n\bar{X} [\because x_1 + x_2 + \dots + x_n = n\bar{X}, \text{ from equation (i)}]$$

$$\sum_{i=1}^n (x_i - \bar{X}) = 0$$

So, given statement is true.

(B) Given,

$$\bar{X} = \frac{x_1 + x_2 + \dots + x_n}{n} \dots (i)$$

Observations are  $= (x_1 + a), (x_2 + a), \dots, (x_n + a)$

$$\Rightarrow \text{Mean} = \frac{(x_1 + a) + (x_2 + a) + \dots + (x_n + a)}{n}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + \dots + x_n + n \times a}{n}$$

$$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + \dots + x_n}{n} + \frac{n \times a}{n}$$



From equation (i) we get,

$$\text{Mean} = (\bar{x} + a)$$

So, given statement is true.

$$(C) \text{ Mean of } x_1, x_2, \dots, x_n = \frac{x_1 + x_2 + \dots + x_n}{n}$$

$$\text{Given mean} = \bar{x}$$

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} \dots (i)$$

$$\text{Observations are} = ax_1, ax_2, \dots, ax_n$$

$$\Rightarrow \text{Mean} = \frac{ax_1 + ax_2 + \dots + ax_n}{n}$$

$$\Rightarrow \text{Mean} = \frac{a(x_1 + x_2 + \dots + x_n)}{n}$$

$$\therefore \text{Mean} = a\bar{x} \dots [\text{From equation (i)}]$$

So, the given statement is true.

$$(D) \text{ Let suppose the observations are } = \bar{x}_1, \bar{x}_2, \dots, \bar{x}_n$$

$$\frac{x_1 + x_2 + \dots + x_n}{n} \dots (Given)$$

$$\text{Sum} = \bar{x}_1 + \bar{x}_2 + \dots + \bar{x}_n = nM \dots (i)$$

And

$$ax_1 + ax_2 + \dots + ax_n = aM$$

Then,

$$\frac{na + (x_1 + x_2 + \dots + x_n)}{n} = aM$$

$$\frac{na + nM}{n} = aM [\text{from equation (i)}]$$

$$= \frac{n(a + M)}{n} = aM$$

$$a + M = aM \text{ (Which is not true)}$$

### 43. Question

Which is false?

A. If the mean of 4, 6, x, 8, 10, 13 is 8, then x = 7.

B. If the median of the following array 59, 62, 65, x, x + 2, 72, 85, 99 is 67, then x = 66.

C. If the mode of 1, 3, 5, 7, 5, 2, 7, 5, 9, 3, p, 11 is 5, then the value of p is 7.

D. If the mean of 10 observations is 15 and that of other 15 observations is 18, then the mean of all the 25 observations is 16.8.

### Answer

(A) Given observations are = 4, 6, x, 8, 10, 13

$$\text{Mean} = \frac{\text{Sum of the observations}}{\text{No. of observation}}$$

Now, given mean = 8

$$8 = \frac{4 + 6 + x + 8 + 10 + 13}{6}$$

Sum of the observations =  $4 + 6 + x + 8 + 10 + 13 = 8 \times 6$

$$\Rightarrow 41 + x = 48$$

$$\therefore x = 48 - 41 = 7$$

$$\text{So, } x = 7$$

The given statement is true.

(B) Given array = 59, 62, 65, x, x + 2, 72, 85, 99

n = 8 (even)

Median =  $\frac{1}{2}$  [value of  $(n/2)$ th term + value of  $(n/2 + 1)$ th term]

=  $\frac{1}{2}$  [value of 4th term + value of 5th term]

$$\text{Median} = \frac{1}{2}[x + (x + 2)] = \frac{2x + 2}{2}$$

Given median = 67

$$67 = \frac{2x + 2}{2} \Rightarrow 2x + 2 = 67 \times 2$$

$$2x + 2 = 134$$

$$2x = 134 - 2$$

$$x = \frac{132}{2} = 66$$

$$\text{So, } x = 66$$

The given statement is true

(C) Given,

Observations are = 1, 3, 5, 7, 5, 2, 7, 5, 9, 3, p, 11

Mode = 5

Value of p = 7

We know that mode is the item which has highest frequency and in given statement 5 is the mode. If p = 7 then it will become the number with highest frequency. It means p can't be equals to 7 as mode is 5.

So, the given statement is false.

(D) Given;

Mean of 10 observations = 15

Mean of 15 observations = 18

Mean of all 25 observation = 16.8

Now the sum of the observations;

$$\text{Sum of 10 observations} = 10 \times 15 = 150$$

$$\text{Sum of 15 observation} = 15 \times 18 = 270$$

Sum of 25 observation = Sum of 10 observations + Sum of 15 observations

$$\text{Mean of 25 observations} = \frac{\text{Sum of 25 observation}}{\text{No. of observations}}$$

$$\Rightarrow \text{Mean} = \frac{150 + 270}{25}$$

$$\Rightarrow \text{Mean} = 420/25$$

$$\therefore \text{Mean} = 16.8$$

So, the given statement is true.

### Formative Assessment (Unit Test)

#### 1. Question

Look at the table given below:

| Marks           | 0-10 | 11-20 | 21-30 | 31-40 |
|-----------------|------|-------|-------|-------|
| No. Of students | 6    | 9     | 11    | 4     |

The true lower limit of the class 21-30 is

- A. 21
- B. 20
- C. 20.5
- D. 21.5

#### Answer

The given class interval is in the form of inclusive form.

To find out the true lower limit of the class we need to draw the table in continuous frequency distribution in exclusive form.

| Marks        | Frequency |
|--------------|-----------|
| - 0.5 - 10.5 | 6         |
| 10.5 - 20.5  | 9         |
| 20.5 - 30.5  | 11        |
| 30.5 - 40.5  | 4         |

So, as we can see that true lower limit of class 21 – 30 is 20.5

## 2. Question

Look at the table given below:

| Marks           | 0-10 | 10-20 | 20-30 | 30-40 |
|-----------------|------|-------|-------|-------|
| No. Of students | 8    | 11    | 7     | 3     |

The true upper limit of the class 10-20 is

- A. 19.5
- B. 20
- C. 20.5
- D. None of these

## Answer

As the class intervals are given in exclusive form so the true upper class limit of the class 10 – 20 is 20.

## 3. Question

Look at the table given below:

|                 |      |       |       |       |
|-----------------|------|-------|-------|-------|
| Marks           | 0-10 | 11-20 | 21-30 | 31-40 |
| No. Of students | 6    | 9     | 11    | 4     |

What is the class size of the class 11-20 in this table?

- A. 9
- B. 15.5
- C. 10
- D. 4.5

**Answer**

The given class interval is in the form of inclusive form.

To find out the class size we need to first find out the true class limits.

Now,

By converting the table in exclusive form;

We get,

| Marks        | Frequency |
|--------------|-----------|
| - 0.5 - 10.5 | 7         |
| 10.5 - 20.5  | 8         |
| 20.5 - 30.5  | 10        |
| 30.5 - 40.5  | 5         |

Class size = True upper limit – True lower limit

Class size =  $20.5 - 10.5 = 10$

**4. Question**

What is the class mark of class 21-30 in the table of Q.3 ?

- A. 4.5
- B. 9
- C. 25.5
- D. 26

**Answer**

Class Interval = 21 – 30 (given)

Upper class limit = 30

Lower class limit = 21

Class marks =  $\frac{1}{2}$  [upper limit + lower limit]

Class marks =  $\frac{1}{2}$  [30 + 21]

$\therefore$  Class marks =  $\frac{51}{2} = 25.5$

**5. Question**

If the mean of five observations  $x$ ,  $x + 2$ ,  $x + 4$ ,  $x + 6$  and  $x + 8$  is 11, find the value of  $x$ .

**Answer**

Observations are =  $x$ ,  $x + 2$ ,  $x + 4$ ,  $x + 6$ ,  $x + 8$

No. of observations = 5

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

Given mean = 11

$$\Rightarrow 11 = \frac{x + (x + 2) + (x + 4) + (x + 6) + (x + 8)}{5}$$

$$\Rightarrow x + x + 2 + x + 4 + x + 6 + x + 8 = 11 \times 5$$

$$\Rightarrow 5x + 20 = 55$$

$$\Rightarrow 5x = 55 - 20$$

$$x = \frac{35}{5} = 7$$

So, value of  $x = 7$ .

**6. Question**

The points scored by a kabaddi team in a series of matches are as follows:

8, 24, 10, 14, 5, 15, 7, 2, 17, 27, 10, 7, 48, 8, 18, 28

Find the median of the points scored by a team.

**Answer**

Arrange the scores in ascending order;

Scores are = 2, 5, 7, 7, 8, 8, 10, 10, 14, 15, 17, 18, 24, 28, 48

Total points = 16 (even)

Median =  $\frac{1}{2}$  [value of  $(n/2)$ th term + value of  $(n/2 + 1)$ th term]

$\Rightarrow$  Median =  $\frac{1}{2}$  [value of 8th term + value of 9th term]

$\Rightarrow$  Median =  $\frac{1}{2}$  [10 + 14]

$$\therefore \text{Median} = 24/2 = 12$$

The median of the points scored by the team is 12.

### 7. Question

The following table shows the number of students participating in the various games in a school:

| Games           | Cricket | Football | Basket ball | Tennis |
|-----------------|---------|----------|-------------|--------|
| No. Of students | 27      | 36       | 18          | 12     |

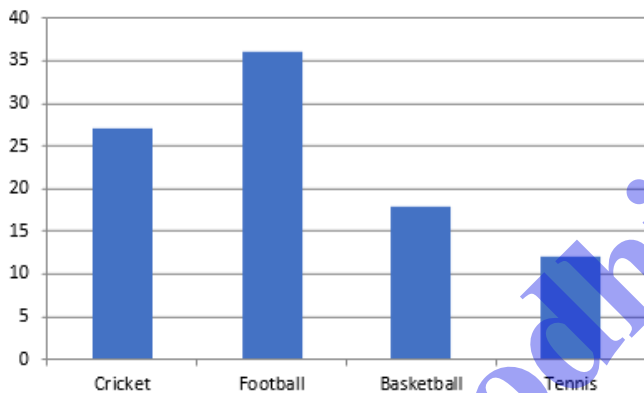
Draw a bar graph to represent the above data.

### Answer

To draw the bar graph,

On x-axis take the games and on y-axis take the no. of students.

Now draw the bar graph;



### 8. Question

The heights of five players are 148 cm, 154 cm, 153 cm, 140 cm, and 150 cm, respectively. Find the mean height per player.

### Answer

Heights of the players = 148cm, 154cm, 153cm, 140cm, 150cm

Number of players = 5

$$\text{Mean height per player} = \frac{\text{Sum of heights}}{\text{No. of players}}$$

$$\Rightarrow \text{Mean} = \frac{148 + 154 + 153 + 140 + 150}{5}$$

$$\Rightarrow \text{Mean} = \frac{745}{5}$$

$$\therefore \text{Mean} = 149\text{cm}$$

So, mean height per player is 149cm.

### 9. Question

The marks obtained by 12 students of a class in the test are:

36, 27, 5, 19, 34, 23, 37, 23, 16, 23, 20, 38

### Answer

By arranging the marks in ascending order, we have;

5, 10, 19, 20, 23, 23, 23, 34, 36, 37, 38

In the given data 23 occurred the maximum number of times,

So, the modal mark = 23

### 10. Question

The class marks of a frequency distribution are

26, 31, 36, 41, 46, 51

Find the true class limits.

### Answer

To find true class limit should know the class size;

$$\text{Class size} = 31 - 26 = 5$$

$$\text{Mid value} = 5/2 = 2.5$$

When class mark is 26;

$$\text{Upper class limit} = 26 + 2.5 = 28.5$$

$$\text{Lower class limit} = 26 - 2.5 = 23.5$$

When class mark is 31;

$$\text{Upper class limit} = 31 + 2.5 = 33.5$$

$$\text{Lower class limit} = 31 - 2.5 = 28.5$$

When class mark is 36;

$$\text{Upper class limit} = 36 + 2.5 = 38.5$$

$$\text{Lower class limit} = 36 - 2.5 = 33.5$$

When class mark is 41;

$$\text{Upper class limit} = 41 + 2.5 = 43.5$$

$$\text{Lower class limit} = 41 - 2.5 = 38.5$$

When class mark is 46;

$$\text{Upper class limit} = 46 + 2.5 = 48.5$$

$$\text{Lower class limit} = 46 - 2.5 = 43.5$$

When class mark is 51;

$$\text{Upper class limit} = 51 + 2.5 = 53.5$$

$$\text{Lower class limit} = 51 - 2.5 = 48.5$$

So, true class limits are;

23.5 - 28.5, 28.5 - 33.5, 33.5 - 38.5, 38.5 - 43.5, 43.5 - 48.5, 48.5 - 53.5

### 11. Question



The mean of the following frequency distribution is 8. Find the value of p.

|   |   |   |    |   |    |    |
|---|---|---|----|---|----|----|
| x | 3 | 5 | 7  | 9 | 11 | 13 |
| y | 6 | 8 | 15 | p | 8  | 4  |

**Answer**

First draw the table as shown below;

| x  | f                   | f × x                  |
|----|---------------------|------------------------|
| 3  | 6                   | 18                     |
| 5  | 8                   | 40                     |
| 7  | 15                  | 105                    |
| 9  | p                   | 9p                     |
| 11 | 8                   | 88                     |
| 13 | 4                   | 52                     |
|    | $\Sigma f = 41 + p$ | $\Sigma fx = 303 + 9p$ |

$$\Rightarrow \text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

Given mean = 8

$$8 = \frac{303 + 9p}{41 + p}$$

$$\Rightarrow 8(41 + p) = 303 + 9p$$

$$\Rightarrow 328 + 8p = 303 + 9p$$

$$\Rightarrow 9p - 8p = 328 - 303$$

$$\Rightarrow p = 25$$

So, the value of  $p = 25$

### 12. Question

If 10, 13, 15, 18,  $x + 1$ ,  $x + 3$ , 30, 32, 35, 41 are ten observations in an ascending order with median 24, Find the value of  $x$ .

### Answer

10 observations in ascending order = 10, 13, 15, 18,  $x + 1$ ,  $x + 3$ , 30, 32, 35, 41

$n = 10$  (even)

Median =  $\frac{1}{2}$  [value of  $(n/2)$ th term + value of  $(n/2 + 1)$ th term]

Median =  $\frac{1}{2}$  [value of 5th term + value of 6th term]

$$\text{Median} = \frac{1}{2} [(x + 1) + (x + 3)] = (2x + 4)/2$$

Given median = 24

$$\Rightarrow 24 = \frac{2x + 4}{2}$$

$$\Rightarrow 2x + 4 = 24 \times 2$$

$$\Rightarrow 2x + 4 = 48$$

$$\Rightarrow 2x = 48 - 4 = 44$$

$$\Rightarrow x = 44/2 = 22$$

### 13. Question

Calculate the mode of the following using empirical formula:

17, 10, 12, 11, 10, 15, 14, 11, 12, 13

### Answer

By arranging the given data in ascending form we get;

10, 10, 11, 11, 12, 12, 13, 14, 15, 17

Draw the table;

| X  | f               | Cumulative frequency | f × x             |
|----|-----------------|----------------------|-------------------|
| 10 | 2               | 2                    | 20                |
| 11 | 2               | 4                    | 22                |
| 12 | 2               | 6                    | 24                |
| 13 | 1               | 7                    | 13                |
| 14 | 1               | 8                    | 14                |
| 15 | 1               | 9                    | 15                |
| 17 | 1               | 10                   | 17                |
|    | $\Sigma f = 10$ |                      | $\Sigma fx = 125$ |

$$\Sigma f = N = 10 \text{ (even)}$$

$$\text{Median} = 1/2 [\text{value of } (n/2)\text{th term} + \text{value of } (n/2 + 1)\text{th term}]$$

$$= 1/2 [\text{value of 5th term} + \text{value of 6th term}]$$

$$= 1/2 [12 + 12] = 24/2 = 12$$

Now,

$$\text{Mean} = (\Sigma fx)/(\Sigma f) = 125/10 = 12.5$$

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

$$= 3 \times 12 - 2 \times 12.5$$

$$= 36 - 25 = 11$$

#### 14. Question

Find the medium of the following frequency distribution:

|           |   |   |    |    |    |    |
|-----------|---|---|----|----|----|----|
| Variables | 3 | 6 | 10 | 12 | 7  | 15 |
| Frequency | 3 | 4 | 2  | 8  | 13 | 10 |

**Answer**

Arrange the data in ascending form:

|           |   |   |    |    |    |    |
|-----------|---|---|----|----|----|----|
| Variables | 3 | 6 | 7  | 10 | 12 | 15 |
| Frequency | 3 | 4 | 13 | 2  | 8  | 10 |

Draw the cumulative frequency table;

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| Variables(x) | Frequency(f)    | Cumulative frequency |
|--------------|-----------------|----------------------|
| 3            | 3               | 3                    |
| 6            | 4               | 7                    |
| 7            | 13              | 20                   |
| 10           | 2               | 22                   |
| 12           | 8               | 30                   |
| 15           | 10              | 40                   |
|              | $\Sigma f = 40$ |                      |

$\Sigma f = N = 40$  (even)

Median =  $\frac{1}{2}$  [value of  $(n/2)$ th term + value of  $(n/2 + 1)$ th term]

=  $\frac{1}{2}$  [value of 20th term + value of 21st term]

=  $\frac{1}{2}$  [7 + 10] =  $17/2 = 8.5$

### 15. Question

The mean of six numbers is 23. If one of the numbers is excluded, the mean of the remaining numbers is 20. Find the excluded number.

### Answer

Let suppose the numbers are =  $n_1, n_2, n_3, n_4, n_5, n_6$

$$\Rightarrow \text{Mean} = \frac{n_1 + n_2 + n_3 + n_4 + n_5 + n_6}{6}$$

Given mean = 23

So,

$$\therefore \frac{n_1 + n_2 + n_3 + n_4 + n_5 + n_6}{6} = 23$$

$$n_1 + n_2 + n_3 + n_4 + n_5 + n_6 = 23 \times 6 = 138 \text{ .....(i)}$$

Let suppose excluded number be  $n_4$

$$N = 5$$

$$\text{Mean of remaining numbers} = \frac{n_1 + n_2 + n_3 + n_5 + n_6}{5} = 20 \text{ (given)}$$

$$n_1 + n_2 + n_3 + n_5 + n_6 = 20 \times 5 = 100 \text{ .....(ii)}$$

Subtract the (ii) equation from (i) equation

We get;

$$n_4 = 138 - 100 = 38$$

So, the excluded number is 38.

#### 16. Question

Fill in the blanks in the following table:

| Marks | Frequency | Cumulative frequency |
|-------|-----------|----------------------|
| 0-5   | 3         | 3                    |
| 5-10  | 5         | .....                |
| 10-15 | 8         | .....                |
| 15-20 | 4         | .....                |

#### Answer

Cumulative frequency is the total of frequency.

| Marks | Frequency | Cumulative frequency |
|-------|-----------|----------------------|
| 0-5   | 3         | 3                    |
| 5-10  | 5         | 8                    |
| 10-15 | 8         | 16                   |
| 15-20 | 4         | 20                   |

**17. Question**

In the city, the weekly observations made on the cost of living index are given below.

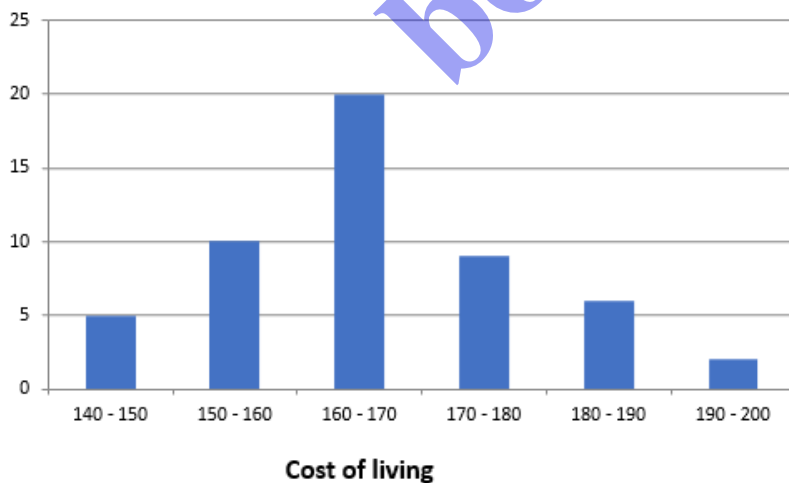
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| Cost of living index | Number of weeks |
|----------------------|-----------------|
| 140-160              | 5               |
| 150-160              | 10              |
| 160-170              | 20              |
| 170-180              | 9               |
| 180-190              | 6               |
| 190-200              | 2               |

Represent the above information in the form of a histogram.

**Answer**

Draw the histogram with the help of given data.



### 18. Question

The mean of the marks scored by 50 students was found to be 39, Later on, it was discovered that a score was 43 was misread as 23, Find the correct mean.

**Answer**



Calculated mean of marks of 50 students = 39

According to the given mean the sum of these marks will be =  $39 \times 50 = 1950$

Correct sum will be = incorrect sum + (correct marks – incorrect marks)

$$= 1950 + 43 - 23$$

$$= 1993 - 23 = 1970$$

$$\text{Correct mean} = (\text{correct sum})/50 = 1970/50 = 39.4$$

So, the correct mean is 39.4

### 19. Question

The following table shows the weights of 12 workers in the factory.

|               |    |    |    |    |    |
|---------------|----|----|----|----|----|
| Weight(in kg) | 60 | 63 | 66 | 69 | 72 |
| No of workers | 4  | 3  | 2  | 2  | 1  |

Find the mean weight of the workers.

### Answer

Draw the table;

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| Weight(x) | No. of workers  | Fx                |
|-----------|-----------------|-------------------|
| 60        | 4               | 240               |
| 63        | 3               | 189               |
| 66        | 2               | 172               |
| 69        | 2               | 138               |
| 72        | 1               | 72                |
|           | $\Sigma f = 12$ | $\Sigma fx = 771$ |

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\Sigma f = 12, \Sigma fx = 771$$

$$\text{Mean} = \frac{771}{12} = 64.25\text{kg}$$

The mean weight is 64.25kg

## 20. Question

The heights (in cm) of 50 students of class are given below.

| Height         | 156 | 154 | 155 | 151 | 157 | 152 | 153 |
|----------------|-----|-----|-----|-----|-----|-----|-----|
| No of students | 8   | 4   | 10  | 6   | 7   | 3   | 12  |

Find the median height

**Answer**

|                |     |     |     |     |     |     |     |
|----------------|-----|-----|-----|-----|-----|-----|-----|
| Height         | 151 | 152 | 153 | 154 | 155 | 156 | 157 |
| No of students | 6   | 3   | 12  | 4   | 10  | 8   | 7   |

Draw the cumulative frequency table;

| Heights (in cm) (x) | No. of students (f) | Cumulative frequency |
|---------------------|---------------------|----------------------|
| 151                 | 6                   | 6                    |
| 152                 | 3                   | 9                    |
| 153                 | 12                  | 21                   |
| 154                 | 4                   | 25                   |
| 155                 | 10                  | 35                   |
| 156                 | 8                   | 43                   |
| 157                 | 7                   | 50                   |

$$N = \sum f = 50 \text{ (even)}$$

$$\text{Median} = \frac{1}{2} [\text{value of } (n/2)\text{th term} + \text{value of } (n/2 + 1)\text{th term}]$$

$$\Rightarrow \text{Median} = \frac{1}{2} [\text{value of 25th term} + \text{value of 26th term}]$$

$$\Rightarrow \text{Median} = \frac{1}{2} [154 + 155] = \frac{309}{2} = 154.5\text{cm}$$