

Class: XI
Subject: Maths
Topic: Statistics and Mathematical reasoning
No. of Questions: 22

1. Mean of first n odd natural numbers is

- A. $\frac{n+1}{2}$
B. n
C. $n+1$
D. none of these

Sol: B

First n odd natural numbers are 1, 3, 5, ..., $2n+1$

$$\begin{aligned} & \frac{1+3+5+\dots+(2n-1)}{n} \\ &= \frac{\frac{n}{2}\{1+(2n-1)\}}{n} = \frac{n^2}{n} = n \end{aligned}$$

Alternatively, the sum of first n odd natural numbers is n^2 .

Hence, the required mean = $\frac{n^2}{n} = n$.

2. Variance of the numbers 3, 7, 10, 18, 22 is equal to

- A. 12
B. 6.4
C. $\sqrt{49.2}$
D. 49.2

Sol: D

The mean of the given items

$$\bar{x} = \frac{3+7+10+18+22}{5} = 12$$

$$\begin{aligned}\text{Hence, variance} &= \frac{1}{n} \sum (x_i - \bar{x})^2 \\ &= \frac{1}{5} \{81 + 25 + 4 + 36 + 100\} \\ &= 49.2\end{aligned}$$

3. The quartile deviation of the following items 12, 7, 15, 10, 16, 17, 25 is
- A. 4.5
 - B. 13.5
 - C. 9
 - D. none of these

Sol: D

4. If the mean of first n natural numbers is equal to $\frac{n+7}{3}$, then n is equal to
- A. 10
 - B. 11
 - C. 12
 - D. none of these

Sol: C

Since the mean of first n natural number is $\frac{\sum n}{n} = \frac{n(n+1)}{2n} = \frac{n+1}{2}$, so we must have

$$\begin{aligned}\frac{n+1}{2} &= \frac{n+7}{3} \\ \Rightarrow 3n+3 &= 2n+14 \\ \Rightarrow n &= 11\end{aligned}$$

5. The relationship between mean, median and mode for a moderately skewed distribution is
- A. mode = median – 2 mean
 - B. mode = 2 median – mean
 - C. mode = 2 median – 3 mean
 - D. mode = 3 median – 2 mean

Sol: D

Mode = 3 median - 2 mean is the required relation.

6. If r is the correlation coefficient, then

- A. $r \geq 1$
- B. $r \leq 1$
- C. $|r| \geq 1$
- D. $|r| \leq 1$

Sol: D

7. If the standard deviation of 1, 2, 3, 4, & ...,10 is σ , then the standard deviation of 11, 12, 13, 14, & ..20 is

- A. + 10
- B. 10σ
- C. σ
- D. none of these

Sol: C

In this case each value of the variable is increased by 10, therefore the standard deviation remains unchanged.

8. The mean of 50 observations is 36. If two observations 30 and 42 are deleted, then the mean of the remaining observations is

- A. 48
- B. 36
- C. 38
- D. none of these

Sol: B

The sum of all 50 observations.
 $= 36 \times 50 = 1800$
Hence, the sum of remaining 48 observations
 $= 1800 - 42 - 30 = 48 \times 36$.
So, the mean of remaining 48 observations is 36

9. If the variance of a data is V , then its standard deviation is

- A. \sqrt{V}
- B. $-\sqrt{V}$
- C. V^2
- D. Report Error

Sol: A

$$\text{S.D} = \sqrt{\text{variance}}$$

10. You are collecting data from newspapers and magazines about price fluctuations of a branded product. What type of data are you referring to?

- A. Primary data
- B. Secondary data
- C. Frequency distribution
- D. None of above

Sol: B

11. Which of the following is a measure of central tendency?

- A. percentile
- B. quartile
- C. standard deviation
- D. mode

Sol: D

Central tendency is measured by mode.

12. For symmetric distribution the mean and the median should be

- A. Mean =Median
- B. Mean > Median
- C. Median > Mean
- D. None

Sol: A

In case of symmetric distribution,
Mean = median,

13. Find the mean of cubes of the first 'n' natural numbers.

- A. $\frac{n^2(n+1)^2}{4}$
B. $\frac{n^2(n+1)}{4}$
C. $\frac{n(n+1)}{4}$
D. $\frac{n(n+1)^2}{4}$

Sol D

Sum of cubes of first 'n' natural numbers = $\left(\frac{n(n+1)}{2}\right)^2$
Mean = $\frac{n(n+1)^2}{4}$

14. Which of the following statements is/are correct?

- (i) Mode can be computed from histogram
(ii) Median is not independent of change of scale
(iii) Variance is independent of change of scale

- A) Only (i)
B) Only (ii)
C) Only (i) and (ii)
D) (i), (ii) and (iii)

Sol: C

In the given statements only first and second statements are correct.

15. For the following data, mean of x is found to be 7.3. The missing frequency is:

x	:	5	6	7	8	9
f	:	4	6	12	-	8

- A. 10
- B. 9
- C. 8
- D. 7

Sol: A

16. The average monthly salary of workers in a factory is Rs. 206. If the average monthly salary of males and females are Rs. 210 and Rs. 190 respectively, the percentage of female employed in the factory is

- A. 10
- B. 50
- C. 30
- D. 20

Sol (D)

Let number of male workers = x
and number of female workers = y

$$\begin{aligned}\therefore 206(x + y) &= 210x + 190y \\ \Rightarrow 206x + 206y &= 210x + 190y \\ \Rightarrow 16y &= 4x \\ \Rightarrow \frac{x}{y} &= \frac{4}{1} \\ \Rightarrow x &= 4y \\ \therefore \text{Total number of workers} &= 5y \\ \therefore \% \text{ of female workers} &= \frac{y}{5y} \times 100\% = 20\%\end{aligned}$$

17. The average marks of boys in a class is 52 and that of girls is 42. The average marks of boys and girls combined is 50. The percentage of boys in the class is

- A. 80
- B. 60
- C. 40
- D. 20

Sol: A

We know weighted mean formula:

$$\bar{x} = \frac{N_G \bar{x}_G + N_B \bar{x}_B}{N_G + N_B}$$

where \bar{x}_B = average marks of boys

\bar{x}_G = average marks of girls

N_G = number of girls

N_B = number of boys

\bar{x} = combined mean

$$50 = \frac{42N_G + 52N_B}{N_G + N_B}$$

$$50N_G + 50N_B = 42N_G + 52N_B$$

$$8N_G = 2N_B$$

$$4 = \frac{N_B}{N_G}$$

$$\text{Percentage of boys} = \frac{N_B}{N_B + N_G} \times 100$$

$$= \frac{N_B}{N_B + N_G} \times 100 = \frac{4x}{5x} \times 100 = 80$$

18. The A.M. of n numbers of a series is \bar{x} . If the sum of first $(n - 1)$ terms is k , then the n^{th} number is:

- A. $\bar{x} - k$
- B. $n\bar{x} - k$
- C. $\bar{x} - nk$
- D. $n\bar{x} - nk$

Sol: B

Let the n numbers be x_1, x_2, \dots, x_n then $\bar{x} = \frac{1}{n}$

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_{n-1} + x_n}{n} = \bar{x} = \frac{k + x_n}{n}$$

$$[x_1 + x_2 + \dots + x_{n-1} = k] \quad x_n = n\bar{x} - k.$$

19. The most stable measure of central tendency is:

- A. mean
- B. median
- C. mode
- D. none of these

Sol: A

The mean

Stability means that there will be less variation between random samples drawn.

20. The sum of the squares of deviations of a set of values is minimum when taken about:

- A. A.M.
- B. GM
- C. H.M.
- D. Median

Sol: A

See the second property of AM.

Let the set of values be 1 2 3 4 5

Hence mean is 3 and squares of deviation is 4 1 0 1 4

Sum = 10, which is minimum.

21. Find the mean deviation about the median

x_1	5	7	9	10	12	15
f_i	8	6	2	2	2	6

Sol:

x_1	f_1	C.F	$ x_1 - M $	$f_1 x_1 - M $
5	8	8	2	16
7	6	14	0	0
9	2	16	2	4
10	2	18	3	6
12	2	20	5	10
15	6	26	8	48
26		Total		84

Total frequencies = 26

$$\therefore \text{Median} = \frac{1}{2} \left[\frac{26^{\text{th}}}{2} \text{value} + \left(\frac{26}{2} + 1 \right)^{\text{th}} \right]$$

$$= \frac{1}{2} (13 + 14) \text{ values}$$

$$= \frac{1}{2} (7 + 7) = 7$$

$$\text{MD} = \frac{\sum f_i (x_i - M)}{\sum f}$$

$$= \frac{84}{26} = \frac{42}{13} = 3.23$$

22. Find the mean of the following i) first 10 multiples of 3.

Sol: First 10 multiples of 3 are:-

3, 6, 9, 12, 15, 18, 21, 24, 27, 30

x_i	$y_i = \frac{x_i - 15}{3}$	y_i^2
3	-4	16
6	-3	9
9	-2	4
12	1	1
15	0	0
18	1	1
21	2	4
24	3	9
27	4	10
30	5	25
Total	5	85

$$\text{Mean} = A + \frac{\sum y_i \times h}{n}$$

$$= 15 + \frac{5}{10} \times 3$$

$$= 15 + 1.5 = 16.5$$