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 $\frac{upper\ limit + lower\ limit}{2}$

(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

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

∴ 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

∴ 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:

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

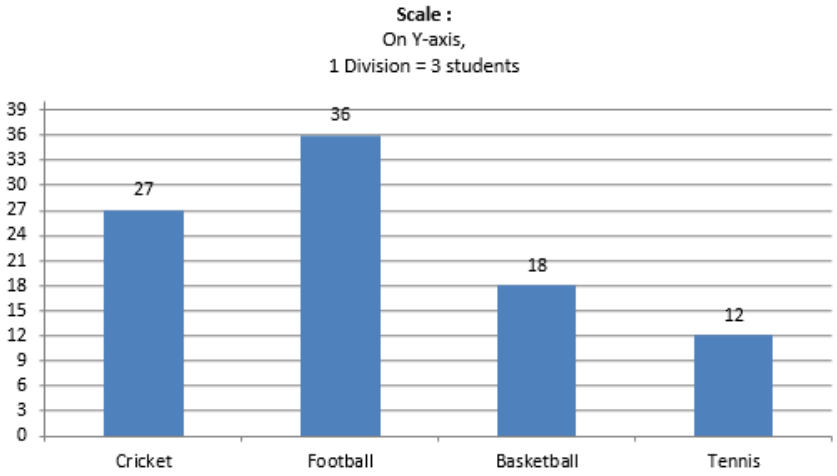
1. Question

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



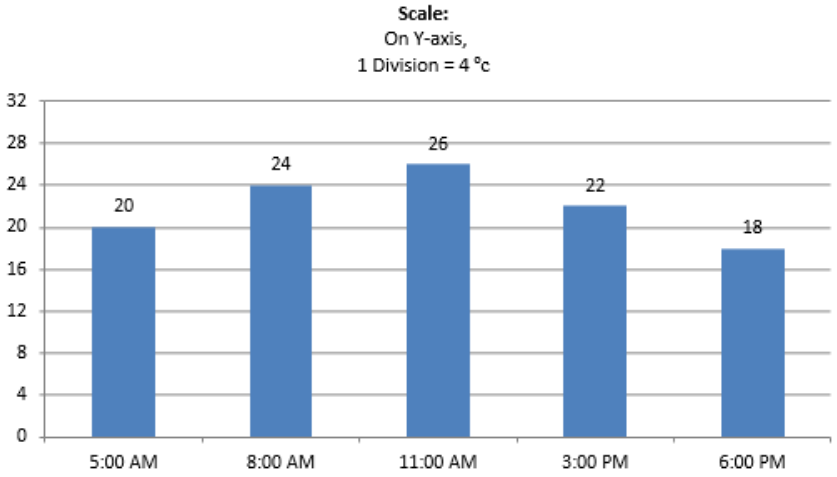
2. Question

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



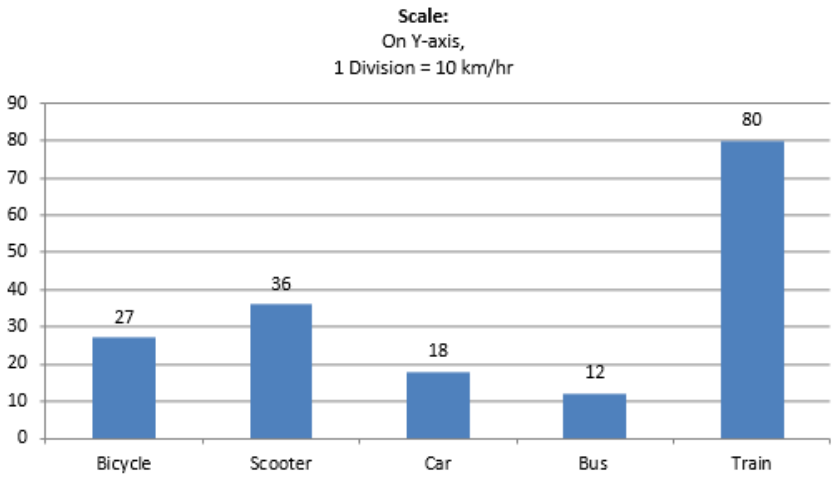
3. Question

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

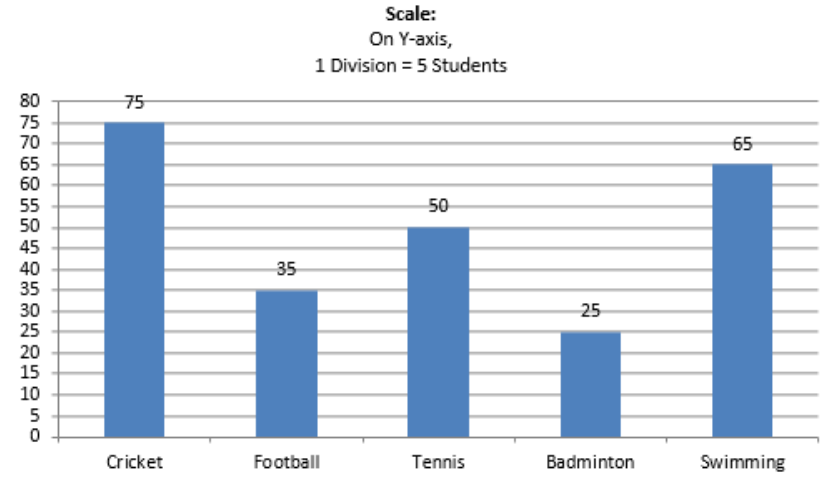


4. Question

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

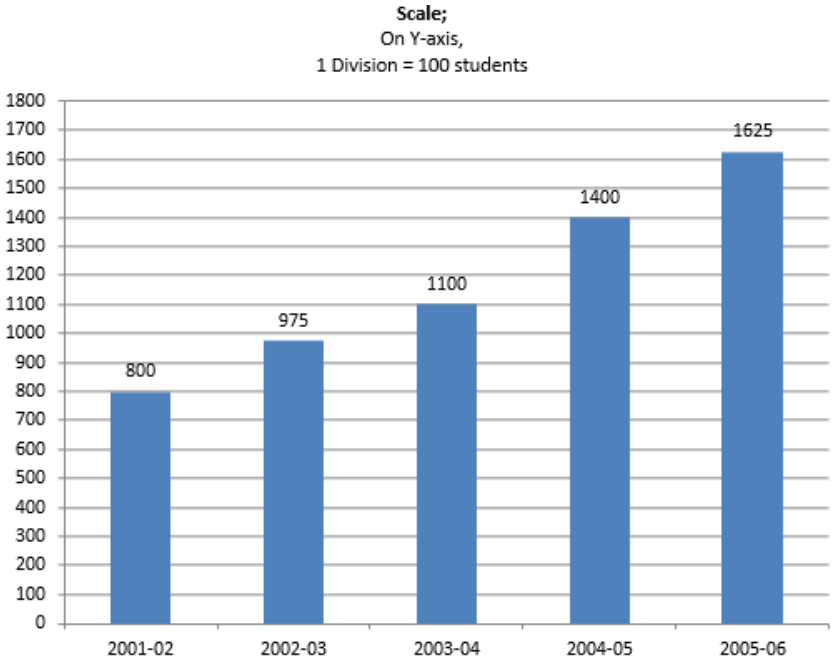


5. Question

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

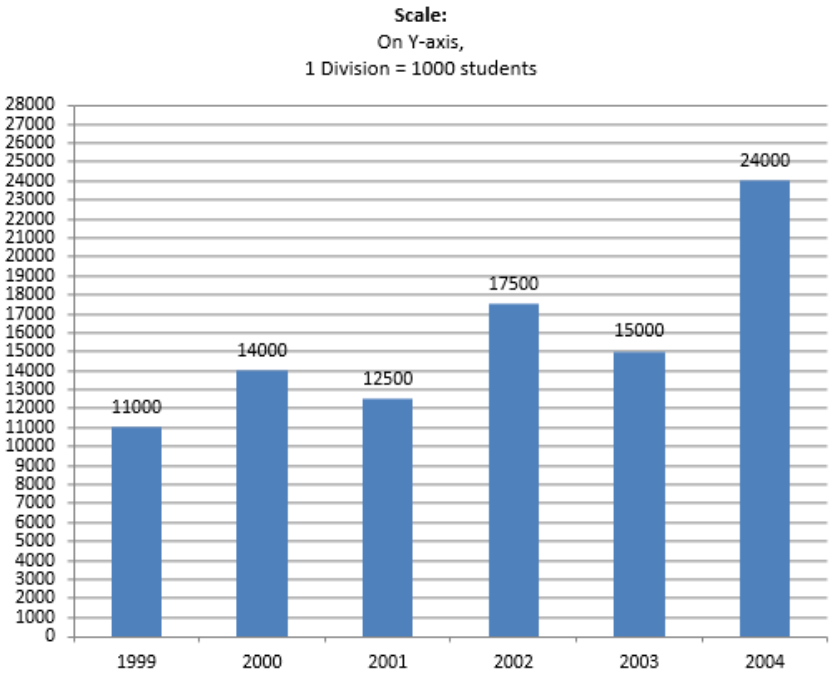


6. Question

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

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

Answer



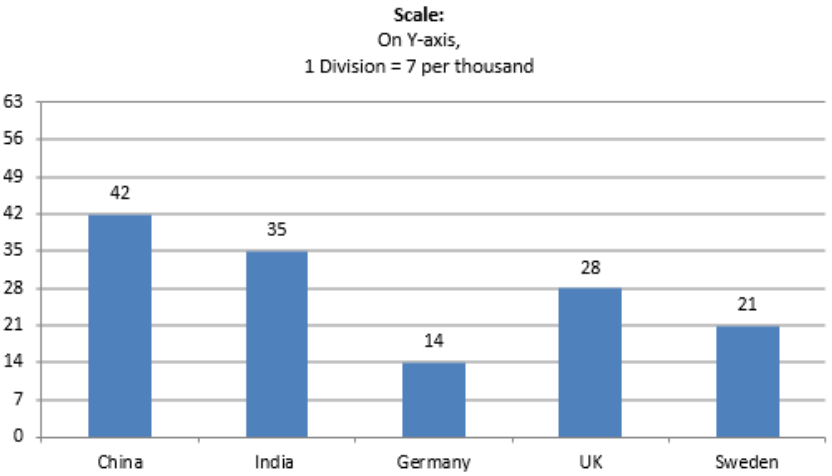
7. Question

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

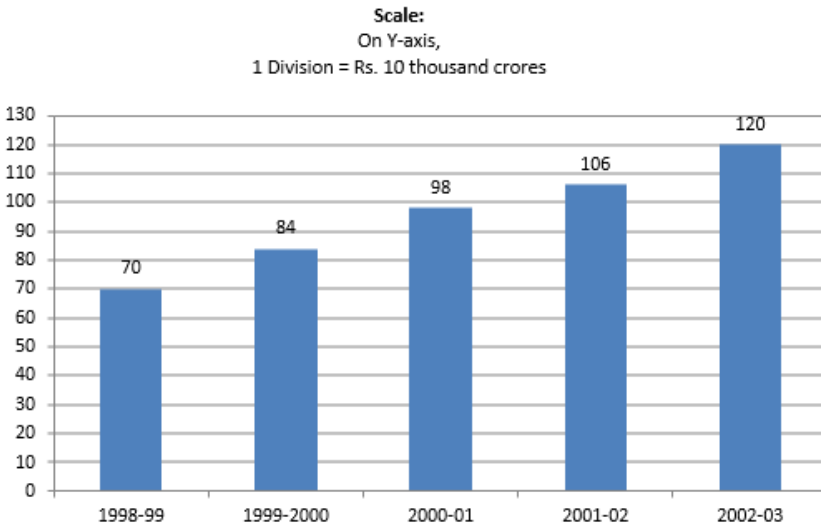


8. Question

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



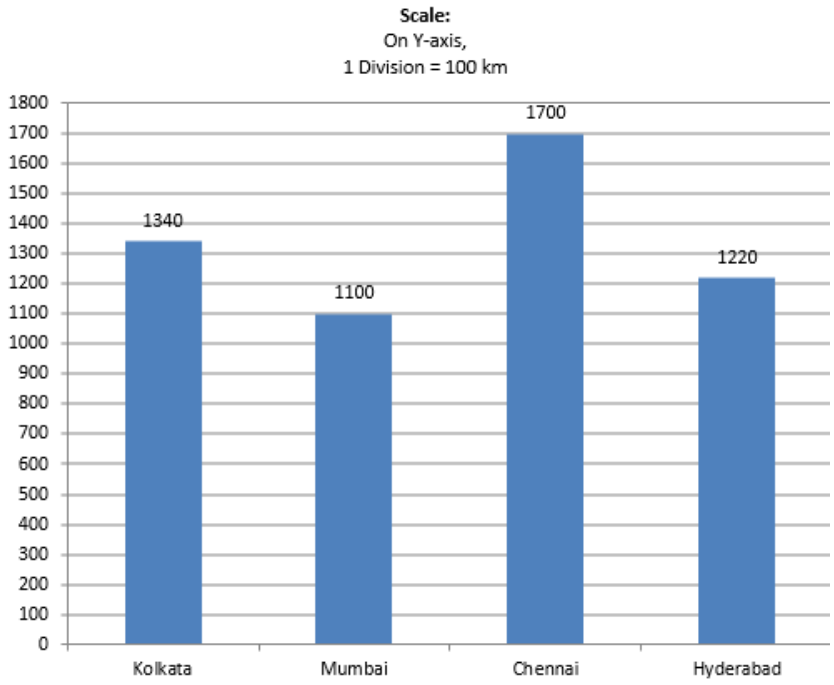
9. Question

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



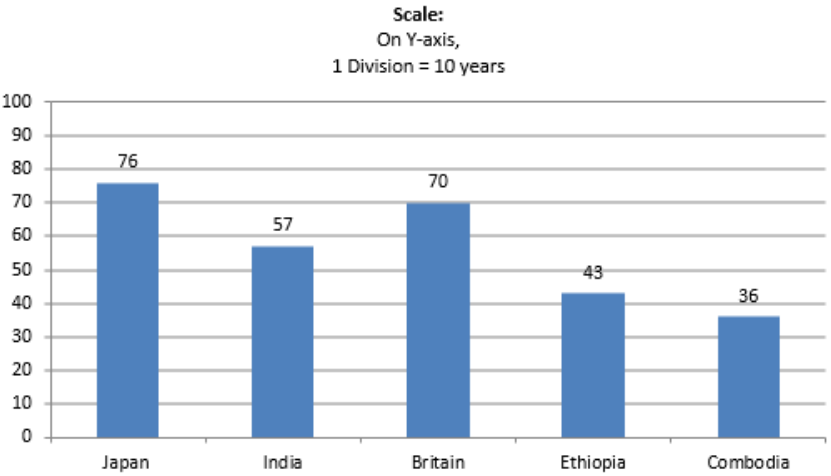
10. Question

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



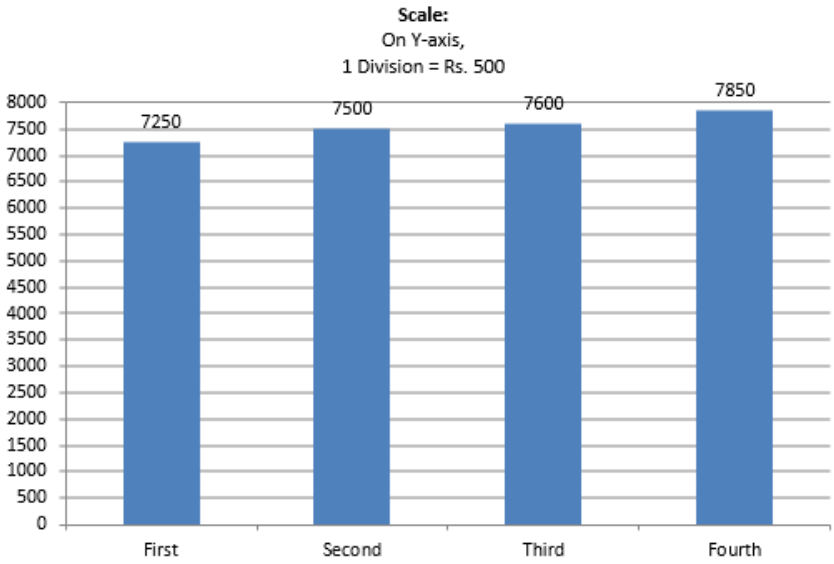
11. Question

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



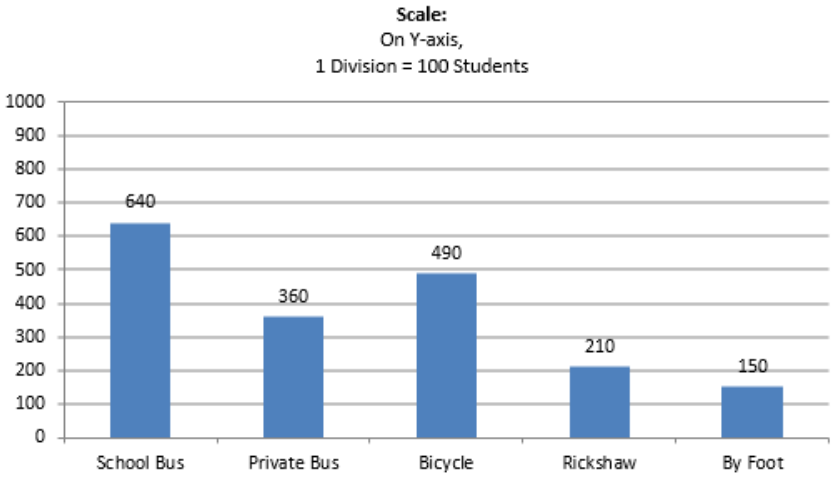
12. Question

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

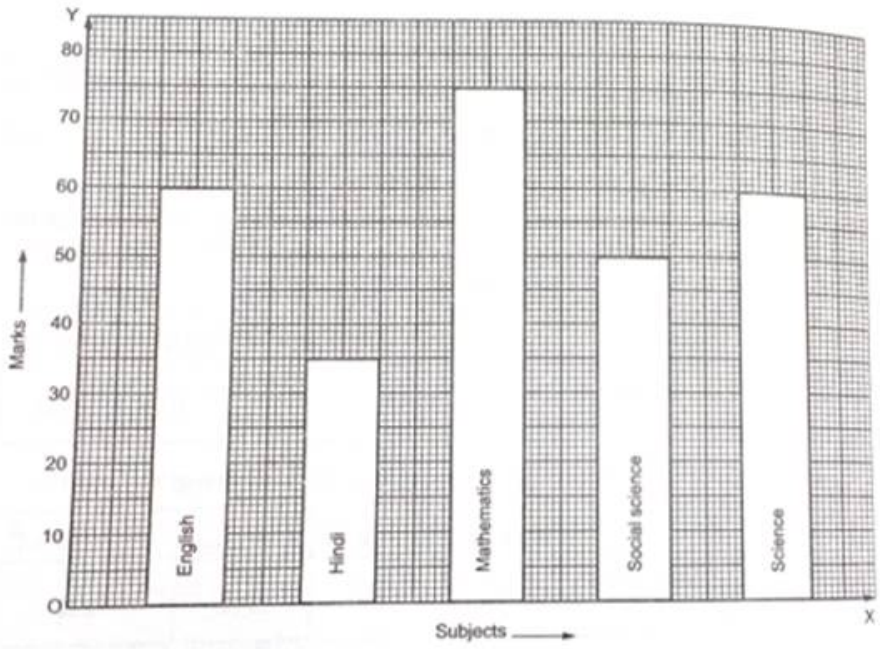
Draw a bar graph to represent the above data.

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.

(i) What information does the bar graph give?

(ii) In which subject is the student very good?

(iii) In which subject is he poor?

(iv) What is the average of his marks?

Answer

(i) The bar graph shows the marks obtained by a student in various subjects in an examination.

(ii) The student scores very good in mathematics, as the height of the corresponding bar is the highest.

(iii) The student scores least marks in Hindi, as the height of the corresponding bar is the lowest.

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

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.

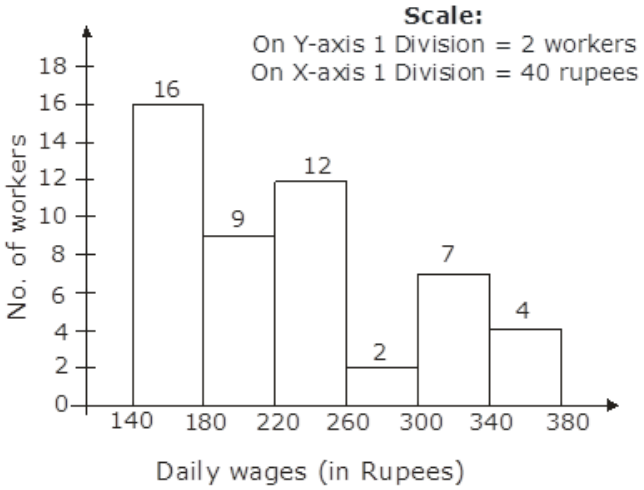
Now take the scale of,

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.

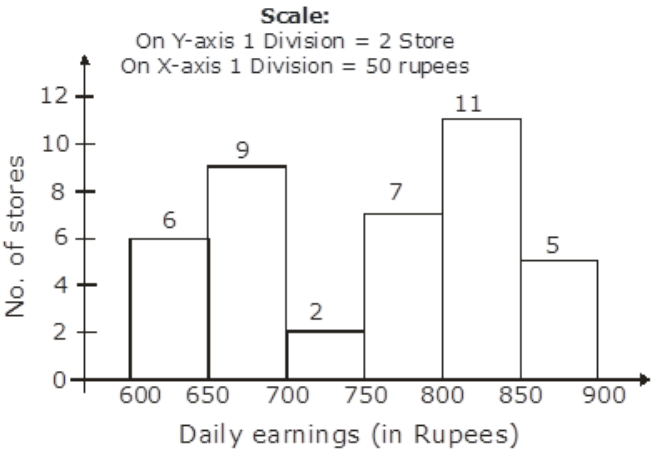
Now take the scale of,

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.

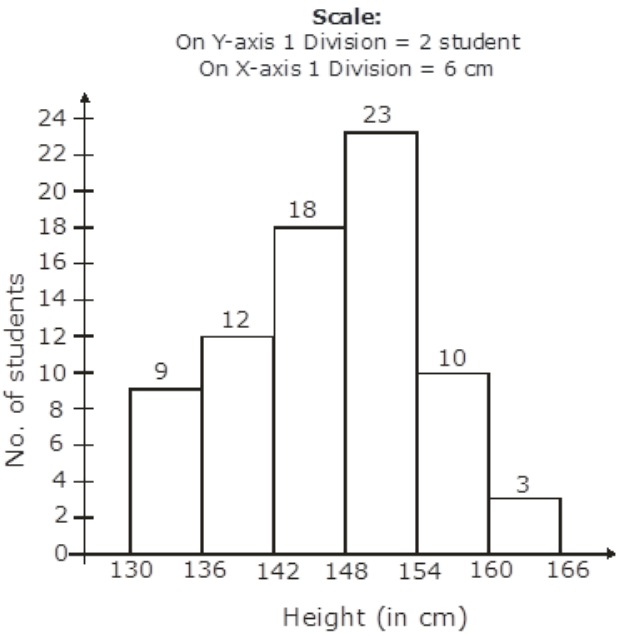
Now take the scale of,

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.

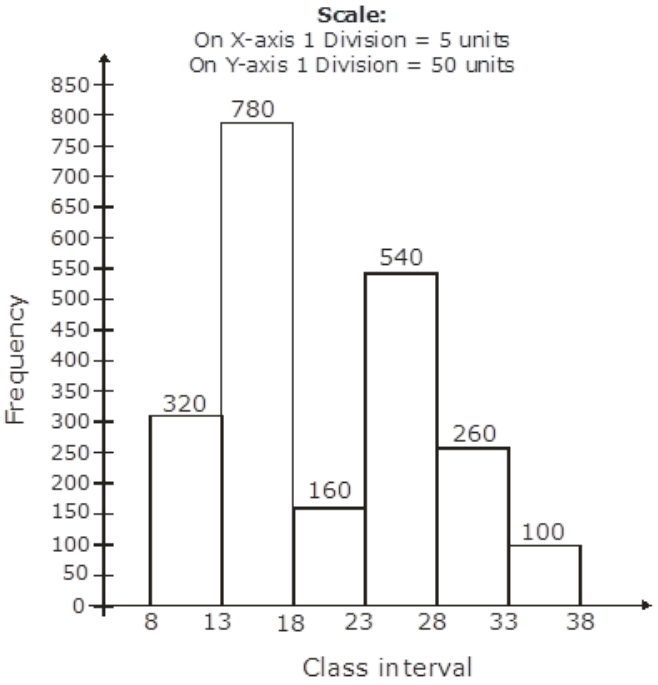
Now take the scale of,

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.

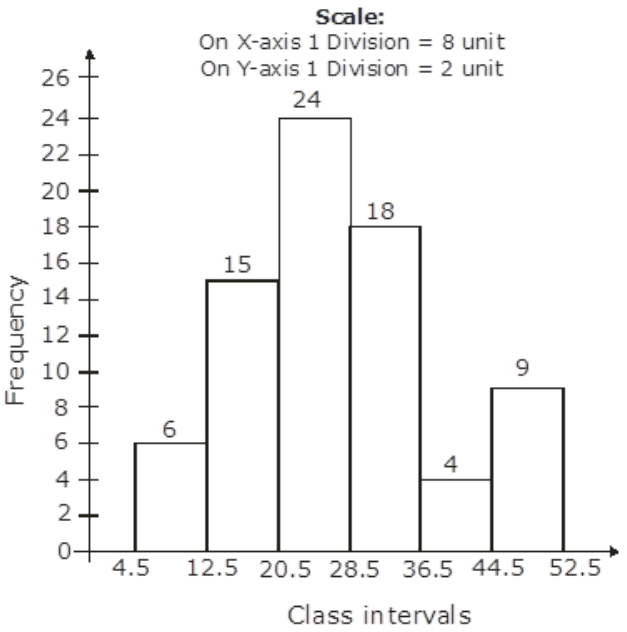
Now take the scale of,

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,

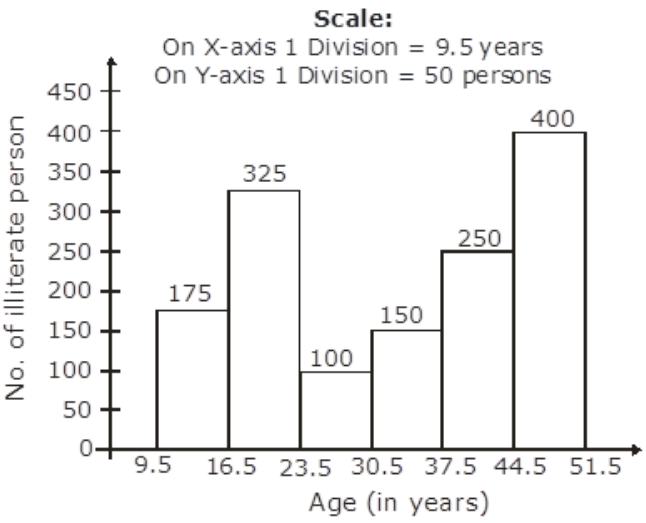
1 big division = 50 person on Y axis

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

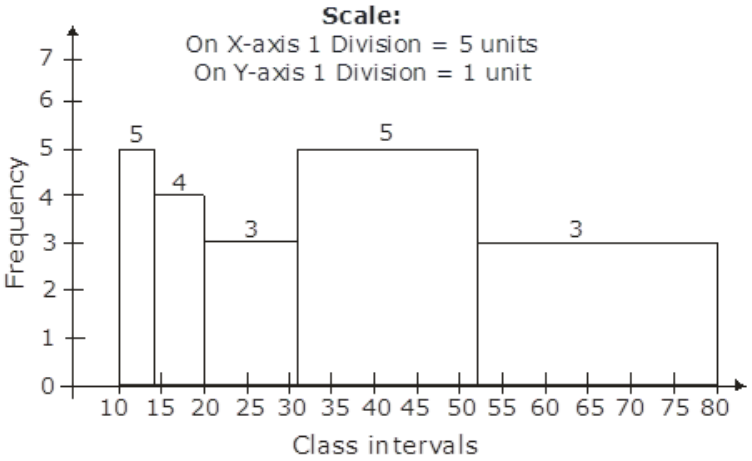
In the given frequency distribution, Class sizes are different.

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

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

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)

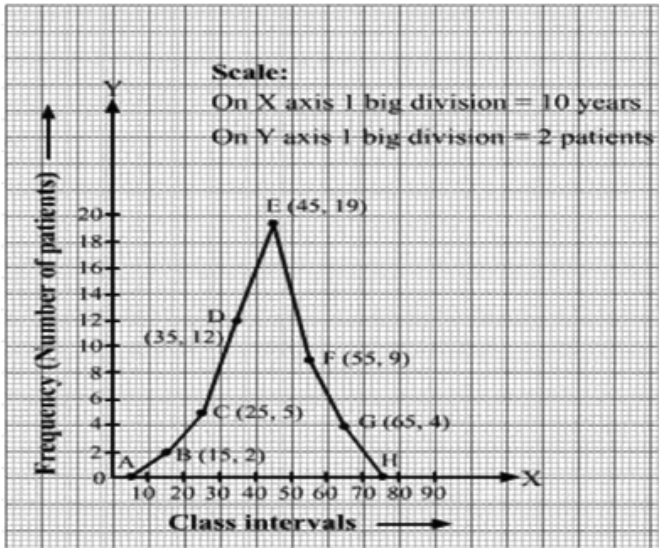
F (55, 9)

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 patience 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

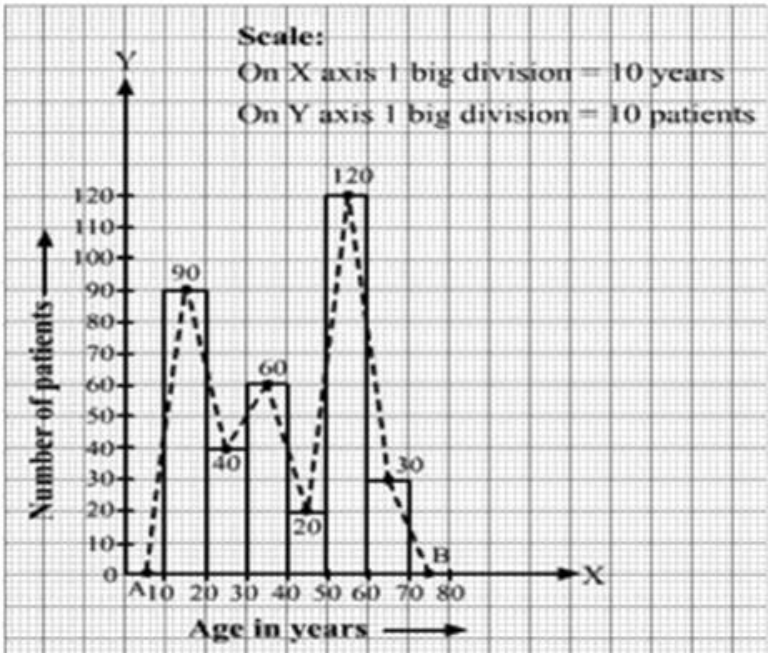
Draw a histogram and a frequency polygon on the same graph to represent the above data.

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.

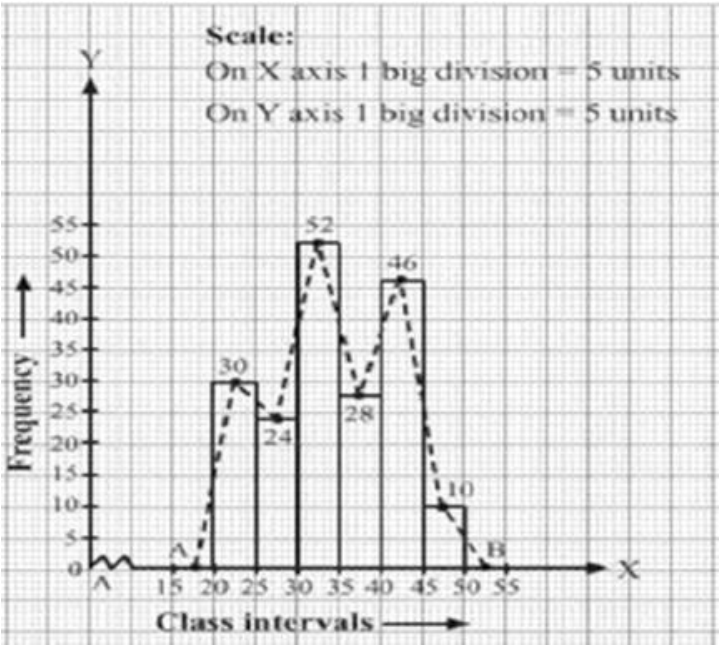
Class interval	20-25	25-30	30-35	35-40	40-45	45-50
Frequency	30	24	52	28	46	10

Answer

We take imagined class 15-20and 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.

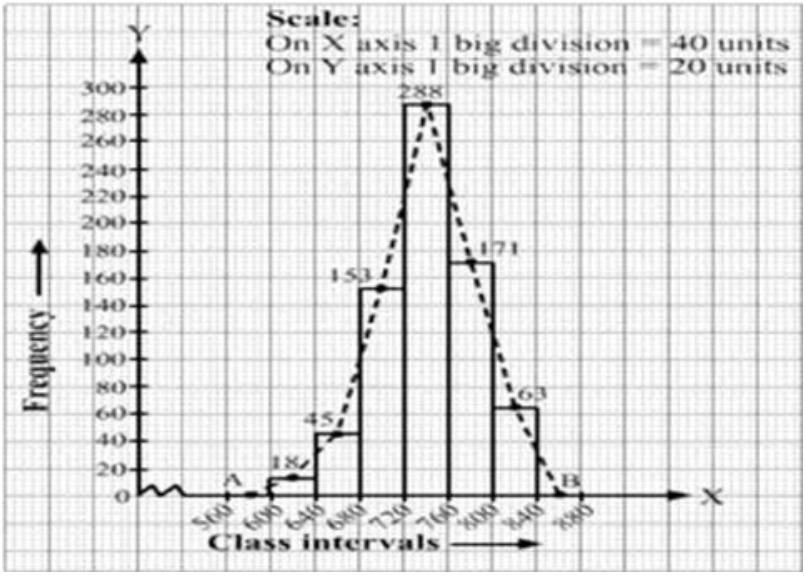
Answer

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)

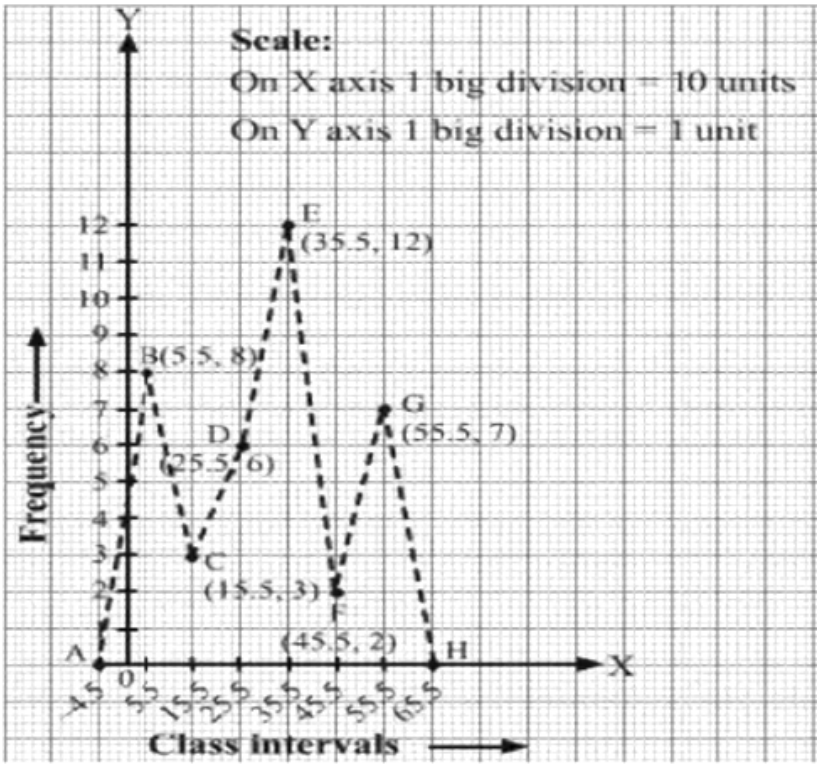
E (35.5, 12)

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

(i) the first eight natural numbers

(ii) the first ten odd numbers

(iii) the first five prime numbers

(iv) the first six even numbers

(v) the first seven multiples of 5

(vi) 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

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

(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

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

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

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

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

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

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

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

(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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

= 61 + x = 13 × 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 × 35 = 840.

Every number is increased by 3,

Total increment = 24 × 3 = 72

New sum = 840 + 72 = 912

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

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 × 43 = 860

When, every number is decreased by 6,

Total decrease in sum = 20 × 6 = 120

New sum will be = 860 – 120 = 740

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

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 × 27 = 405

When, every number is multiplied by 4,

The new sum becomes = 405 × 4 = 1620

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

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 × 40 = 480

When each number is divided by 8

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

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

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 × 18 = 360.

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

Total increment in sum = 10 × 3 = 30.

New sum becomes = 360 + 30 = 390

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

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 × 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 × 39 = 1950

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

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

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

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 × 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

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

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

Sum of numbers = 23 × 6 = 138

Mean of 5 numbers = 20 (Given)

Sum of 5 numbers = 20 × 5 = 100

So,

The excluded number = Sum of 6 numbers – 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,

Mean marks of 7 students = 226

Total marks of 7 students = 7×226 = 1582

Total marks of 6 students = (340 + 180 + 260 + 56 + 275 + 307)

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

= 1582 – 1418 = 164

Hence the marks of the 7^{th} 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

Mean weight of 34 students = 46.5kg

Total weight of 34 students = 34×46.5 = 1581 kg

If the weight of a teacher is included then mean arises = 500gm = 0.5 kg

So new mean = 46.5 + 0.5 = 47kg

Total weight = 47×35 = 1645 kg

Weight of a teacher = 1645 – 1581 = 84kg

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

Mean weight of 36 students = 41kg

Total weight of 36 students = 36×41 = 1476 kg

If one student leaves the class then mean decreases = 200gm = 0.2 kg

So new mean = 41 - 0.2 = 40.8kg

Total weight of 35 students = 40.8×35 = 1428 kg

Weight of the student = 1476 – 1428 = 48kg

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 = 39×40 = 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 = 39.8kg

Total weight of 39 students and 1 new student = 39.8×40 = 1592 kg

Weight of new student = 1592 – 1560 = 32kg

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 = 20×7650 = 153000Rs

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 × 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 = 10×9000 = 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 -81900 Rs

The wage of new member = 7200 Rs

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

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

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 = 7×330 = 2310 liters

Average consumption for next 5 months = 270 liters

Total consumption for next 5 months = 5×270 = 1350 liters

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

Now,

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

$= \frac{3660}{12}$ = 305 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 = 18×15 = 270

Mean of remaining 10 numbers = 13

Sum of remaining 10 numbers = 10×13 = 130

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

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

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 = 60×52.75 = 3165 kg

Mean weight of 25 students of them = 51kg

Sum of weight of 25 students = 51×25 = 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

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

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

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

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

10x – 58 + weight of new mean = 10(x + 1.5)

10x – 58 + weight of new mean = 10x + 15

Weight of new mean = 15 + 10x – 10x + 58

Weight of new mean = 73 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

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

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^{th} results.

Answer

Mean of 31 results = 60

Sum of 31 results = 31×60 = 1860

Mean of first 16 results = 58

Sum of first 16 results = 58×16 = 928

Mean of last 16 results = 62

Sum of last 16 results = 62×16 = 992

16^{th} result = sum of first 16^{th} results + sum of last 16 results – sum of 31 results

= 992 + 928 – 1860 = 60

So, 16^{th} 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^{th} number.

Answer

Given,

Mean of 11 number = 42

So, Sum of numbers = 11 × 42 = 462.

Mean of first 6 numbers = 37.

Hence, sum of first six numbers = 6 × 37 = 222.

Mean of last 6 numbers = 46

Sum of last 6 numbers = 6 × 46 = 276.

So,

The 6^{th} number = (sum of first 6 numbers and last 6 numbers) – (Sum of 11 numbers)

= (222 + 276) – 462 = 498 – 462 = 36.

The 6^{th} 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^{th} student.

Answer

Given,

Mean weight of 25 students = 52 kg

Total weight of 25 students = 25 × 52 = 1300 kg

Mean weight of first 13 students = 48 kg

Total weight of First 13 students = 13 × 48 = 624 kg

Mean weight of last 13 students = 55 kg

Total weight of last 13 students = 13 × 55 = 715 kg

So,

Weight of 13^{th} 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^{th} 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 × 80 = 2000.

Mean score of another 55 observations = 60

Total score of 55 observations = 55 × 60 = 3300.

Total observations = 55 × 25 = 80

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

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

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,

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

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

= 50 × 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 × 5680 = Rs.426000

Mean salary of 25 workers of them = Rs.5400

Total salary of 25 workers = 25 × 5400 = Rs.135000

Mean salary of 30 workers in them = Rs.5700

Total salary of 30 workers = 30 × 5700 = 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,

Average speed of ship in whole journey = $\frac{2xy}{x+y} = \frac{2\times15\times10}{25} = \frac{300}{25} = 12\ km/h$

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

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_1).

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
	$\sum f_i = 60$	$\sum x_i \times f_i = 7110$

By putting the formula of;

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) (xi)	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
	$\sum f_i = 12$	$\sum x_i \times f_i = 771$

By putting the formula of mean we get;

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

= 64.25 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_1)	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∑xi×fi

Age (in years) (xi)	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;

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

= 17.45 years

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

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
	$\sum f_i = 50$	$\sum x_i \times f_i = 2750$

By putting the formula of mean we get;

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

= 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 ∑xi×fi

(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;

Mean = $\frac{\sum f_i \times x_i}{\sum f_i} = 8$(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 ∑xi×fi

(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
	$\sum f_i = 50 + P$	$\sum x_i \times f_i = 1445 + 25P$

By putting the formula of mean we get;

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

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

28.25(50 + P) = 1445 + 25P

28.25×50 + 28.25×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
	$\sum f_i = 100$	$\sum x_i \times f_i = 1228 + 24P$

By putting the formula of mean we get;

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

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

16.6×100 = 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 ∑xi×fi

(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
	$\sum f_i = 68 + f_1 + f_2$	$\sum x_i \times f_i = 3480 + 30f_1 + 70f_2$

We have,

$\Sigma f_i = 120$ (given)

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

$f_1 + f_2 = 120 - 68$

$f_1 + f_2 = 52$…. Equation (i)

Now we have,

Mean = 50 (given)

Mean = $\frac{\sum f_i \times x_i}{\sum f_i}$ = 50

$50 = \frac{3480 + 30f1 + 70f2}{68 + f1 + f2}$

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

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

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

$20f_1 - 20f_2 = 80$

$20(f_1 - f_2) = 80$

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

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

Σf_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
	$\sum f_i = 100$		$\sum(d_i \times f_i) = -880$

We have,

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

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

$= 900 - 8.80$

= 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) (x_i)	No. of plants (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
	$\sum f_i = 100$		$\sum x_i f_i = 45$

We know,

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

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:

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
	$\sum f_i = 2200$		$\sum u_i \times f_i$ = - 840

We Know that,

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

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:

Height (in meter) x_i	No. of villages f_i	$u_i = \frac{x_i - 1400}{400}$	$u_i \times f_i$
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
	$\sum f_i = 1343$		$\sum u_i \times f_i$ = -1395

We know that,

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

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

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^{th} 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^{th} 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^{th} 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^{th} 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)

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

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

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

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)

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

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

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

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)

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

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

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

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^{th} 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 (0dd number)

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

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

= value of 5^{th} 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)

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

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

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

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)

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

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

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

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)

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

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

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

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,

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 21st term which is 50.

As we can see student from 20th to 28th 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^{th} observation, which comes under the observations from 18^{th} to 21^{st}.

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 22nd student as we know students from 11th to 26th 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,

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)

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

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

As we can see height of 25th student is 154 and 26th 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,

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)

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

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

As we can see variate from 18^{th} to 30^{th} has the size of 20 and from 31^{st} to 34^{th} 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		∑fx = 125

We have;

N = 10 (even number)

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

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

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

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

Now,

∑fx = 125 and ∑f = N = 10

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×12 - 2×12.5

= 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

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		∑fx = 332

We have;

N = 25 (odd number)

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

= value of 13^{th} term

= 13

Now,

∑fx = 332 and ∑f = N = 25

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×13 - 2×13.28

= 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,

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		∑fx = 407

We have;

N = 34 (even number)

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

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

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

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

Now,

∑fx = 407 and ∑f = N = 34

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×12 - 2×11.97

= 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,

(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		∑fx = 1161

We have;

N = 40 (even number)

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

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

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

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

Now,

∑fx = 1161 and ∑f = N = 40

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×30 - 2×29

= 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,

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		∑fx = 2935

We have;

N = 50 (even number)

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

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

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

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

Now,

∑fx = 2935 and ∑f = N = 50

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×59.7 - 2×58.7

= 179.1 – 117.4

= 61.1 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,

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		∑fx = 1992

We have;

N = 80 (even number)

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

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

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

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

Now,

∑fx = 1992 and ∑f = N = 80

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×28 - 2×24.9

= 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,

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		∑fx = 2650

We have;

N = 106 (even number)

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

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

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

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

Now,

∑fx = 2650 and ∑f = N = 106

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

Hence,

Mode = 3(median) – 2 (mean)

= 3×25 - 2×25

= 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,

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		∑fx = 796

We have;

N = 15(0dd number)

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

= value of 8^{th} term

= 53

Now,

∑fx = 796 and ∑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 = 1/2 (upper class limit + lower class limit)

= 1/2 (100 + 120) = 1/2 ×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 mild-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

Mild value = 10 (given)

We know that,

Mild value = 1/2 (u + l)

10 = 1/2 (u + l)

= u + l = 20.....(i)

Width of class = 6 (given)

= u – l = 6 .....(ii)

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

2l = 14

= l = 14/2 = 7.

∴ 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,

Mid-point = 1/2 (upper class limit + lower class limit)

m = 1/2 (upper class limit + lower class limit)

upper class limit = u (given)

u + lower class limit = 2m

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

Width of each class = 5 (given)

Total no. Of classes = 5 (given)

Lower class limit of lowest class = 10 (given)

∴ Total width of class = 5 × 5 = 25

∴ 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,

Mid-point of class = m

We know that,

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

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

lower class limit = l (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 = 1/2 (u + l)

42 = 1/2 (u + l)

= u + l = 84.....(i)

Class size = u – l

= u – l = 10 (given)

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

2u = 94

⇒ 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

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

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

$\Rightarrow$ Mean = 9 (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,

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 $x_1, x_2, x_3, \ldots, x_n$, then $\sum_{i=1}^{n}(x_i - \bar{x}) = ?$

A. -1

B. 0

C. 1

D. n-1

Answer

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

$\Rightarrow$ Mean of $x_1, x_2, x_3 ..... x_n = \bar{x}$ .....(i)

Now,

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

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

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

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.....x_n

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

If each observation is increased by 5, we get,

$x_1 + 5$, $x_2 + 5$, $x_3 + 5$.....$x_n + 5$

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

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

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

$\Rightarrow$ 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, ..., x_n and $\bar{y}$ be the mean of y_1, y_2, ...y_n. If $\bar{z}$ is the mean of x_1, x_2, ..., x_n, y_1, y_2..., 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

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

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

Now, their combined mean is,

$$= \left(\frac{x_1+x_2+x_3+\ldots+x_n}{n} + \frac{y_1+y_2+y_3+\ldots+y_n}{n}\right)$$

$$= \frac{x_1+x_2+x_3+\ldots+x_n+y_1+y_2+y_3+\ldots+y_n}{2n}$$

$$= \frac{1}{2}\left[\frac{x_1+x_2+x_3+\ldots+x_n}{n} + \frac{y_1+y_2+y_3+\ldots+y_n}{n}\right]$$

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

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

15. Question

If $\bar{x}$ is the mean of $x_1, x_2, \ldots, x_n$ then for $a \neq 0$, the mean of $ax_1, ax_2, \ldots, ax_n, \frac{x_1}{a}, \frac{x_2}{a}, \ldots, \frac{x_n}{a}$ 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 $\frac{x_1+x_2+x_3+\ldots+x_n}{n} = \bar{x}$ ... (i)

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

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

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

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 $\bar{x}_1, \bar{x}_2, \ldots, \bar{x}_n$ are the means of n groups with $\bar{n}_1, \bar{n}_2, \ldots, \bar{n}_n$ 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

Sum of all terms = $n_1\bar{x_1} + n_2\bar{x_2} + n_3\bar{x_3} \ldots\ldots + n_n\bar{x_n}$

Total number of factors = $n_1 + n_2 + n + \ldots + n_n$

$\therefore$ Required mean = $\frac{n_1\bar{x_1} + n_2\bar{x_2} + n_3\bar{x_3} \ldots\ldots + n_n\bar{x_n}}{n_1 + n_2 + n + \ldots + n_n}$

$\frac{\sum_{i=1}^{n} n_i \bar{x}}{\sum_{i=1}^{n} n_i}$.

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, 46kg and 44 kg. The weight of the 6^{th} 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^{th} boy = x kg

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

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

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

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

$\Rightarrow x = 288 - 235 = 53$ kg

Hence, the weight of the 6^{th} 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 × 50 = 1950.

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

= 1950 – 23 + 43 = 1970

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 × 100 = 6400.

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

= 6400 – (26 + 9) + (36 + 90)

6400 – 35 + 126 = 6491.

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 × 50 = 5000

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

New sum = 5000 – 50 + 150 = 5100.

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^{th} observation is

A. 23

B. 36

C. 38

D. 40

Answer

Mean of 25 observations 36.

Sum of 25 observations = 25 × 36 = 900.

Mean of first 13 observations = 32

Sum of first 13 observations = 13 × 32 = 416.

Means of last 13 observations = 40

Sum of last 13 observations = 13 × 40 = 520.

Hence,

13^{th} observation = (sum of first 13 observation + sum of last 13observations) – sum of 25 observations.

13^{th} observation = 416 + 520 – 900 = 936 – 900 = 36

Hence, 13^{th} 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, ……, n_{50}

And mean = x

Then sum = 50x

Now each number is subtracted from 53,

We have,

53 - n_1, 53 - n_2, ……, 53 - n_{50}

Sum becomes = 53 × 50 – (n_1 + n_2 + ……, + n_{50})

Given Mean = - 3.5

So,

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

= 2650 – 50x = 50 × (- 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 × Y
3	6	18
5	8	40
7	15	105
9	P	9p
11	8	88
13	4	52
	$\sum y = 41 + p$	$303 + 9p$

Mean = $\frac{\sum x.y}{\sum y}$

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

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,

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

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

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

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

$\therefore$ Mean weight = 42 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,

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

⇒ 5^{th} 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,

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

Sum of five numbers = 5 × 30 = 150

Change in the mean when one number is excluded, it become = 28

Sum of remaining four numbers = 4 × 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 = 1/2 [Value of (n/2)th term + (n/2 + 1)th term]

Now, Median = 24 (given)

24 = 1/2 [Value of 5^{th} term + Value of 6^{th} term]

24 × 2 = (x + 2) + (x + 4)

48 = 2x + 6

48 – 6 = 2x

42 = 2x

So,

x = 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, …….. , n_{15}

$$\text{Mean} = \frac{n_1 + n_2 + \ldots..+ n_{15}}{15}$$

Given mean = 25

$25 = \frac{n_1 + n_2 + \ldots..+ n_{15}}{15}$

$\Rightarrow n_1 + n_2 + \ldots\ldots + n_{15} = 25 \times 15$

$\Rightarrow n_1 + n_2 + \ldots\ldots + n_{15} = 375$ … [equation (i)]

After subtracting 6 from each number the mean = 19

So, we have,

$(n_1 - 6), (n_2 - 6), \ldots\ldots.. (n_{15} - 6)$

$$\Rightarrow \text{Mean} = \frac{(n_1 - 6) + (n_2 - 6) + \ldots..+ (n_{15} - 6)}{15}$$

$$\Rightarrow \text{Mean} = \frac{(n_1 + n_2 + \ldots..+ n_{15}) - 6 \times 15}{15}$$

$$\Rightarrow \text{Mean} = \frac{n_1 + n_2 + \ldots..+ n_{15}}{15} - \frac{6 \times 15}{15}$$

From equation (i)

$$\Rightarrow \text{Mean} = \frac{375}{15} - \frac{6 \times 15}{15}$$

$\Rightarrow$ 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 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^{th} 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 3rd 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 = $\frac{1}{2}$(5th term + 6th 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

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) Class size = 52 – 47 = 5

(ii) Class size = 5

Mid value = $\frac{5}{2}$ = 2.5

Class marks = 52

Upper class limit = 52 + 2.5 = 54.5

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. Mode $= \frac{1}{2}$(mean + 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;

Median = 1/2 [value of (n/2)th term + value of (n/2 + 1)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;

Mode = 3(median) – 2(mean)

So, the given statement is false.

42. Question

Which is false?

A. If $\overline{x}$ is the mean of $\overline{x}_1, \overline{x}_2, \ldots, \overline{x}_n$,

then $\sum_{i=1}^{n}(x_i - \overline{x}) = 0.$

B. If the mean of $\overline{x}_1, \overline{x}_2, \ldots, \overline{x}_n$ is $\overline{x}$,

then the mean of $(x_1 + a), (x_2 + a), \ldots, (x_n + a) \text{is} (\overline{x} + a).$

C. If the mean of $\overline{x}_1, \overline{x}_2, \ldots, \overline{x}_n$ is $\overline{x}$ and a≠ 0,

then the mean of $ax_1, ax_2, \ldots, ax_n \text{is } a\overline{x}.$

D. If M is the median of $\overline{x}_1, \overline{x}_2, \ldots, \overline{x}_n$ and a≠ 0,

then aM is the median of $ax_1, ax_2, \ldots, ax_n$.

Answer

(A) Given,

$\bar{x} = \frac{x_1 + x_2 + \ldots\ldots + x_n}{n}$ .....(i)

Now take L.H.S

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

$\Rightarrow (x_1 - \bar{x}) + (x_2 - \bar{x}) + \ldots.. + (x_n - \bar{x})$

$\Rightarrow (x_1 + x_2 + \ldots.. + x_n) - n\bar{x}$

$\Rightarrow n\bar{x} - n\bar{x} [\because x_1 + x_2 + \ldots.. + x_n = n\bar{x}, \text{from equation (i)}]$

$\sum_{i=1}^{n}(x_i - \bar{x}) = 0$

So, given statement is true.

(B) Given,

$\bar{x} = \frac{x_1 + x_2 + \ldots\ldots.. + x_n}{n}$ .....(i)

Observations are = $(x_1 + a)$, $(x_2 + a)$, ... $(x_n + a)$

$\Rightarrow \text{Mean} = \frac{(x_1 + a) + (x_2 + a) + \ldots\ldots + (x_n + a)}{n}$

$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + \ldots\ldots.. + x_n + n \times a}{n}$

$\Rightarrow \text{Mean} = \frac{x_1 + x_2 + \ldots\ldots.. + x_n}{n} + \frac{n + a}{n}$

From equation (i) we get,

$$\text{Mean} = (\bar{x} + a)$$

So, given statement is true.

(C) Mean of $x_1, x_2, \ldots\ldots x_n = \frac{x_1 + x_2 + \ldots\ldots + x_n}{n}$

Given mean = $\bar{x}$

$$\bar{x} = \frac{x_1 + x_2 + \ldots\ldots + x_n}{n} \ldots\ldots (i)$$

Observations are = $ax_1, ax_2, \ldots\ldots ax_n$

$$\Rightarrow \text{Mean} = \frac{ax_1 + ax_2 + \ldots\ldots + ax_n}{n}$$

$$\Rightarrow \text{Mean} = \frac{a(x_1 + x_2 + \ldots\ldots + x_n)}{n}$$

$\therefore$ Mean = $a\bar{x}$ ….. [From equation (i)]

So, the given statement is true.

(D) Let suppose the observations are = $\bar{X}_1, \bar{X}_2, \ldots \bar{X}_n$

$\frac{x_1 + x_2 + \ldots\ldots + x_n}{n}$ …….(Given)

Sum = $\bar{X}_1 + \bar{X}_2 + \ldots + \bar{X}_n$ = nM……..(i)

And

$ax_1 + ax_2 + \ldots\ldots\ldots\ldots + ax_n = aM$

Then,

$$\frac{na + (x_1 + x_2 + \ldots\ldots + x_n)}{n} = aM$$

$\frac{na + nM}{n} = aM$ [from equation (i)]

$$= \frac{n(a + M)}{n} = aM$$

a + M = aM (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

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 × 6

⇒ 41 + x = 48

∴ x = 48 – 41 = 7

So, x = 7

The given statement is true.

(B) Given array = 59, 62, 65, x, x + 2, 72, 85, 99

n = 8 (even)

Median = 1/2 [value of (n/2)th term + value of (n/2 + 1)th term]

= 1/2 [value of 4th term + value of 5th term]

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

Given median = 67

67 = $\frac{2x+2}{2}$ ⇒ 2x + 2 = 67 × 2

2x + 2 = 134

2x = 134 – 2

X = $\frac{132}{2}$ = 66

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;

Sum of 10 observations = 10 × 15 = 150

Sum of 15 observation = 15 × 18 = 270

Sum of 25 observation = Sum of 10 observations + Sum of 15 observations

Mean of 25 observations = $\frac{\text{Sum of 25 observation}}{\text{No.of observations}}$

$\Rightarrow \text{Mean} = \frac{150 + 270}{25}$

$\Rightarrow$ Mean = 420/25

$\therefore$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 = 1/2 [upper limit + lower limit]

Class marks = 1/2 [30 + 21]

∴ Class marks = 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

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

⇒ x + x + 2 + x + 4 + x + 6 + x + 8 = 11 × 5

⇒ 5x + 20 = 55

⇒ 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 = 1/2 [value of(n/2)th term + value of (n/2 + 1)th term]

⇒ Median = 1/2 [value of 8th term + value of 9th term]

⇒ Median = 1/2 [10 + 14]

∴ 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

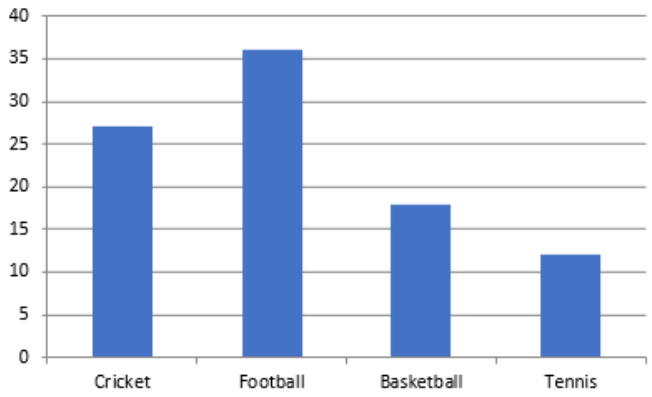
Draw a bar graph to represent the above data.

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

Mean height per player = $\frac{\text{Sum of heights}}{\text{No.of players}}$

$$\Rightarrow \text{Mean} = \frac{148 + 154 + 153 + 140 + 150}{5}$$

$$\Rightarrow \text{Mean} = \frac{745}{5}$$

∴ Mean = 149cm

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 model 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;

Class size = 31 – 26 = 5

Mid value = 5/2 = 2.5

When class mark is 26;

Upper class limit = 26 + 2.5 = 28.5

Lower class limit = 26 – 2.5 = 23.5

When class mark is 31;

Upper class limit = 31 + 2.5 = 33.5

Lower class limit = 31 – 2.5 = 28.5

When class mark is 36;

Upper class limit = 36 + 2.5 = 38.5

Lower class limit = 36 – 2.5 = 33.5

When class mark is 41;

Upper class limit = 41 + 2.5 = 43.5

Lower class limit = 41 – 2.5 = 38.5

When class mark is 46;

Upper class limit = 46 + 2.5 = 48.5

Lower class limit = 46 – 2.5 = 43.5

When class mark is 51;

Upper class limit = 51 + 2.5 = 53.5

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
	$\sum f = 41 + p$	$\sum fx = 303 + 9p$

$$\Rightarrow \text{Mean} = \frac{\sum fx}{\sum f}$$

Given mean = 8

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

⇒ 8(41 + p) = 303 + 9p

⇒ 328 + 8p = 30 + 9p

⇒ 9p – 8p = 328 – 303

⇒ 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 = 1/2 [value of (n/2)th term + value of (n/2 + 1)th term]

Median = 1/2 [value of 5th term + value of 6th term]

Median = 1/2 [(x + 1) + (x + 3)] = (2x + 4)/2

Given median = 24

$\Rightarrow 24 = \frac{2x + 4}{2}$

⇒ 2x + 4 = 24 × 2

⇒ 2x + 4 = 48

⇒ 2x = 48 – 4 = 44

⇒ 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
	∑f = 10		∑fx = 125

∑f = N = 10 (even)

Median = 1/2 [value of (n/2)th term + value of (n/2 + 1)th term]

= 1/2 [value of 5th term + value of 6th term]

= 1/2 [12 + 12] = 24/2 = 12

Now,

Mean = (∑fx)/(∑f) = 125/10 = 12.5

Mode = 3(median) – 2(mean)

= 3 × 12 – 2 × 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;

Variables(x)	Frequency(f)	Cumulative frequency
3	3	3
6	4	7
7	13	20
10	2	22
12	8	30
15	10	40
	∑f = 40	

∑f = N = 40 (even)

Median = 1/2 [value of (n/2)th term + value of (n/2 + 1)th term]

= 1/2 [value of 20th term + value of 21st term]

= 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,

$$\therefore \frac{n_1 + n_2 + n_3 + n_4 + n_5 + n_6}{6} = 23$$

$n_1 + n_2 + n_3 + n_4 + n_5 + n_6 = 23 \times 6 = 136$ …….(i)

Let suppose excluded number be n_4

N = 5

Mean of remaining numbers = $\frac{n_1 + n_2 + n_3 + n_5 + n_6}{5} = 20$ (given)

$n_1 + n_2 + n_3 + n_5 + n_6 = 20 \times 5 = 100$ …….(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

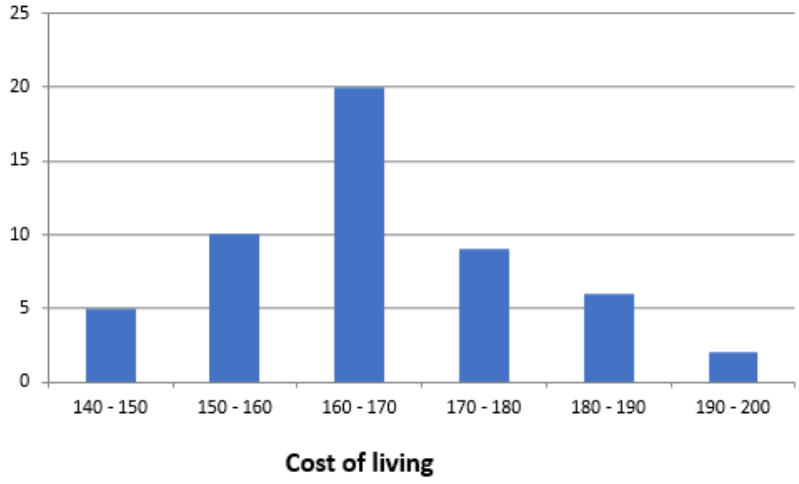
In the city, the weekly observations made on the cost of living index are given below.

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 ×50 = 1950

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

= 1950 + 43 – 23

= 1993 – 23 = 1970

Correct mean = (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;

Weight(x)	No. of workers	Fx
60	4	240
63	3	189
66	2	172
69	2	138
72	1	72
	$\sum f = 12$	$\sum fx = 771$

Mean = $\frac{\sum fx}{\sum f}$

$\sum f = 12$, $\sum fx = 771$

$$\text{Mean} = \frac{771}{12} = 64.25\text{kg}$$

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 = ∑f = 50 (even)

Median = 1/2 [value of (n/2)th term + value of (n/2 + 1)th term]

⇒ Median = 1/2 [value of 25th term + value of 26th term]

⇒ Median = 1/2 [154 + 155] = 309/2 = 154.5cm