

10. STATISTICS

KEY CONCEPTS

- * Father of 'statistics' - Sir Ronald Aylmer Fisher
[17-02-1890 to 29-07-1962]
British Statistician
- * Father of Indian statistics - P.C. Mahalanobis
- * Origin of the word statistics - Statistica [Latin, Italian]
Statistik [German]
Statistiques [French]
- * The word statistics is used in two different senses i.e., in singular as well as in plural. In singular, statistics refers to the subject as a whole ; in plural, it refers the data (numerical facts).
- * Statistics - A branch of mathematics, which is useful in the collection, classification and interpretation of data.
- * The word data means information (given facts).
- * Data - The set of information in the form of numerical figures is known as "Data".
- * Types of statistical data - 1. Primary data
2. Secondary data
- * Primary data - When an investigator collects the data himself with a definite plan in mind, it is called "Primary data".
- * Secondary data - The data which is collected by one investigator and used by another investigator for his study is called "Secondary data".
- * Ungrouped (Raw) data - The data which is presented in its original form (i.e., without any classification or analysis) is called "ungrouped (Raw) data".
- * If the raw data is arranged in ascending or descending order of magnitude, it is called an "array".
- * Range - The difference between maximum and minimum values of given data is called "Range" of given data.
$$\text{Range} = \text{Maximum value} - \text{Minimum value}$$
- * Grouped data - The data which is classified as classes (groups) is called "Grouped data". Every group is called "class - interval".
- * Frequency - The no. of times an observation occurs in a data or the no. of observations in a class is called "the frequency" of the observation or the class.
- * Frequency distribution - The tabular arrangement of data showing the frequency of each item is called "Frequency distribution".

- * For grouped data there are two types of frequency distributions.
They are,
 1. Inclusive form (Discontinuous form)
 2. Exclusive form (Continuous form)
- * Inclusive form (Discontinuous form) - A frequency distribution, in which upper limit of each class is included is called "Inclusive form of frequency distribution".
Classes of this distribution are called "Inclusive classes".
Ex : 1-10, 11-20, 21-30,
- * Exclusive form (Continuous form) - A frequency distribution, in which upper limit of each class is excluded is called "Exclusive form of frequency distribution".
Classes of this distribution are called "Exclusive classes."
Ex : 0-10, 10-20, 20-30,

* No. of Classes =
$$\frac{\text{Range}}{\text{Class-interval(size)}}$$

- * Class limits - The lowest and highest values of a class, which are included in the class are called "lower and upper limits" of that class.
Ex : In the class 35-44, lower limit = 35 and upper limit = 44.

- * Class boundary / Actual class limits / True class limits -
The class boundary is called as the average of upper and lower limits of two successive classes.

Upper boundary of first class or lower boundary of second class

$$= \frac{\text{upper limit of first class} + \text{lower limit of second class}}{2}$$

- * Class mark or mid-value - It is the average of class limits or boundaries.

$$\text{Mid value or Class mark} = \frac{\text{lower limit (boundary)} + \text{Upper limit (boundary)}}{2}$$

- * Class - interval or size or length - The difference between the lower limits (boundaries) or upper limits (boundaries) or mid-values of any two successive classes is called "Class-interval or size or length". It is denoted by 'h'.

$$\begin{aligned} \text{Class interval (size)} &= \text{Lower limit of second class} - \text{lower limit of first class} \\ &= \text{Upper limit of second class} - \text{upper limit of first class} \\ &= \text{Lower boundary of second class} - \text{lower boundary of first class} \\ &= \text{Upper boundary of second class} - \text{upper boundary of first class} \\ &= \text{Mid- value of second class} - \text{mid value of first class} \end{aligned}$$

- * If x is the mid-value of a class, lower limit (boundary) ℓ and upper limit (boundary) u , then $x = \frac{l+u}{2}$

$$\Rightarrow l = 2x - u$$

$$\Rightarrow u = 2x - l$$
- * If x the mid value of a class and 'h' be the class-interval, then lower boundary, $l = x - \frac{h}{2}$ and upper boundary, $u = x + \frac{h}{2}$
- * Diagrammatic representation of data - 1. Bar graphs, 2. Pictograms, 3. Pie charts, 4. Histograms, 5. Frequency Polygon, 6. Frequency curves 7. Cumulative frequency curves (Ogive curves).
- * Measure of central tendency - The value around which the observations tend to cluster and which typifies their magnitude i.e., it is that single value which may be taken as the most suitable representation of the data is called "Measure of Central tendency".
- * The measure of central tendencies which are commonly used are,
 1. Mean 2. Median 3. Mode
- * Measures of Central tendencies of an ungrouped data :
 - I. Mean : The average value of the observations of a data is called its mean.

$$\text{Arithmetic mean, } \bar{x} = \frac{\text{sum of observations}}{\text{no. of observations}}$$

1. If $x_1, x_2, \dots, x_n$ are n observations, then

$$\text{Arithmetic mean (A.M), } \bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} = \frac{\sum x_i}{n}$$

2. If $f_1, f_2, \dots, f_n$ be the frequencies of the observations $x_1, x_2, \dots, x_n$ respectively, then

$$\text{Arithmetic mean (A.M), } \bar{x} = \frac{f_1x_1 + f_2x_2 + \dots + f_nx_n}{f_1 + f_2 + \dots + f_n} = \frac{\sum fx}{\sum f}$$

$$\text{i.e., A.M, } \bar{x} = \frac{\sum fx}{N}, \text{ here } N = \text{sum of frequencies.}$$

3. If $w_1, w_2, \dots, w_n$ be the weights of the observations $x_1, x_2, \dots, x_n$, respectively, then

$$\text{Weighted Arithmetic mean, } \bar{x} = \frac{w_1x_1 + w_2x_2 + \dots + w_nx_n}{w_1 + w_2 + \dots + w_n} = \frac{\sum w_x}{\sum w}$$

4. If A is the assumed mean of the observations $x_1, x_2, \dots, x_n$ then Arithmetic

$$\text{mean (A.M), } \bar{x} = A + \frac{\sum(x_i - A)}{n} \text{ [Deviation method]}$$

Note : If $\bar{x}$ is the mean of the observations $x_1, x_2, \dots, x_n$ and k be any non-zero constant, then

i) mean of $x_1 + k, x_2 + k, \dots, x_n + k$ is $\bar{x} + k$

ii) mean of $x_1 - k, x_2 - k, \dots, x_n - k$ is $\bar{x} - k$

iii) mean of $kx_1, kx_2, \dots, kx_n$ is $k\bar{x}$

iv) mean of $\frac{x_1}{k}, \frac{x_2}{k}, \dots, \frac{x_n}{k}$ is $\frac{\bar{x}}{k}$.

II. Median : The middle most value of a data which is arranged in ascending or descending order is called “Median” of the data.

If there are n observations in a data, then

$$\text{i) Median (M) = } \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ observation} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ observation}}{2} \text{ (if } n \text{ is even)}$$

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

III. Mode : The most repeated observation of a data is called “Mode”.

i) For a data, there may be mode or no mode.

ii) If there is mode for a given data, it may be one or more than one mode.

iii) The data having only one mode is called uni-modal data.

iv) The data having two modes is called bi-modal data.

v) The data having three modes is called tri-modal data.

vi) The data having three or more than three modes is called multi-modal data.

Emperical Relation: Mode = 3 x median - 2 x mean [only for unimodal data]

Note : i) The mean of first ‘ n ’ natural numbers is $\frac{n+1}{2}$

ii) The mean of first ‘ n ’ even natural numbers is $n+1$.

iii) The mean of first ‘ n ’ odd natural numbers is ‘ n ’.

iv) The median of first ‘ n ’ natural numbers $\frac{n+1}{2}$.

v) The median of first ‘ n ’ even natural numbers is $n+1$.

vi) The median of first ‘ n ’ odd natural numbers is ‘ n ’

vii) The mode of first ‘ n ’ natural numbers - no mode.

viii) If all the observations are equally repeated, then the data has no

mode.

* Measures of central tendency of a grouped data :

I. Mean :

1. In direct method, mean, $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$, Here f_i = frequency of the class

x_i = mid - value

$\sum f_i$ = sum of frequencies

2. In deviation method, mean, $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$, Here a = assumed mean

f_i = frequency of class

d_i = deviation from 'a' = $x_i - a$

x_i = mid - value

$\sum f_i$ = sum of frequencies

3. In short method or Step deviation method,

mean, $\bar{x} = a + \frac{\sum f_i u_i}{\sum f_i} \times h$ here a = assumed mean

f_i = frequency of class

u_i = deviation from a

$$= \frac{x_i - a}{h}$$

x_i = mid - value

h = class interval (length)

$\sum f_i$ = sum of frequencies

$\sum f_i u_i$ = sum of all $f_i u_i$ values

II. Median :

Median, $M = \ell + \frac{\frac{n}{2} - cf}{f} \times h$, here ℓ = lower boundary of median class

n = sum of frequencies

cf = cumulative frequency of the previous class to median class

f = frequency of median class

h = class interval (length)

III. Mode :

Mode, $Z = \ell + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$, here ℓ = lower boundary of modal class

f_1 = frequency of modal class

f_0 = frequency of previous class to modal class

f_2 = frequency of next class to the modal class

h = class-interval (length)

Note : i) The measure of central tendency which consider all the observations is mean.

ii) If the difference between minimum and maximum values of a data is considerably more, then the measure of central tendency to be taken is median. It does not depend on least and highest values.

iii) For a data, mean is unique. It represents entire data.

iv) To find mean, we will use class marks (mid-values).

v) To find median, we use cumulative frequencies.

- * While drawing frequency polygon or curve, we will take mid-values of the classes on X-axis and corresponding frequencies on Y-axis.
- * While constructing a histogram, we will take class-intervals on X-axis and corresponding frequencies on Y-axis.
- * While drawing less than cumulative frequency curve, we will take upper boundaries on X-axis and corresponding less than cumulative frequencies on Y-axis.
- * While drawing greater than cumulative frequency curve, we will take lower boundaries on X-axis and corresponding greater than cumulative frequencies on Y-axis.
- * If (x, y) be the intersecting point of less than and greater than cumulative frequency curves then, the no. of observations in that data is $n = 2y$ and the median of the data, $M = x$.

* Mean of first 'n' natural numbers = $\frac{n+1}{2}$

* Mean of squares of first 'n' natural numbers = $\frac{(n+1)(2n+1)}{6}$

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

Solved Examples

1. If the mean of 9, 11, 13, p, 18, 19 is p then the value of p is _____

Sol. Given observations = 9, 11, 13, p, 18, 19

No. of observations = 6

$$\therefore \text{mean} = p = \frac{9+11+13+p+18+19}{6}$$

$$6p = p + 70$$

$$6p - p = 70$$

$$5p = 70$$

$$p = \frac{70}{5} = 14$$

II method : $6p - p = 9 + 11 + 13 + 18 + 19$

$$5p = 70$$

$$p = 14$$

2. Mean of $1^2, 2^2, 3^2, \dots, 11^2$ is _____

Sol. Mean of $1^2, 2^2, 3^2, \dots, 11^2 = \frac{(11+1)(2 \times 11 + 1)}{6} = \frac{12 \times 23}{6} = 46$

3. Mean of $1^3, 2^3, 3^3, \dots, 8^3$ is _____

Sol. $\frac{8 \times (8+1)^2}{4} = \frac{8 \times 81}{4} = 162$

4. Mean of 8 observations is 10 and mean of 12 observations is 15. Then mean of all observations is _____

Sol. $\frac{8 \times 10 + 12 \times 15}{8 + 12} = \frac{80 + 180}{20} = \frac{260}{20} = 13$

5. In a grouped frequency distribution, if $n = 70$, $cf = 25$, $f = 24$, $h = 20$ and $\ell = 40$ then median is _____

Sol. Median = $\ell + \frac{\frac{n}{2} - cf}{f} \times h = 40 + \frac{\frac{70}{2} - 25}{24} \times 20 = 40 + \frac{10 \times 5}{6} = 40 + 8.33 = 48.33$

6. If the median of the observations $\frac{x}{3}, \frac{x}{2}, \frac{x}{4}, \frac{2x}{9}, x(x > 0)$ is 5, then the value of x is _____

Sol. Given, observations = $\frac{x}{3}, \frac{x}{2}, \frac{x}{4}, \frac{2x}{9}, x(x > 0)$
 $= \frac{2x}{6}, \frac{2x}{4}, \frac{2x}{8}, \frac{2x}{9}, \frac{2x}{2}$
 $\quad \quad \quad 3 \quad 4 \quad 2 \quad 1 \quad 5$

$\therefore$ Median = $\frac{1}{6^3} 2x = 5 \Rightarrow x = 3 \times 5 = 15$

7. The mean of x and $\frac{1}{x}$ is 5 then the mean of x^2 and $\frac{1}{x^2}$ is _____

Sol. Mean of x and $\frac{1}{x} = \frac{x + \frac{1}{x}}{2} = 5 \Rightarrow x + \frac{1}{x} = 2 \times 5 = 10$

$$\begin{aligned} \therefore \text{Mean of } x^2 \text{ and } \frac{1}{x^2} &= \frac{x^2 + \frac{1}{x^2}}{2} \\ &= \frac{\left(x + \frac{1}{x}\right)^2 - 2 \times x \times \frac{1}{x}}{2} = \frac{100 - 2}{2} = \frac{98}{2} = 49 \end{aligned}$$

8. In four integers, the mean of first two smallest integers is 102, mean of first three smallest integers is 103 and the mean of all four integers is 104 then the largest number _____

Sol. Mean of first two smallest integers = 102.

$$\text{Sum of first two smallest integers} = 2 \times 102 = 204.$$

$$\text{Mean of first three smallest integers} = 103.$$

$$\text{Sum of first three smallest integers} = 3 \times 103 = 309.$$

$$\text{Mean of all four integers} = 104.$$

$$\text{Sum of four integers} = 4 \times 104 = 416.$$

$$\therefore \text{Largest number} = 416 - 309 = 107.$$

9. The mean of 17, 4, 8, 6, 15 is m . Median of 8, 14, 10, 5, 7, 5, 20, 19, n is $m-1$. Then the value of $m+n$ is _____

Sol. Mean of 17, 4, 8, 6, 15 = $\frac{17+4+8+6+15}{5} = m$

$$\therefore m = \frac{50}{5} = 10$$

Except n , (ascending) order of 8, 14, 10, 5, 7, 5, 20, 19 = 5, 5, 7, 8, 10, 14, 19, 20
and median = $m - 1 = 10 - 1 = 9$

$$\text{So, } n = 9.$$

$$\therefore m + n = 10 + 9 = 19.$$

10. Among 100 numbers, 20 numbers are 4's, 40 numbers are 5's, 30 numbers are 6's and remaining are 10's then their mean and median are _____

Sol. Total numbers $n = 100$ (even)

$$\text{no. of 4's} = 20$$

$$\text{no. of 5's} = 40$$

$$\text{no. of 6's} = 30$$

no. of 10's = 10

$$\therefore \text{Mean} = \frac{4 \times 20 + 5 \times 40 + 6 \times 30 + 10 \times 10}{100} = \frac{80 + 200 + 180 + 100}{100} = \frac{560}{100} = 5.6$$

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{obs.} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{obs.}}{2} = \frac{50^{\text{th}} \text{obs.} + 51^{\text{st}} \text{obs.}}{2} = \frac{5 + 5}{2} = 5.$$

11. The mean weight of three students is 40 kg. One of the student weighs 46 kg and the other two students have the same weight, then the weight of each student is _____ kg.

Sol. Mean weight of three students = 40 kg

Total weight of three students = $3 \times 40 = 120$ kg.

Weight of one student = 46 kg

Weight of remaining two students = $120 - 46 = 74$ kg

$\therefore$ Weight of two students is same, weight of each student = $\frac{74}{2} = 37$ kg.

Second method : Weight of each student = $\frac{3 \times 40 - 46}{2} = \frac{74}{2} = 37$ kg.

12. There are four distinct numbers. The mean of first two numbers is 4, the mean of first three is 9 and the mean of all four numbers is 15. If one of them is 2, other numbers _____

Sol. Let the four distinct numbers = a, b, c, d

$$\text{Mean of first two numbers} = \frac{a+b}{2} = 4 \Rightarrow a+b = 2 \times 4 = 8 \quad \dots\dots\dots(1)$$

$$\text{Mean of first 3 numbers} = \frac{a+b+c}{3} = 9 \Rightarrow a+b+c = 3 \times 9 = 27$$

$$\therefore c = 27 - 8 = 19$$

$$\text{Mean of 4 numbers} = \frac{a+b+c+d}{4} = 15 \Rightarrow a+b+c+d = 4 \times 15 = 60$$

$$\therefore d = 60 - 27 = 33$$

$\therefore$ One of them, i.e., $a = 2$, then from (1), $b = 8 - 2 = 6$.

$\therefore$ Other three numbers = 6, 19, 33.

13. Mean of 40 observations is 160. If one observation 125 is registered instead of 165, then the corrected mean _____

Sol. Mean of 40 observations = 160

Sum of 40 observations = $40 \times 160 = 6400$

$\therefore$ One observation 125 is registered instead of 165,

Corrected sum = $6400 + 165 - 125 = 6440$

$$\text{Corrected mean} = \frac{6440}{40} = 161$$

14. Mean of 100 observations is 30. If 32 and 12 are wrongly registered instead of 23 and 11 respectively, then the corrected mean _____

$$\text{Sol. Corrected mean} = \frac{100 \times 30 - 32 - 12 + 23 + 11}{100} = \frac{2990}{100} = 29.9$$

15. If $\sum_{i=1}^n (x_i - 12) = -10$ and $\sum_{i=1}^n (x_i - 3) = 62$ then n and $\bar{x}$ are 8

$$\text{Sol. } \sum_{i=1}^n (x_i - 12) = -10 \Rightarrow \sum_{i=1}^n x_i - 12n = -10 \quad \dots\dots\dots(1)$$

$$\sum_{i=1}^n (x_i - 3) = 62 \Rightarrow \sum_{i=1}^n x_i - 3n = 62 \quad \dots\dots\dots(2)$$

By doing (2) - (1), we get $-3n + 12n = 62 + 10 \Rightarrow 9n = 72 \Rightarrow n = 8$

$$\text{From (1), } \sum_{i=1}^n x_i - 12 \times 8 = -10 \Rightarrow \sum_{i=1}^n x_i = -10 + 96 = 86.$$

$$\therefore \bar{x} = \frac{\sum_{i=1}^n x_i}{n} = \frac{86}{8} = 10.75$$

$$\therefore n = 8, \bar{x} = 10.75$$

16. If the median of 8 observations is 15. If every observation is multiplied by 2, then the median of resultant data.

$$\text{Sol. Median of resultant data} = 2 \times 15 = 30.$$

17. If the mean of the following data is 1.46, then f_1 and f_2 are _____

x	0	1	2	3	4	5	Total
f	46	f_1	f_2	25	10	5	200

$$\text{Sol. } \sum f_i = 46 + f_1 + f_2 + 25 + 10 + 5 = 200 \Rightarrow f_1 + f_2 = 200 - 86 = 114 \quad \dots\dots\dots(1)$$

$$\sum f_i x_i = 0 + f_1 + 2f_2 + 75 + 40 + 25 = f_1 + 2f_2 + 140.$$

$$\therefore \bar{x} = 1.46 \Rightarrow \frac{f_1 + 2f_2 + 140}{200} = 1.46 \Rightarrow f_1 + 2f_2 = 292 - 140 = 152 \quad \dots\dots\dots(2)$$

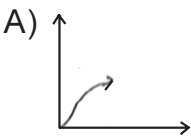
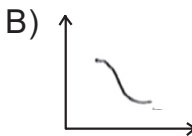
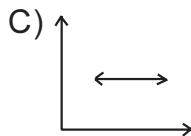
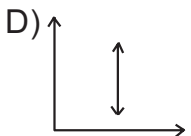
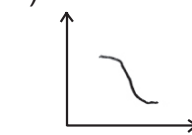
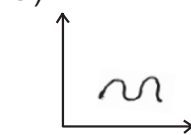
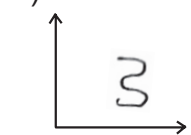
By doing (2) - (1),

$$f_2 = 152 - 114 = 38$$

$$\text{From (1)} \quad f_1 = 114 - 38 = 76$$

Level - 1

1. Father of 'Statistics' is
A) Pascal B) Leibnitz C) Sir Ronald A. Fisher D) Sylvister
2. Father of "Indian Statistics" is
A) AmarthSen B) Swami Nadhan C) P.C. Mahalanobis D) Kautilya
3. The range of 5, 11, 3, 31, 19, 29, 45, 37 is
A) 40 B) 41 C) 42 D) 43
4. The range of first 100 natural numbers is
A) 100 B) 99 C) 98 D) 101
5. In a data of ten observations, the maximum value is 30 and the minimum value is 12. Then the value which may be the mean of the given data is
A) 10 B) 29 C) 31 D) 42
6. The mean of first 10 natural numbers is
A) 5 B) 6 C) 5.5 D) 4.5
7. The mean of first 5 prime numbers is
A) 5 B) 5.2 C) 5.4 D) 5.6
8. The mode of 25, 26, 25, 27, 28, 30, 31, 27, 33, 27, 29 is
A) 25 B) 26 C) 27 D) 28
9. The mode of 1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4 is
A) 1 B) 1, 2 C) 1, 2, 3, 4 D) no mode
10. The median of 14, 36, 25, 28, 35 32, 56, 42, 50 is
A) 34 B) 35 C) 35.5 D) 36
11. The median of 24, 29, 34, 38, x is 34 then the value of x is
A) $x < 34$ B) $x > 34$ C) $x = 34$ D) B & C
12. The median of first 10 natural numbers
A) 5 B) 5.5 C) 4.5 D) 6.5
13. The measure of central tendency used to select the favourite actor is
A) mean B) median C) mode D) range
14. The measure of central tendency which is helpful to an invigilator to bring sufficient number of additional sheets to the examination hall is
A) mean B) median C) mode D) none

15. In a frequency distribution with the classes 0-10, 10-20, 20-30,..... the observation 30 belongs to _____ class.
 A) 20-30 B) 30-40 C) 10-20 D) A & B
16. The class mark of a class is 40 and its lower boundary is 25 then its upper boundary is
 A) 35 B) 45 C) 55 D) 65
17. In a frequency distribution with the classes 1-10, 11-20, 21-30, 31-40, the value 20.5 belongs to _____ class.
 A) 11-20 B) 21-30 C) 31-40 D) A & B
18. In a histogram _____ of the bars equal.
 A) lengths B) widths C) frequencies D) none
19. _____ are there in a histogram (or) histogram consists _____
 A) squares B) rectangles C) circles D) triangles
20. In a histogram, the lengths of rectangles are in proportional to _____
 A) widths B) frequencies C) A & B D) none
21. In a histogram, the widths of rectangles represent
 A) frequency B) class interval C) class mark D) range
22. Ogive curve means
 A) lessthan cumulative frequency curve
 B) greaterthan cumulative frequency curve
 C) A & B
 D) none
23. The shape of ogive curve is
 A) O B) S C) U D) V
24. Which of the following is *lcf* curve ?
 A)  B)  C)  D) 
25. Which of the following is *gcf* curve ?
 A)  B)  C)  D) 
26. Class mark of a class is 15 and class-interval is 20 then upper boundary is
 A) 5 B) 15 C) 25 D) 35

27. The upper boundary of a class is 30 and the class-interval is 10 then lower boundary is
 A) 10 B) 20 C) 15 D) 25
28. If the mode of 2, 3, 3, 2, 1, 1, 3 is p then the value of p is
 A) 1 B) 2 C) 3 D) none
29. In a pie chart, the sum of the angles made by all sectors at the centre of the circle is
 A) 180° B) 270° C) 360° D) 720°
30. The mean of 20 observations is 15.5, then the sum of observations is
 A) 31 B) 155 C) 310 D) 210
31. The mean of a data is 25 and median is 30 then mode is
 A) 35 B) 27.5 C) 40 D) 55
32. The mean of 7, 10, 5, x , 6 is 8 then the value of x is
 A) 11 B) 12 C) 13 D) 14
33. The measure of central tendency which is found by using lower boundaries of classes is
 A) mean B) median C) mode D) B & C
34. If $\sum x_i = 115$, $n = 10$ then $\bar{x} =$
 A) 12 B) 11.5 C) 11 D) 10.5
35. The median of $2x, 10x, 4x, 3x, x$ is
 A) $2x$ B) $3x$ C) $4x$ D) $\frac{7x}{2}$
36. The median of $a-3, a-1, a+1, a+3$ is
 A) a B) $2a$ C) $a-1$ D) $2(a+1)$
37. The class mark (mid-value) of 9.5 - 19.5 is
 A) 14 B) 10 C) 10.5 D) 14.5
38. The frequency of 12 in the data 11, 12, 13, 10, 12, 11, 14, 12, 11, 10 is
 A) 3 B) 12 C) 36 D) 4
39. The mode of the data 1, 2, 2, 3, 3, 3, 4, 4, 4, 4,, 11, 11 is
 A) 4 B) 11 C) 44 D) no mode
40. The difference between the median and mode of the data
 6, 9, 12, 15, 9, 3, 6, 9, 12, 6, 10, 3, 6, 15, 6 is
 A) 1 B) 2 C) 3 D) 4
41. The maximum value of a data is 57 and its range is 20 then minimum value
 A) 77 B) 57 C) 37 D) 17

42. The mean of 20 observations is 18. If 3 is added to every observation then the mean of new data is
 A) 18 B) 6 C) 21 D) 54
43. In 1-10, 11-20, 21-30, the boundaries of the class 11-20 are
 A) 11, 20 B) 10.5, 20 C) 11, 20.5 D) 10.5, 20.5
44. The mode of any three consecutive numbers is
 A) 3 B) middle number
 C) 3 x middle number D) no mode
45. The mean of first 100 even natural numbers is
 A) 100 B) 101 C) 102 D) 103
46. The mean of first 50 odd natural numbers is
 A) 50 B) 51 C) 100 D) 101
47. Which measure of central tendency can be found from the intersecting point of less than and greater than cumulative frequency curves ?
 A) mean B) median C) mode D) none
48. In the graph of frequency polygon, _____ will be taken on X-axis.
 A) mid-value B) frequency
 C) cumulative frequency D) none
49. When the values of x_i and f_i are considerably small, then _____ method is used to find the mean.
 A) direct B) deviation C) step-deviation D) none
50. In the construction of frequency curve, _____ will be taken on Y-axis.
 A) class-interval B) frequency C) class mark D) none
51. Which of the following cannot be affected by least and highest values.
 A) mean B) median C) mode D) range
52. _____ is constructed by taking classes and their corresponding frequencies of a frequency distribution table on X and Y-axes respectively.
 A) frequency polygon B) histogram
 C) frequency curve D) Ogive curve
53. The x - coordinate of the intersecting point of less than and greater than cumulative frequency curves represents _____
 A) mean B) median C) mode D) range
54. The median of first 10 whole numbers is
 A) 5 B) 4 C) 4.5 D) 5.5

Level - 2

1. The mean of first 10 whole numbers
A) 5 B) 5.5 C) 4.5 D) 4
2. If the mean of $x_1, x_2, x_3, \dots, x_{10}$ is 20 then the mean of $x_1 + 2, x_2 + 4, x_3 + 6, \dots, x_{10} + 20$ is
A) 20 B) 30 C) 25 D) 31
3. The median of 11 different observations is 30. If 5 is added to every four biggest numbers, then the median of new data is
A) 35 B) 33 C) 31 D) 30
4. Mean of 10 numbers is 7 and the mean of 15 numbers is 12 then the mean of total data is
A) 25 B) 19 C) 10 D) 20
5. The mean of $\frac{2}{5}, \frac{5}{3}, \frac{1}{3}, \frac{5}{6}, \frac{1}{6}$ is
A) $\frac{16}{25}$ B) $\frac{17}{25}$ C) $\frac{18}{25}$ D) $\frac{19}{25}$
6. If n observations are arranged in ascending order n is even, then the median of the data is
A) $\left(\frac{n+1}{2}\right)^{th} \text{ obs.}$ B) $\frac{\frac{n+1}{2} - \frac{n}{2}}{2}$ C) $\frac{\left(\frac{n+2}{2}\right)^{th} \text{ obs.} + \left(\frac{n}{2}\right)^{th} \text{ obs.}}{2}$ D) $\left(\frac{n}{2} + 1\right)^{th} \text{ obs.}$
7. The median of $\frac{3}{4}, \frac{1}{2}, \frac{2}{3}, \frac{1}{6}, \frac{7}{12}$ is
A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{1}{6}$ D) $\frac{7}{12}$
8. The median of $\frac{x}{2}, x, \frac{x}{3}, \frac{2x}{7}, \frac{x}{4}$ ($x > 0$) is 10 then x is
A) 10 B) 20 C) 30 D) 40
9. The mean of $1^2, 2^2, 3^2, \dots, 20^2$ is
A) 40 B) 50 C) 60 D) none
10. The modal class of frequency distribution :

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	11	17	25	13	7

A) 10-20 B) 20-30 C) 30-40 D) 40-50
11. If mean is $2p + q$ and median is $p + 2q$ then the mode is
A) $p - 4q$ B) $4p - q$ C) $4q - p$ D) $q - 4p$
12. The mean of 3 numbers is 8 and the mean of these 3 numbers and x is 7 then the value of x is

- A) 2 B) 3 C) 4 D) 5
13. The median of first 5 odd natural numbers is 5. If 6th odd number is added then the median is
A) 5.5 B) 5 C) 6 D) 6.5
14. The median of 8, 10, $x-1$, $x+3$, 17, 19 which are arranged in order is 14, then the value of x is
A) 11 B) 12 C) 13 D) 15
15. The mean of $x_1, x_2, \dots, x_{50}$ is $\bar{x}$. If every $x_i (i=1, 2, \dots, 50)$ is replaced by $\frac{x_i}{50}$, the mean of resultant data is
A) $\bar{x}$ B) $\frac{\bar{x}+1}{50}$ C) $50\bar{x}$ D) $\frac{\bar{x}}{50}$
16. The mean of x_1, x_2 is 6 and mean of x_1, x_2, x_3 is 7 then $x_3 =$
A) 1 B) 8 C) 9 D) 5
17. The mean of first n odd natural numbers is $\frac{n^2}{81}$ then $n =$
A) 9 B) 81 C) 1 D) none
18. Mean of 1, 3, 4, 5, 7, 4 is m and the mean of 3, 2, 2, 4, 3, 3, p is $m-1$ and median is q then the value of $p+q$ is
A) 5 B) 6 C) 7 D) 8
19. The mode of a data is 12 more than mean then the mode is _____ more than median.
A) 4 B) 8 C) 12 D) 18
20. The median of the following data
- | | | | | | | |
|---------------|---|---|----|----|----|----|
| Observation : | 3 | 6 | 10 | 12 | 7 | 15 |
| Frequency : | 3 | A | 2 | 8 | 13 | 10 |
- A) 12 B) 10 C) 7 D) 15
21. The mean of $2-a, a, a+2$ is
A) a B) $\frac{a-2}{3}$ C) $\frac{a+3}{3}$ D) $\frac{a+4}{3}$
22. The mean of 10 consecutive numbers starting from $x+1$ is
A) $x+5$ B) $x-5$ C) $x+5.5$ D) $x-5.5$
23. The less than and greater than cumulative frequency curves of a data are intersected at the point (42.5, 60) then the no. of observations of the data is

- A) 85 B) 120 C) 30 D) none
24. Mean of 15 observations is 20. If 6 is subtracted from each observation, then the resultant mean is
A) 17 B) 16 C) 15 D) 14
25. The mean age of m boys is x years, mean age of n girls is y years then the mean age of all of them is
A) $\frac{mx - ny}{m - n}$ B) $\frac{my - nx}{m - n}$ C) $\frac{mx + ny}{m + n}$ D) $\frac{my + nx}{m + n}$
26. The median of $31\frac{1}{2}, 32\frac{1}{4}, 31\frac{2}{3}, 33\frac{3}{4}$ is
A) $32\frac{1}{3}$ B) $33\frac{1}{3}$ C) $31\frac{23}{24}$ D) $31\frac{3}{4}$
27. If a, b, c, d, e are the 5 consecutive odd numbers then their mean is
A) $a - 4$ B) $a + 4$ C) $5(a + b + c + d + e)$ D) $\frac{abcde}{5}$
28. The mean marks of a class having 100 students is 30. And the mean marks of 50 students of another class is 60 then the mean marks of all students of two classes is
A) 50 B) 40 C) 35 D) 45
29. The mean of two numbers is 6, their range is 4 then the numbers are
A) 10, 6 B) 8, 4 C) 6, 2 D) 9, 5
30. The mean of 1, 2, 3, n is $\frac{6n}{11}$ then $n =$
A) 9 B) 10 C) 11 D) 12
31. The absolute value of the difference of median of 19, 25, 59, 48, 35, 31, 30, 32, 51 and the median of the above data when the observation 25 is replaced by 52 is
A) -3 B) 3 C) 32 D) 35
32. The mean of a, b, c, d, e is 28 and the mean of a, c, e is 24 then the mean of b, d is
A) 31 B) 32 C) 33 D) 34
33. The mean of $x, x+2, x+4, x+6, x+8$ is 11, then the mean of first three observations is
A) 9 B) 11 C) 13 D) 15
34. Which of the following data has same value for mean, median and mode ?
A) 2,2,2,2,4 B) 1,3,3,3,5 C) 1,1,2,5,6 D) 1,1,1,2,5
35. Which of the following is true to the data 2, 2, 4, 5 and 12 ?

- A) mean = median B) mean > mode
C) mean < mode D) mode = median

36. If the mean of the following data is 15 then $p =$

x	5	10	15	20	25
f	6	p	6	10	5

- A) 7 B) 8 C) 9 D) 8.5
37. The mean of $1^3, 2^3, 3^3, \dots, n^3$ is
- A) $\frac{(n+1)^3}{4}$ B) $\frac{n(n+1)^2}{4}$ C) $\frac{n(n+1)}{2}$ D) $\frac{n^2(n+1)^2}{2}$
38. In a bar graph, the length of the bar of 10 cm represents 50 units, then the length of the bar representing 35 units is _____ cm.
- A) 3.5 B) 3.8 C) 7 D) 14
39. The angle of a sector is 135° in a pie-chart, then it is _____ part of pie-chart.
- A) $\frac{3}{5}$ B) $\frac{3}{7}$ C) $\frac{3}{8}$ D) $\frac{3}{10}$
40. In a frequency distribution, if $h=13$, $\ell=65.5$, $f=42$, $cf=23$, $N=102$ then median is
- A) 65.5 B) 74.17 C) 66.93 D) 66.43
41. For a uni-modal data, if $\bar{x}=72.5$, $z=76.7$ then median =
- A) 72.9 B) 73.9 C) 74.9 D) 75.9
42. If a, b, c are the numbers so that $a-b=b-c$, then their mean =
- A) a B) b C) c D) $\frac{abc}{3}$
43. The mean of $1, 3, 5, 7, \dots, (2n-1)$, $n \in N$ is
- A) n B) $\frac{n}{2}$ C) $\frac{n}{3}$ D) $\frac{2n}{3}$
44. In a frequency distribution, if $\ell=29.5$, $f_1-f_0=24$, $f_1-f_2=20$, $h=5$ then the mode =
- A) 31.22 B) 32.22 C) 33.22 D) 30.22
45. The mean of first n whole numbers is
- A) $\frac{n+1}{2}$ B) $\frac{n}{2}$ C) $\frac{n-1}{2}$ D) $\frac{n}{2}-1$
46. The median of all integers from -4 to $+4$ is
- A) 4 B) 16 C) 8 D) 0

Level - 3

1. The mean temperature of a town in a certain week was 25°C . If the mean temperature of Monday, Tuesday, Wednesday and Thursday was 23°C and that of Thursday, Friday, Saturday and Sunday was 28°C , then temperature on Thursday
A) 23°C B) 27°C C) 28°C D) 29°C
2. The mean of n observations is $\bar{x}$. If the first observation is increased by 1, the second by 2, the third by 3 and so on, then the new mean is
A) $\bar{x}$ B) $2\bar{x}$ C) $\bar{x} - \frac{n+1}{2}$ D) $\frac{2\bar{x} + n + 1}{2}$
3. If $x_i = \frac{x_i - 25}{10}$, $\sum f_i x_i = 20$, $\sum f_i = 100$ then $\bar{x} =$
A) 20 B) 25 C) 27 D) 45
4. The mean of n terms in the series $a, a + d, a + 2d, \dots$ is
A) $a + (n-1)d$ B) $a + nd$ C) $2a + (n-1)d$ D) $a + (n-1)\frac{d}{2}$
5. The mean daily wage earned by 4 labourers is Rs. 180. If another labourer is included in the group, the mean wage goes upto Rs. 185, then the wage of included labourer is
A) Rs. 200 B) Rs. 205 C) Rs. 195 D) Rs. 204
6. A constant distance from town A to town B is covered by a person at 40 km/h. He rides back to same distance at 30 km/h. Then the average speed during the whole journey is
A) 34.29 km/h B) 34.39 km/h C) 34.59 km/h D) 34.69 km/h
7. There are 45 students in a class of which 15 are girls. The average weight 15 girls is 45 kg and that of 30 boys is 52 kg. Then the mean weight of the all students of the class is _____ kg.
A) 44.67 kg B) 45.67 kg C) 49.67 kg D) 51.67 kg
8. A school has four sections in a class having 40, 35, 45 and 42 students. The mean marks obtained in a test are 50, 60, 55, 45 respectively. Then the overall average of the marks per student is
A) 52 B) 52.25 C) 52.5 D) 52.75
9. A car runs for t_1 hours at v_1 km/h, t_2 hours at v_2 km/h. Then the average speed of the car for the entire journey is _____ km/h.
A) $\frac{v_1 t_1 + v_2 t_2}{t_1 + t_2}$ B) $\frac{(v_1 + v_2)t_2}{t_1}$ C) $\frac{v_1 t_1 + v_2 t_2}{v_1 + v_2}$ D) $\frac{v_1 + v_2}{t_1 + t_2}$

10. A train runs x km at an average speed of v_1 km/h, and y km at an average speed of v_2 km/h, then the average speed of the train for the entire journey is
- A) $\frac{x+y}{v_1+v_2}$ km/h B) $\frac{(x+y)v_1v_2}{v_1+v_2}$ km/h C) $\frac{(x+y)v_1v_2}{xv_2+yv_1}$ km/h D) $\frac{xv_1+yv_2}{v_1+v_2}$ km/h
11. Of three numbers, the first is twice the second and thrice the third. The average of all the three numbers is 88, then the smallest number is
- A) 72 B) 36 C) 48 D) 18
12. 9 men visited a hotel, 8 of them spent Rs. 4 each over their meal and the 9th spent Rs. 2 more than the average of all the nine. Then the total money spent by them is
- A) Rs. 36.25 B) Rs. 37.25 C) Rs. 38.25 D) Rs. 39.25
13. The mean of x and $\frac{1}{x}$ is k then the mean of x^2 and $\frac{1}{x^2}$ is
- A) $2k$ B) $2k^2+1$ C) $2k^2-1$ D) k^2
14. The mean of observations of a data is 12.5. By mistake one observation -15 is wrongly registered instead of 15. If the mean of resultant data is 14 then the no. of observations in the data is
- A) 15 B) 20 C) 25 D) 30
15. The mean of $ax_1, ax_2, \dots, ax_n$ is $a\bar{x}$ then
- $(ax_1 - a\bar{x}) + (ax_2 - a\bar{x}) + \dots + (ax_n - a\bar{x})$
- A) $\bar{x}$ B) a C) 0 D) $x_1 + x_2 + \dots + x_n$
16. If $x_1, x_2, \dots, x_n$ are n values of a variable x such that $\sum_{i=1}^n (x_i - 2) = 110$ and $\sum_{i=1}^n (x_i - 5) = 20$ then $n =$
- A) 20 B) 30 C) 40 D) 65
17. The sum of the deviations of $x_1, x_2, \dots, x_n$ measured from 50 is -10 and the sum of deviations measured from 46 is 70. Then their mean is
- A) 39.5 B) 45.5 C) 49.5 D) 55.5
18. If $(x-1)$ is a factor of the polynomial $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_n$ ($a_0 \neq 0$) then the mean of $a_0, a_1, a_2, \dots, a_n$ is
- A) n B) $n-1$ C) 1 D) 0
19. If the mean of x^n and $\frac{1}{x^n}$ is 1, then the mean of x and $\frac{1}{x}$ is
- A) 0 B) 1 C) $2n$ D) $\frac{n}{2}$
20. If $(x+1)$ is a factor of polynomial $a_0x^{10} + a_1x^9 + a_2x^8 + a_3x^7 + a_4x^6 + a_5x^5 + a_6x^4 + a_7x^3 + a_8x^2 + a_9x + a_{10}$ ($a \neq 0$), then the mean of $a_0, -a_1, a_2, -a_3, a_4, -a_5, a_6, -a_7, a_8, -a_9, a_{10}$ is
- A) 10 B) 5 C) 1 D) 0

KEY

Level - 1 :

1. C	2. C	3. C	4. B	5. B	6. C	7. D
8. C	9. D	10. B	11. D	12. B	13. C	14. A
15. B	16. C	17. B	18. B	19. B	20. B	21. B
22. C	23. B	24. A	25. B	26. C	27. B	28. C
29. C	30. C	31. C	32. B	33. D	34. B	35. B
36. A	37. D	38. A	39. B	40. C	41. C	42. C
43. D	44. D	45. B	46. A	47. B	48. A	49. A
50. B	51. C	52. B	53. B	54. C	55. C	

Level - 2 :

1. C	2. D	3. D	4. C	5. B	6. C	7. D
8. C	9. D	10. C	11. C	12. C	13. C	14. C
15. D	16. C	17. B	18. C	19. B	20. C	21. D
22. C	23. B	24. D	25. C	26. C	27. B	28. B
29. B	30. C	31. B	32. D	33. A	34. B	35. B
36. B	37. B	38. C	39. C	40. B	41. B	42. B
43. A	44. B	45. B	46. D			

Level - 3 :

1. D	2. D	3. C	4. D	5. B	6. A	7. D
8. B	9. A	10. C	11. A	12. C	13. C	14. B
15. C	16. B	17. C	18. D	19. B	20. D	