CHAPTER 14

Statistics

1. OBJECTIVE QUESTIONS

1. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is
(a) 6 (b) 7
(c) 8 (d) 12

Ans : (b) 7
Let x be the upper limit and y be the lower limit.
Since the mid value of the class is 10.

Hence, $\dfrac{x+y}{2} = 10$

$x+y = 20$ ...(1)

and $x-y = 6$

(width of the class $= 6$) ...(2)

By solving (1) and (2), we get $y = 7$
Hence, lower limit of the class is 7.

2. For finding the popular size of readymade garments, which central tendency is used?
(a) Mean
(b) Median
(c) Mode
(d) Both Mean and Mode

Ans : (c) Mode
For finding the popular size of ready made garments, mode is the best measure of central tendency.

3. If the difference of mode and median of a data is 24, then the difference of median and mean is
(a) 12 (b) 24
(c) 08 (d) 36

Ans : (a) 12
We have,

Mode $-$ Median $= 24$

We know that, Mode $= 3$ (Median) $- 2$ Mean

Mode $-$ Median $= 2$ Median $- 2$ Mean

$24 = 2$ (Median $-$ Mean)

Median $-$ Mean $= 12$

4. The mean of discrete observations y_1, y_2 .... y_n is given by

(a) $\dfrac{\sum_{i=1}^{n} y_i}{n}$ (b) $\dfrac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} i}$

(c) $\dfrac{\sum_{i=1}^{n} y_i f_i}{n}$ (d) $\dfrac{\sum_{i=1}^{n} y_i f_i}{\sum_{i=1}^{n} f_i}$

Ans : (a) $\dfrac{\sum_{i=1}^{n} y_i}{n}$

5. If the mean of the numbers $27+x$, $31+x$, $89+x$ $107+x, 156+x$ is 82, then the mean of $130+x, 126+x, 68+x, 50+x, 1+x$ is
(a) 75 (b) 157
(c) 82 (d) 80

Ans : (a) 75
Given,

$$82 = \frac{(27+x)+(31+x)+(89+x)+(107+x)+(156+x)}{5}$$

$$82\times 5 = 410+57$$

$$410-410 = 5x$$

$$x = 0$$

Required mean is,

$$\overline{x} = \frac{130+x+126+x+68+x+50+x+1+x}{5}$$

$$\overline{x} = \frac{375+5x}{5} = \frac{375+0}{5}$$

$$= \frac{375}{5} = 75$$

6. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observation of the set is increased by 2, then the median of the new set
(a) Is increased by 2
(b) Is decreased by 2
(c) Is two times the original median
(d) Remains the same as that of the original set

Ans : (d) Remains the same as that of the original set

Since, n $= 9$

then, median term $= \left(\dfrac{9+1}{2}\right)^{\text{th}} = 5^{\text{th}}$ item.

Now, last four observations are increased by 2.
The median is 5^{th} observation, which is remaining unchanged.
There will be no change in median.

7. If the coordinates of the point of intersection of less than ogive and more than ogive is (13.5,20), then the value of median is
(a) 13.5 (b) 20
(c) 33.5 (d) 7.5

Ans : (a) 13.5

The abscissa of point of intersection gives the median of the data. So, median is 13.5.

8. A set of numbers consists of three 4's, five 5's, six 6's, eight 8's and seven 10's. The mode of this set of numbers is

(a) 6 (b) 7

(c) 8 (d) 10

Ans : (c) 8

Mode of the data is 8 as it is repeated maximum number of times.

9. If the mean of the observation $x, x+3, x+5, x+7$ and $x+10$ 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) $11\frac{2}{3}$

Ans : (c) $11\frac{1}{3}$

We know,

$$\text{Mean} = \frac{\text{Sum of all the observations}}{\text{Total no. of observation}}$$

$$\text{Mean} = \frac{x - x+3 - x+5 - x+7 + x - 10}{5}$$

$$9 = \frac{5x+25}{5}$$

$$x = 4$$

So, mean of last three observation is

$$\frac{3x+22}{3} - \frac{12+22}{3} = \frac{34}{3} = 11\frac{1}{3}$$

10. If the arithmetic mean of the following distribution is 47, then the value of p is

Class interval	0-20	20-40	40-60	60-80	80-100
Frequency	8	15	20	p	5

(a) 10 (b) 11

(c) 163 (d) 12

Ans : (d) 12

Let us construct the following table for finding the arithmetic mean

Class interval	**Frequency** (f_i)	**Class mark** (X_i)	$f_i x_i$
0-20	8	10	80
20-40	15	30	450
40-60	20	50	1000
60-80	p	70	70 p
80-100	5	90	450
Total	$\sum f_i = 45 + p$		$\sum f_i x_i = 1980 + 70p$

Now,
$$\overline{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{1980+70p}{48+p}$$

$$47 = \frac{1980+70p}{48+p}$$

$$2256 + 47p = 1980 + 70p$$

$$276 = 23p$$

$$p = 12$$

11. The mean weight of 9 students is 25 kg. If one more student is joined in the group the mean is unaltered, then the weight of the 10^{th} student is

(a) 25 kg (b) 24 kg

(c) 26 kg (d) 23 kg

Ans : (a) 25 kg

The sum of the weights of the 9 students $= 25 \times 9 = 225$. If one more student is joined in the group, then total number of students is 10 and mean is 25.

Hence, the sum of the weights of the 10^{th} students $= 25 \times 10 = 250$.

Hence, the weight of the 10^{th} student is $250 - 225 = 25$ kg.

12. The mean and median of the data a, b and c are 50 and 35 respectively, where $a < b < c$. If $c - a = 55$, then find $(b - a)$.

(a) 8 (b) 7

(c) 3 (d) 5

Ans : (d) 5

Since, a, b and c and are in ascending order, therefore median $= b \Rightarrow b = 35$.

$$\text{Mean} = 50$$

$$\frac{a+b+c}{3} = 50$$

$$a+b+c = 150$$

$$a+c = 150 - 35 = 115 \quad ...(1)$$

Also, it is given that $\quad c - a = 55 \quad ...(2)$

On solving Eqs. (1) and (2), we get

$$c = 85$$

and $\quad a = 30$

Hence, $\quad b - a = 35 - 30 = 5$

13. Observations of some data are $\frac{x}{5}, x, \frac{x}{3}, \frac{2x}{3}, \frac{x}{4}, \frac{2x}{5}$ and $\frac{3x}{4}$,

where $x > 0$. If the median of the data is 4, then the value of x is

(a) 5 (b) 15

(c) 9 (d) 10

Ans : (d) 10

Given observations are $\frac{x}{5}, x, \frac{x}{3}, \frac{2x}{3}, \frac{x}{4}, \frac{2x}{5}$ and $\frac{3x}{4} (x > 0)$.

On arranging the above observations in ascending order, we get

$$\frac{x}{5}, \frac{x}{4}, \frac{x}{3}, \frac{2x}{5}, \frac{2x}{3}, \frac{3x}{4}, x$$

Here, total number of observations $= 7$, which is odd.

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

$$= \left(\frac{7+1}{2}\right)^{\text{th}} \text{ observation}$$

$$= 4^{\text{th}} \text{ observation } = \frac{2x}{5}$$

$$\text{Median } = \frac{2x}{5} = 4 \qquad \text{[Given]}$$

$$x = \frac{4 \times 5}{2} = 10$$

14. If the mean of the squares of first n natural numbers is 105, then the first n natural numbers is

(a) 8 (b) 9

(c) 10 (d) 11

Ans : (b) 9

We know that,

$$\sum x^2 = \frac{n(n+1)(2n+1)}{6}$$

Mean of squares of first n natural numbers

$$= \frac{(n+1)(2n+1)}{6}$$

$$105 = \frac{(n+1)(2n+1)}{6}$$

$$2n^2 + 3n + 1 = 630$$

$$2n^2 + 3n - 629 = 0$$

$$2n^2 + 37n - 34n - 629 = 0$$

$$n(2n+37) - 17(2n+37) = 0$$

$$(2n+37)(n-17) = 0$$

$$n = 17$$

[Since, n can not be negative]

Since, n is odd, therefore median

$= \left(\frac{17+1}{2}\right)^{\text{th}}$ observation $= 9^{\text{th}}$ observation $= 9$.

15. The following table shows the literacy rate (in percentage) of 35 cities.

Literacy rate (in%)	45-55	55-65	65-75	75-85	85-95
Number of cities	3	10	11	8	3

The mean literacy rate is

(a) 50.43 (b) 60.50

(c) 69.43 (d) 59.43

Ans : (c) 69.43

Let us construct the following table for finding the mean literacy rate

Literacy rate (in%)	**Number of cities (f_i)**	**Mid-point (x_i)**	$u_i = \frac{x_i - 70}{10}$	$f_i u_i$
45-55	3	50	-2	-6
55-65	10	60	-1	-10
65-75	11	70	0	0
75-85	08	80	1	08
85-95	03	90	2	06
Total	$\sum f_i = 35$			$\sum f_i u_i = -2$

Now, using step-deviation method,

$$\overline{x} = 70 + \frac{-2}{35} \times 10$$

$$= 70 - \frac{4}{7} = 70 - 0.57 = 69.43$$

16. Mode of the following grouped frequency distribution is

Class	**Frequency**
3-6	2
6-9	5
9-12	10
12-15	23
15-18	21
18-21	12
21-24	03

(a) 13.6 (b) 15.6

(c) 14.6 (d) 16.6

Ans : (c) 14.6

We observe that the class 12-15 has maximum frequency. Therefore, this is the modal class.

We have, $l = 12$

$h = 3$

$f_1 = 23$

$f_0 = 10$

and $f_2 = 21$

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 12 + \frac{23 - 10}{46 - 10 - 21} \times 3$$

$$= 12 + \frac{13}{15} \times 3$$

$$= 12 + \frac{13}{5} = 14.6$$

17. While computing the mean of grouped data, we assume that the frequencies are

(a) evenly distributed over all the classes

(b) centred at the class marks of the classes

(c) centred at the upper limits of the classes

(d) centred at the lower limits of the classes

Ans : (b) centred at the class marks of the classes

While computing mean of ground data, we assume that the frequencies distribution table.

18. If median $= 137$ and mean $= 137.05$, then the value of mode is

(a) 156.90 (b) 136.90

(c) 186.90 (d) 206.90

Ans : (b) 136.90

Given,

$$\text{median} = 137$$

and

$$\text{mean} = 137.05$$

We know that,

$$\text{Mode} = 3(\text{Median}) - 2(\text{Mean})$$

$$= 3(137) - 2(137.05)$$

$$= 411 - 274.10 = 136.90$$

19. The following data gives the distribution of total household expenditure (in <) of manual workers in a city.

Expenditure (in <)	Frequency
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	28
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	07

Then, find the average expenditure which is done by the maximum number of manual workers.

(a) 1747.26 (b) 1847.26

(c) 1947.26 (d) 2047.26

Ans : (b) 1847.26

Given,

$$l = 1500$$
$$h = 500$$
$$f_1 = 40$$
$$f_0 = 24$$

and
$$f_2 = 33$$

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$
$$= 1500 + \frac{40-24}{80-24-33} \times 500$$
$$= 1500 + \frac{16}{23} \times 500 = 1847.26$$

20. For the following distribution

Marks	Number of Students	Marks	Number of students
Below 10	3	Below 40	57
Below 20	12	Below 50	75
Below 30	28	Below 60	80

The modal class is

(a) 0-20 (b) 20-30

(c) 30-40 (d) 50-60

Ans : (c) 30-40

Let us first construct the following frequency distribution table.

Marks	Number of Students
0-10	3
10-20	9
20-30	16
30-40	29
40-50	18
50-60	5

Since, the maximum frequency is 29 and the class corresponding to this frequency is 30-40.

So, the modal class is 30-40.

21. If X, M and Z are denoting mean, median and mode of a data and $X:M = 9:8$, then the ratio M: Z is

(a) 3 : 4 (b) 4 : 9

(c) 4 : 3 (d) 2 : 5

Ans : (c) 4 : 3

Since, Mode $= 3$ Median $- 2$ Mean

$$Z = 3M - 2X \quad \text{...(1)}$$

Given,
$$X:M = 9:8$$
$$\frac{X}{M} = \frac{9}{8}$$
$$X = \frac{9M}{8}$$

On putting the value of X Eq. (1), we get

$$Z = 3M - 2 \times \frac{9M}{8} = 3M - \frac{9M}{4}$$
$$Z = \frac{3M}{4}$$
$$\frac{M}{Z} = \frac{4}{3}$$

or
$$M:Z = 4:3$$

22. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 min and summarised in the table give below.

Number of cars	Frequency
0-10	7
10-20	14
20-30	13
30-40	12
40-50	20
50-60	11
60-70	15
70-80	08

Then, the mode of the data is

(a) 34.7 (b) 44.7

(c) 54.7 (d) 64.7

Ans : (b) 44.7

Here, modal class is 40-50. Since, it has maximum frequency which is 20.

So, $l = 40$, $f_1 = 20$, $f_0 = 12$, $f_2 = 11$

and $h = 10$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$
$$= 40 + \left(\frac{20-12}{40-12-11}\right) \times 10$$
$$= 40 + \frac{80}{17}$$
$$= 40 + 4.7 = 44.7 \text{ cars}$$

23. If the mean of a, b, c is M and $ab + bc + ca = 0$, the mean of a^2, b^2 and c^2 is KM^2, then K is equal to

(a) 3 (b) 9

(c) 6 (d) 4

Ans : (a) 3

Given,

$$\frac{a+b+c}{3} = M$$

$$a+b+c = 3M$$

and $$\frac{a^2+b^2+c^2}{3} = KM^2$$

Now, $$(a+b+c)^2 = a^2+b^2+c^2+2(ab+bc+ca)$$

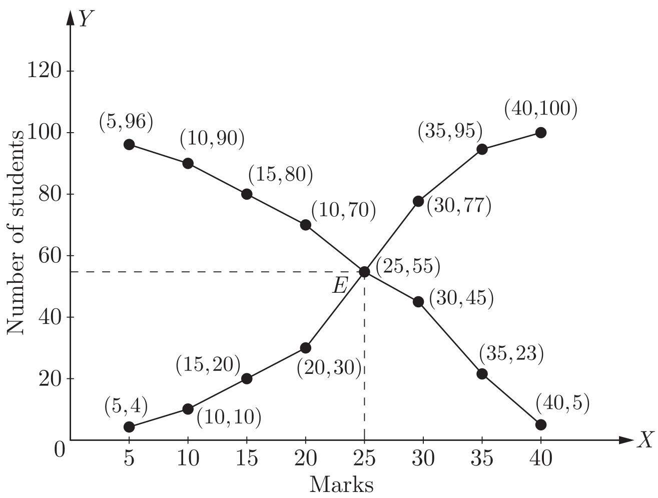
$$a^2+b^2+c^2 = 9M^2 \qquad [\because ab+bc+ca = 0]$$

$$\frac{a^2+b^2+c^2}{3} = 3M^2$$

$$KM^2 = 3M^2$$

$$K = 3$$

24. A median through the less than ogive and more than ogive is 24.



The median through the calculation method is

(a) 24 (b) 25

(c) 24.5 (d) 25.5

Ans : (a) 24

Firstly, we make a table from the given ogive. The points on the less than ogive curve are (5, 4), (10, 10), (15, 20), (20, 30), (25, 55), (30, 77) (35, 95) and (40, 100).

In each point, the value of x-coordinate is upper limit of the class interval and the value of y-coordinate is the frequency of that interval. Here, we see that the difference of two consecutive upper limits (i.e. 10-5) is 5. So, the lower limit of the initial interval is 0 (i.e. 5-5).

The less than cumulative frequency table from given ogive is

Marks	**Class intervals**	**Cumulative frequency**	**Frequency**
Less than 5	0-5	4	4
Less than 10	5-10	10	$10-4=6$
Less than 15	10-15	20	$20-10=10$
Less than 20	15-20	$30 = cf$	$30-20=10$
Less than 25	20-25	55	$55-30=25=f$
Less than 30	25-30	77	$77-55=22$
Less than 35	30-35	95	$95-77=18$
Less than 40	35-40	100	$100-95=5$

Here, $$n = 100$$

$$\frac{n}{2} = \frac{100}{2} = 50$$

The cumulative frequency just greater than 50 is 55 and the corresponding class intervals is 20-25. So, the median class is 20-25.

Here, $$l = 20$$

$$cf = 30$$

$$f = 25$$

and $$h = 5$$

$$\text{Medina} = l + \left\{\frac{\frac{n}{2}-cf}{f}\right\} \times h$$

$$= 20 + \left\{\frac{50-30}{25}\right\} \times 5$$

$$= 20 + \frac{100}{25} = 20+4 = 24$$

Hence verified

25. The mean of 25 observations is 36. If the mean of the first 13 observation is 32 and that of the last 13 observations is 39, then the 13th observations is

(a) 16 (b) 23

(c) 21 (d) 18

Ans : (b) 23

Given, mean of 25 observations $= 36$

$$\overline{x}_1 = \frac{\sum x_1}{n_1}$$

$$36 = \frac{\sum x_1}{25}$$

$$\sum x_1 = 36 \times 25 = 900$$

Sum of 25 observation $= 900$

Mean of the first 13 observations $= 32$

$$\overline{x}_2 = \frac{\sum x_2}{n_2}$$

$$32 = \frac{\sum x_2}{13}$$

$$\sum x_2 = 13 \times 32 = 416$$

Sum of first 13 observations $= 416$

and mean of the last 13 observations $= 39$

Hence, $\overline{x}_2 = \frac{\sum x_3}{n_3}$

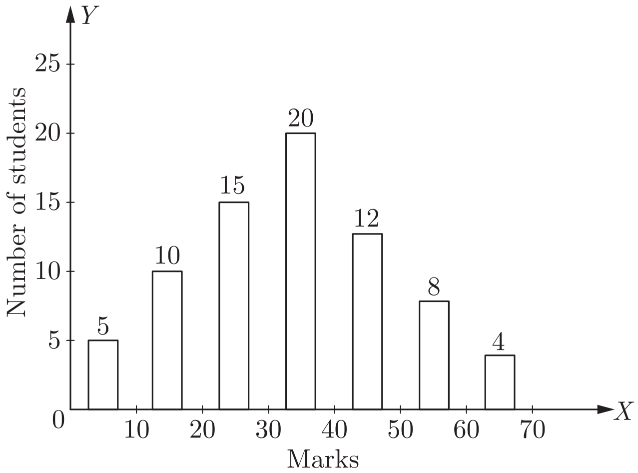
$$39 = \frac{\sum x_3}{13}$$

$$\sum x_3 = 13 \times 39 = 507$$

Hence, Sum of last 13 observations = 507
Now, 13th observation = Sum of first 13 observations + Sum of last 13 observations − Sum of 25 observations

$$= 416 + 507 - 900 = 23$$

26. A histogram of equal class intervals is given below.



The mean, median and mode for the above data, are
(a) 33.64, 33.85, 33.71 (b) 33.71, 33.85, 33.64
(c) 33, 34 35 (d) None of these

Ans : (a) 33.64, 33.85, 33.71

The frequency distribution from the given graph is

Marks	Number of students (f_i)	Mid value (x_i)	$u_i = \frac{x_i - 35}{10}$	$f_i u_i$
0-10	5	5	−3	−15
10-20	10	15	−2	−20
20-30	15	25	−1	−15
30-40	20	35 = a	0	0
40-50	12	45	1	12
50-60	08	55	2	16
60-70	04	65	3	12
Total	$\sum f_i = 74$			$\sum f_i u_i = -10$

Mean

Here, $a = 35$

$$h = 10$$

$$\sum f_i = 74$$

and $\sum f_i u_i = -10$

By using step deviation method,

$$\text{Mean} = a + \left\{\frac{\sum f_i u_i}{\sum f_i}\right\} \times h$$

$$= 35 + \left\{\frac{-10}{74}\right\} \times 10 = 35 - \frac{100}{74}$$

$$= 35 - 1.36 = 33.64$$

Mode

The highest frequency in the table is 20 and the corresponding interval is 30-40.

Here, $l = 30$

$$f_1 = 20$$

$$f_0 = 15$$

$$f_2 = 12$$

and $h = 10$

$$\text{Mode} = l + \left\{\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right\} \times h$$

$$= 30 + \left\{\frac{20 - 15}{40 - 15 - 12}\right\} \times 10$$

$$[\because 2f_1 = 2 \times 20 = 40]$$

$$= 30 + \frac{50}{40 - 27} = 30 + \frac{50}{13}$$

$$= 30 + 3.85 = 33.85$$

Median

We know that,

$$\text{Median} = \frac{\text{Mode} + 2\,\text{Mean}}{3}$$

$$= \frac{33.85 + 2 \times 33.64}{3}$$

$$= \frac{23.85 + 67.28}{3} = \frac{101.13}{3}$$

$$= 33.71 \text{ (approx.)}$$

2. FILL IN THE BLANK

1. In the class interval 35-46, the lower limit is .... and upper limit is ....
Ans : 35, 46

2. A class interval of a data has 15 as the lower limit and 25 as the size then the class mark is ....
Ans : 27.5

3. .... is mid value of class interval.
Ans : Class mark

4. .... is the value of the observation having the maximum frequency.
Ans : Mode

5. The mid-point of a class interval is called its ....
Ans : class-mark

6. Facts or figures, collected with a definite purpose, are called ....
Ans : data

7. To find the mode of a grouped data, the size of the classes is ....
Ans : unifrom

8. Median divides the total frequency into .... equal parts.
Ans : two

9. Average of a data is called ....
Ans : Mean

10. The algebraic sum of the deviations from arithmetic mean is always ....
Ans : zero

11. The class mark of a class is 25 and if the upper limit of that class is 40, then its lower limit is ....
Ans : 10

12. The mid-value of 20-30 is ....
Ans : 25

13. The sum of 12 observation is 600, then their mean is ....
Ans : 50

14. Value of the middle-most observation (s) is called ....
Ans : median

15. The .... is the most frequently occurring observation.
Ans : mode

16. 3 median = mode + ... mean.
Ans : 2

17. .... is graphical representation of cumulative frequency distribution.
Ans : Ogive

18. 0-10, 10-20, 20-30 .... so on are the classes, the lower boundary of the class 20-30 is ....
Ans : 20

19. On an ogive, point A (say), whose Y-co-oedinate is $\frac{n}{2}$ (half of the total observation), has its X-coordinate equal to .... of the data.
Ans : Median

20. Two ogives, for the same data intersect at the point P. Then Y-coordinate of P represents ....
Ans : cumulative

3. TRUE/FALSE

DIRECTION : Read the following statements and write your answer as true or false.

1. An ogive is a graphical representation of a grouped frequency distribution.
Ans : False

2. If 16 observations are arranged in ascending order, then median is

$$\frac{(8^{\text{th}}\text{ observation} + 9^{\text{th}}\text{ observation})}{2}$$

Ans : True

3. The modal value is the value of the variate which divides the total frequency into two equal parts.
Ans : False

4. The mean of x, y, z is y, then $x + z = 2y$
Ans : True

5. The value of the mode of a grouped data is always greater than the mean of the same data
Ans : False

6. 2 (Median − Mean) = Mode − Mean.
Ans : False

7. The median for grouped data is formed by using the formula,

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

Ans : True

8. The median of grouped data with unequal class sizes cannot be calculated.
Ans : False

9. The mean, median and mode of a data can never coincide.
Ans : False

10. Class mark $= \frac{\text{Upper class limit } + \text{Lower class limit}}{2}$
Ans : True

11. While computing the mean of grouped data, we assume that the frequencies are centered at the class marks of the classes.
Ans : True

12. The median of ungrouped data and the median calculated when the same data is grouped are always the same.
Ans : False

13. Mean may or may not be the appropriate measure of central tendency.
Ans : True

14. Median of 15, 28, 72, 56, 44, 32, 31, 43 and 51 is 42.
Ans : True

15. Mode of 2, 3, 4, 5, 0, 1, 3, 3, 4, 3 is 3.
Ans : True

16. Mean of 41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 49, 42, 52, 60 is 54.8

Ans : True

4. MATCHING QUESTIONS

DIRECTION : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column I have to be matched with statements (p, q, r, s) in column II.

1. The table shows a frequency distribution of the life time of 400 radio tubes tested at a company.

Life time (hours)	Number of tubes
300-399	14
400-499	46
500-599	58
600-699	76
700-799	68
800-899	62
900-999	48
1000-1099	22
1100-1199	6

Column-II gives data for description given in Column-I, match them correctly.

	Column-I		Column-II
(A)	Upper limit of the fifth class	(p)	100
(B)	Lower limit of the eighth class	(q)	949.5
(C)	Class marks of the seventh class	(r)	1000
(D)	Class interval size	(s)	799

Ans : (A) – s, (B) – r, (C) – q, (D) – p

2. Following is the distribution of heights of students in a class and the total number of students is 50.

Height (in cm)	150-155	155-160	160-165	165-170	170-175	175-180
Frequency	12	b	10	d	e	2
Cumulative frequency	a	25	c	43	48	f

With the help of information given match the columns.

	Column-I (Unknown)		Column-II (Values)
(A)	$a =$	(p)	35
(B)	$b =$	(q)	5
(C)	$c =$	(r)	13
(D)	$d =$	(s)	50
(E)	$e =$	(t)	12
(F)	$f =$	(u)	8

Ans : (A) – t, (B) – r, (C) – p, (D) – u, (E) – q, (F) – s

As we know, cumulative frequency of an interval is equal to the sum of frequency of that interval and of previous intervals.

$$a = 12$$
$$a + b = 25$$
$$b = 13 \qquad (a = 12)$$

Now,
$$25 + 10 = c$$
$$c = 35$$
$$c + d = 43$$
$$d = 8 \qquad (c = 35)$$
$$43 + e = 48$$
$$e = 5$$

and
$$f = 48 + 2 = 5$$

3.

	Column-I		Column-II
(A)	The arithmetic mean of a set of observations is obtained by	(p)	Value of the $\left(\frac{n+1}{2}\right)^{th}$ observation.
(B)	The value of the observation having maximum frequency is called	(q)	$\frac{1}{2} \times$ Value of $\left[\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}\right]$
(C)	If n is odd, then median is equal to	(r)	Median
(D)	If n is even then median is equal to	(s)	Mode
(E)	– divides the arranged series (in ascending or descending order) into two equal parts.	(t)	Dividing the sum of the values of observations by the number of observations parts.

Ans : (A) – t, (B) – s, (C) – p, (D) – q, (E) – r

4.

	Column-I		Column-II
(A)	Mean of first five prime numbers is	(p)	12
(B)	Mean of all factors of 24 is	(q)	7.5
(C)	Mean of first six multiples of 4 is	(r)	5.4

(D)	If mean of $x-5y, x-3y,$ $x-y, x+y, x+3y$ and $x+5y$ is 12, then x is	(s)	14

Ans : (A) – r, (B) – q, (C) – s, (D) – p

5. For the following marks distribution of 5 students in an examination, match Column-I with the data given in Column-II.

Class interval	0-10	10-20	20-30	30-40
No. of students	1	3	0	1

Here,

x_k = lower limit of the modal class interval

f_k = frequency of the modal class

f_{k+1} = frequency of the class succeeding the modal class

h = width of the class interval

f_{k-1} = frequency of the class preceding the modal class

	Column -I		**Column -II**
(A)	x_k	(p)	3
(B)	f_k	(q)	10
(C)	f_{k-1}	(r)	0
(D)	h	(s)	(0, 4)
		(t)	1
		(u)	(4, 12)

Ans : (A) – (q, u), (B) – (p, s), (C) – (t, s), (D) – (q, u).

6. For the given frequency distribution match the Column-I with Column-II.

Class	**Frequency**
30-35	14
35-40	16
40-45	18
45-50	23
50-55	18
55-60	8
60-65	3

h = width of the class interval

f = frequency of the class interval to which median belongs

c = cumulative frequency

l_1 = lower limit of the median class interval

	Column -I		**Column -II**
(A)	f	(p)	45.4
(B)	c	(q)	45
(C)	l_1	(r)	(40, 50)
(D)	median	(s)	23
		(t)	Positive number
		(u)	48
		(v)	Cube

Ans : (A) – (s, t), (B) – (u, t, r), (C) – (q, r, t), (D) – (p, r, t)

5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

1. **Assertion :** The arithmetic mean of the following given frequency distribution table is 13.81.

x	4	7	10	13	16	19
f	7	10	15	20	25	30

Reason : $\overline{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Both assertion and reason are true, reason is the correct explanation of the assertion.

2. **Assertion :** If the number of runs scored by 11 players of a cricket team of India are 5, 19, 42, 11, 50, 30, 21, 0, 52, 36, 27 then median is 30.

Reason : Median $= \left(\dfrac{n+1}{2}\right)^{\text{th}}$ value, if n is odd.

Ans : (d) Assertion (A) is false but reason (R) is true.

Arranging the terms in ascending order,

0, 5, 11, 19, 21, 27, 30, 36, 42, 50, 52

$$\text{Median value} = \left(\frac{11+1}{2}\right)^{\text{th}}$$

$$= 6^{\text{th}} \text{ value} = 27$$

3. **Assertion :** If the value of mode and mean is 60 and 66 respectively, then the value of median is 64.

Reason : Median $= (\text{mode} + 2\,\text{mean})$

Ans : (c) Assertion (A) is true but reason (R) is false.

$$\text{Median} = \frac{1}{3}(\text{mode} + 2\,\text{mean})$$

$$= \frac{1}{3}(60 + 2 \times 66) = 64$$