5. STATISTICS

SYNOPSIS

A. MEASURES OF CENTRAL TENDENCY :

Statistics may rightly be called as the science of averages. These averages are also known as central values. All these averages tend towards the central value of the given data. These are said to be measures of central tendency.

There are five types of measures of Central Tendency:

1. ArithmeticMean(A.M)
2. Geometric Mean (G.M) } $\Rightarrow$ Mathematical Averages
3. Harmonic Mean (H.M)

4. Median } $\Rightarrow$ Positional Averages
5. Mode

I. ARITHMETIC MEAN (A.M.) :

i) Individual series :

If $x_1, x_2, x_3, ..., x_n$ are n values of variant x, then its Arithmetic Mean, denoted by $\bar{x}$

$$\text{A.M. } (\bar{x}) = \frac{x_1 + x_2 + x_3 + ... + x_n}{n} = \frac{\sum x_i}{n} \text{ (or) } \text{A.M. } (\bar{x}) = A + \frac{\sum (x_i - A)}{n}$$

where A is the assumed average. (For individual series)

ii) Discrete frequency distribution :

$\text{A.M. } (\bar{x}) = A + \frac{\sum f_i d_i}{\sum f_i}$, where $d_i = x_i - A$ and A is assumed average. $\text{A.M.} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$

iii) Combined Arithmetic Mean :

If $\bar{x}_i$ are the means of k **- series** of sizes n_i $(i = 1, 2, 3, ...,k)$ respectively, then the combined or composite mean $\bar{x}$ can be obtained by the formula :

$$\bar{x} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2 + ... + n_k\bar{x}_k}{n_1 + n_2 + ... + n_k} = \frac{\sum n_i \bar{x}_i}{\sum n_i}$$

iv) Weighted Arithmetic Mean : Let $w_1, w_2, ..., w_n$ be the weights assigned to the values $x_1, x_2, ..., x_n$ respectively of a variable x, then the weighted A.M. is $\bar{x} = \frac{\sum w_i x_i}{\sum w_i}$.

v) $\text{AM}(aX+b) = a\text{AM}(X)+b$ (where AM(X) = Arithmetic Mean of X)

II. GEOMETRIC MEAN (G.M.) :

i) Geometric mean is the n^{th} root of the product of n terms in a given series. $x_1, x_2, x_3, ..., x_n$ are n items then $\text{G.M.} = \sqrt[n]{x_1 x_2 x_3 .... x_n}$.

$$\Rightarrow \log(GM) = \frac{1}{n}\{\log x_1 + \log x_2 + ... + l\log x_n\} \Rightarrow GM = Anti\log\left(\frac{\sum_{1}^{n}\{\log(x_i)\}}{n}\right)$$

ii) For a discrete frequency distribution, $GM=\sqrt[N]{x_1^{f_1}x_2^{f_2}x_3^{f_3}....x_n^{f_n}}$ where $x_1, x_2, ..., x_n$ are mid values of n classes and $f_1, f_2, ..., f_n$ are corresponding frequencies and $N=\sum f_i$

$$\log(GM)=\frac{1}{N}\{f_1\log x_1+f_2\log x_2+.....+f_n\log x_n\} \Rightarrow GM=Anti\log\left(\frac{\sum_{i=1}^{n} f_i\log(x_i)}{\sum_{i=1}^{n} f_i}\right)$$

iii) If G_1, G_2 and G_3 are the GM of three series of sizes n_1, n_2 and n_3 respectively, then the GM of the combined series is given by $GM=\sqrt[N]{G_1^{n_1}G_2^{n_2}G_3^{n_3}}$ where N = $n_1+n_2+n_3$

$$\log(GM)=\frac{1}{N}\{n_1\log G_1+n_2\log G_2+n_3\log G_3\} \Rightarrow GM=Anti\log\left\{\frac{n_1\log G_1+n_2\log G_2+n_3\log G_3}{n_1+n_2+n_3}\right\}$$

Note : GM cannot be calculated if the size of any of the item is zero or negative.

III. HARMONIC MEAN (H.M.) :

Harmonic mean of a given series is the reciprocal of the arithmetic mean of the reciprocal values of its various items in the variable x are n items ($x_1, x_2, x_3, ..., x_n$) then

$$\text{H.M.}=\frac{n}{\frac{1}{x_1}+\frac{1}{x_2}+\frac{1}{x_3}+.....+\frac{1}{x_n}}$$

For discrete frequency distribution ;

$$\text{H.M.}=\frac{\sum_{i=1}^{n} f_i}{\sum_{i=1}^{n}\frac{f_i}{x_i}}$$

***Note*1)** To find average speed when distance covered is constant we use H.M

2) $\text{Velocity}=\frac{\text{distance}}{\text{time}}$

d_1, d_2, d_3.....d_n are distances, t_1, t_2, t_3.....t_n are times, v_1, v_2, v_3.....v_n are velocites.

Then $\text{Average velocity}=\frac{\text{Total distance covered}}{\text{total time}}$

$$=\frac{d_1+d_2+d_3+.....+d_n}{t_1+t_2+t_3+.....+t_n}=\frac{d_1+d_2+d_3+.....+d_n}{\frac{d_1}{v_1}+\frac{d_2}{v_2}+\frac{d_3}{v_3}+.....+\frac{d_n}{v_n}}$$

3) If $d_1=d_2=d_3=.....=d_n$ then average velocity $=\frac{n}{\frac{1}{v_1}+\frac{1}{v_2}+.....+\frac{1}{v_n}}$

4) i) If all the numbers are equal then AM = GM = HM

ii) The numbers are different then AM $\geq$ GM $\geq$ HM and $(GM)^2$ = (AM).(HM)

IV. MEDIAN :

Median is the central value of the set of observations after all the observations are arranged in the ascending or descending order of their magnitudes.

i) Arrange n observations in ascending or descending order of magnitude then Median $= \left(\frac{n+1}{2}\right)^{th}$ observation when n is odd,

$= \frac{1}{2}\left[\left(\frac{n}{2}\right)^{th} \text{observation} + \left(\frac{n}{2}+1\right)^{th} \text{observation}\right]$ when n is even.

ii) **Discrete Frequency Distribution :**

1) Arrange the data in ascending or descending order.

2) Find the cumulative frequencies.

3) Apply the formula : Median = Size of $\left(\frac{N+1}{2}\right)^{th}$ item, $N = \sum f_i$ = sum of frequencies

iii) For the continuous frequency distribution,

$$\text{Median} = l + \left(\frac{\frac{N}{2} - F}{f}\right) C$$

where, l = Lower limit of the Median Class,

C = Width of the median class

f = Frequency of Median Class,

$N = \sum f_i$ = Sum of frequencies

F = Cumulative frequency of the class just preceding to median class.

Note : **Class interval corresponding to cumulative frequency just more than $N/2$ is median class**

Partition Values :

1. These are the values which divide the series into a number of **equal parts**.
2. The three points which divide the series into four equal parts are called **quartiles**. The first, second and third points are known as the **first** (Q_1), **second** (Q_2) and **third** (Q_3) **quartile** respectively.
3. The nine points which divide the series into ten equal parts are called **deciles**, denoted by D_t where $t = 1$ to 9.
4. The ninty nine points which divide the series into 100 equal parts are called **percentiles**, denoted by P_t where $t = 1$ to 99.
5. The methods of computing the partition values are the same as those of locating the median in the case of both discrete and continuous distribution.

   i) The lower (or first) quartile Q_1 equals to $\left(\frac{n+1}{4}\right)^{th}$ observation in case of an individual series and size of $\left(\frac{N+1}{4}\right)^{th}$ item in case of discrete frequency distribution, and in case of continuous frequency distribution $Q_1 = l_1 + \left(\frac{\frac{N}{4} - F_1}{f_1}\right) C_1$

ii) The upper quartile Q_3 equals to $\left(\frac{3(n+1)}{4}\right)^{th}$ observation in case of an individual series and size of $\left(\frac{3(N+1)}{4}\right)^{th}$ item in case of discrete frequency distribution and for continuous frequency distribution $Q_3 = l_3 + \left(\frac{\frac{3N}{4} - F_3}{f_3}\right) C_3$

Where l_1 = lower limit of Q_1 class,

l_3 = lower limit of Q_3 class,

N = Total Frequency,

C_1 = width of the Q_1 class

C_3 = width of the Q_3 class

f_1 = Frequency of Q_1 class

f_3 = Frequency of Q_3 class

F_1 = Cumulative frequency of the class just preceding to Q_1 class.

F_3 = Cumulative frequency of the class just preceding to Q_3 class.

Note : 1. Class interval corresponding to cumulative frequency just more than $N/4$ is Q_1 class

2. Class interval corresponding to cumulative frequency just more than $3N/4$ is Q_3 class

3. Upper and Lower quatile's are equidistant from median.

6. i) For discrete series $t^{th}\ decile = t\left(\frac{n+1}{10}\right)^{th}$

observation → (i) If it is integer

observation → (ii) Average of two terms if it is not an integer

ii) For frequency distibution

$t^{th}\ decile\ class = \frac{t}{10}(N+1)^{th}$ item

D_t denotes the t^{th} decile then $D_t = l + \left(\frac{\frac{tN}{10} - F}{f}\right) C$

where l = lower limit of decile class

N = total frequency

f = frequency of decile class

C = width of the class i nterval

F = comulative frequency of the class preseding the decile class

7. i) For discrete series $t^{th}\ percentile = t\left(\frac{n+1}{100}\right)^{th}$

observation → (i) If it is integer

observation → (ii) Average of two terms if it is not an integer

ii) For frequency distibution t^{th} *percentile class* $= \frac{t}{100}(N+1)^{th}$ item

P_t denotes the tth percentile then $P_t = l + \left(\frac{\frac{tN}{100} - F}{f}\right)C$

whrere l = lower limit of percentile class

C = width of the class interval

N = total frequency

F = comulative frequency of the class preseding the percentile class

f = frequency of percentile class

Note : **i)** In a symetric distribution the **upper** and **lower quartiles** are Equi distant from **median**.

Note : **ii)** for the symmetric distribution **median = second quertile** (Q_2) **= 5th decile = 50th percentile.**

V. MODE :

Mode is defined as the value in series which occurs most frequently. In a frequency distribution, mode is that variate which has the maximum frequency. Mode $(Z) = l + \left(\frac{f_m - f_1}{2f_m - f_1 - f_2}\right) c$

Where l = lower limit of the modal class

C = width of the modal class

f_1 = frequency of the class just preceding the modal class.

f_m = frequency of the modal class

f_2 = frequency of the class just succeeding the modal class.

Note : **Class interval having maximum frequency is called modal class**

A distribution in which mean, median and mode coincide is called a symmetrical distribution. If the distribution is moderately asymmetrical, the mean, median and mode are connected by the formula. Mode = 3 Median – 2 Mean (or) Mean – Mode = 3(Mean - Median)

DISPERSION : Dispersion is the measure of the variation of the items from an average.

B. MEASURES OF DISPERSION :

1) Range 2) Quartile Deviation 3) Mean Deviation 4) Standard Deviation

1) *Range :*

i) The difference between maximum and minimum items of the series is called range.

ii) Coefficient of Range $= \frac{\text{Range}}{\text{Maximum} + \text{Minimum}}$

2) *Quartile Deviation : (Semi-inter quartile range)*

i) Quartile Deviation $= \frac{Q_3 - Q_1}{2}$

ii) Coefficient of Quartile Deviation $= \frac{Q_3 - Q_1}{Q_3 + Q_1}$

where Q_3 is the upper Quartile, Q_1 is the lower Quartile.

3) *Mean Deviation (Average Deviation) :*

i) If $\bar{x}$ is the mean of n observations $x_1, x_2, x_3, \ldots\ldots, x_n$ then Mean Deviation $= \frac{1}{n}\sum_{i=1}^{n} |x_i - \bar{x}|$

ii) Mean Deviation $= \frac{1}{n}\sum |x_i - m|$ Where m is the median.

iii) Mean Deviation $= \frac{1}{n}\sum |x_i - z|$ Where z is the mode.

iv) Let $x_1, x_2, x_3, \ldots, x_n$ occurs with frequencies $f_1, f_2, f_3, \ldots\ldots, f_n$ respectively and M can be either Mean, Median or Mode then Mean Deviation from $M = \frac{\sum f_i |x_i - M|}{\sum f_i}$

v) Coefficient of Mean Deviation $= \frac{\text{Mean Deviation}}{M}$ where M is the Mean, Median or Mode

Note : The mean deviation from the median is < that measured from any other value.

4) *Variance(v) and Standard Deviation (S.D.) :*

Variance (σ^2) : If $x_1, x_2 \ldots\ldots\ldots x_n$ are n items and $\bar{x}$ is their arithmetic mean.

Then **i)** Variance $\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n} = \frac{\sum (x_i^2)}{n} - (\bar{x})^2 = \frac{\sum (x_i^2)}{n} - \left(\frac{\sum x_i}{n}\right)^2$

ii) $S.D. = \sigma = \sqrt{\text{variance}}$

a) Individual Series :

i) Standard Deviation $(\sigma) = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}} = \sqrt{\frac{\sum d_i^2}{n}} = \sqrt{\frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2}$

(Deviations to be taken from actual mean)

ii) Standard Deviation $(\sigma) = \sqrt{\frac{\sum d_i^2}{n} - \left(\frac{\sum d_i}{n}\right)^2}$ where $d_i = x_i - A$

(Deviations to be taken from assumed mean)

b) Discrete Frequency Distribution :

i) Actual Mean Method : S.D. $= \sqrt{\frac{\sum f_i d_i^2}{\sum f_i} = \sqrt{\frac{\sum f_i x_i^2}{\sum f_i} - \left(\frac{\sum f_i x_i}{\sum f_i}\right)^2}}$

ii) Assumed Mean Method : S.D. $= \sqrt{\frac{\sum f_i d_i^2}{\sum f_i} - \left(\frac{\sum f_i d_i}{\sum f_i}\right)^2}$ where $d_i = x_i - A$

(where A is assumed mean)

iii) For a moderately asymmetrical distribution **Mean diveation** $= \frac{4}{5}$ **(standard deviation)**

c) i) **Coefficient of Standard Deviation** = $\frac{\sigma}{\bar{x}}$ ii) **Coefficient of Variation** = $\frac{\sigma}{\bar{x}} \times 100$

d) **Variance of combined series :**

If n_1, n_2 are the sizes, $\bar{x}_1, \bar{x}_2$ the means, and σ_1, σ_2 the standard deviations of two series, then the standard deviation σ of the combined series is given by

$$\sigma^2 = \frac{1}{n_1 + n_2}\left[n_1\sigma_1^2 + n_2\sigma_2^2 + \frac{n_1 n_2}{n_1 + n_2}(\bar{x}_1 - \bar{x}_2)^2 \right]$$

$$\sigma^2 = \frac{n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)}{n_1 + n_2}$$

where $d_1 = \bar{x} - \bar{x}_1$, $d_2 = \bar{x} - \bar{x}_2$, $\bar{x}$ is combined mean

Imp Note : **I. If $V(X)$ is variance of X, then**

i) $V(X + a) = V(X)$ ii) $V(aX) = a^2 V(X)$

iii) $V(aX + b) = a^2 V(X)$

II. For the series $a, a+d, a+2d, \ldots, a+(n-1)d$.

1) **Arithmetic mean** $(\bar{x}) = a + \frac{(n-1)d}{2}$; 2) **Variance** $(\sigma^2) = \frac{n^2 - 1}{12} d^2$

3) **standard deviation** = $\sqrt{\frac{n^2 - 1}{12}}|d|$

4) **Standard deviation of n consecutive natural numbers** = $\sqrt{\frac{n^2 - 1}{12}}$ $(\because d = 1)$

IMPORTANT POINTS TO BE REMEMBERED:

1. A.M. gives more weightage to longer values where as G.M. and H.M. give more weightage to smaller values.
2. **Some Points About A.M. :**
   i) Of all types of averages the Arithmetic mean is most commonly used average.
   ii) It is based upon all observations.
   iii) If the number of observations is very large, it is more accurate and reliable basis for comparision.
3. **Some points About Median :**
   i) It is an appropriate average on dealing with qualitative data like intelligence, wealth etc.,
   ii) The sum of all deviations of the items from median, ignoring algebraic sign is less than the sum from any other point.
4. **Some points about Mode :**
   i) It is not based on all items of the series.
   ii) As compared to other averages, mode is affected to a large extent by fluctuations of sampling.
   iii) It is not suitable on a case where the relative importance of items have to be considered.
5. **Some Points About Geometric Mean :**
   i) It is based on all items of the Series.
   ii) It is most suitable for constructing index numbers, averaging ratios, percentages etc.,
   iii) G.M. can not be calculated if the size of any of the items is zero or negative.

6. **Some Points about Harmonic Mean :**
   i) It is based on all items of the series.
   ii) It can not be measured graphically.
   iii) This is useful in problmes related with rates, ratios, times etc.,
7. i) To know the intelligence of students of a class, we use median.
   ii) When effect of extreme items is to be kept out, we use median.
   iii) For average size of shoe sold at shop, we use Mode.
   iv) To average the price of a commodity, when amount spent each time is constant, we use A.M.
   v) Per Capita income, we use A.M.
   vi) For average percentage rate of depreciation of a machine, we use G.M.
8. i) Variance and standard deviation is independent of change of origin.
   ii) Variance is not independent of change of scale.
   iii) $a, a+d, a+2d, \ldots\ldots, a+2nd$ M.D. from Mean $= \frac{n(n+1)d}{2n+1}$ S.D. $= \sqrt{\frac{n(n+1)}{3}} \cdot d \ (d>0)$
9. i) In a statistical data, the sum of the deviations of individual values from A.M. is always zero i.e., $\sum_{i=1}^{n} f_i (x_i - \bar{x}) = 0$, (f_i = frequency of x_i)
   ii) In a statistical data, the sum of squares of the deviations of individual values from A.M. is least, i.e $\sum_{i=1}^{n} f_i (x_i - \bar{x})^2$ is least.

LECTURE SHEET

EXERCISE

Arithmetic Mean :

1. If the mean of 3, 4, x, 7, 10 is 6 then the value of x is
   1) 4 2) 5 3) 6 4) 7

2. Arithmetic mean of the data

x :	1	2	3	.....	n
f :	1	2	3	.....	n

   is
   1) $n(n+1)/2$ 2) $(n+1)/2$ 3) $(2n+1)/3$ 4) $n(2n+1)/4$

3. If a variable takes the values 0, 1, 2, ..., n with frequencies proportional to binomial coefficients $n_{C_0}, n_{C_1}, n_{C_2}, \ldots\ldots, n_{C_n}$; then mean of distribution is
   1) $\frac{2^n}{n+1}$ 2) $\frac{2^{n+1}}{n(n+1)}$ 3) $\frac{n+1}{2}$ 4) $\frac{n}{2}$

4. Mean of 100 items is 49. It was found that three items 60, 70, 80 were wrongly read as 40, 20, 50 respectively. Then the correct mean is
   1) 48 2) $82\frac{1}{2}$ 3) 50 4) 80

5. Consider the frequency distribution

Value	1	2	3	4
Frequency	5	4	6	f

   . If the mean is known to be '3', then the value of f is
   1) 3 2) 7 3) 10 4) 14

6. If a variable takes values 0,1,2, ..., n with frequencies q^n, $\frac{n}{1}q^{n-1}p$, $\frac{n(n-1)}{1.2}q^{n-2}p^2$,.....,$p^n$ where $p+q = 1$, then the mean is

1) pq 2) np 3) nq 4) np^2

7. In a class of 100 students there are 70 boys whose average marks in a subject is 75. If the average marks of the complete class is 72, then the average marks of the girls is

1) 73 2) 65 3) 68 4) 74

8. 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

1) 40 2) 20 3) 80 4) 60

9. Mean of the numbers 1, 2, 3, ..., n with respective weights $1^2+1, 2^2+2, 3^2+3, \ldots, n^2+n$ is

1) $\frac{3n+2}{2}$ 2) $\frac{3n+1}{4}$ 3) $\frac{2n+1}{3}$ 4) $\frac{3n(n+1)}{2(2n+1)}$

10. A student has obtained 75%, 80% and 85% in three subjects. If the marks of another subject is added then his average can not be less than

1) 60% 2) 65% 3) 80% 4) 90%

11. The mean of n items is $\bar{x}$. If the first item is increased by 1, second by 2 and so on, then the new mean is

1) $\bar{x}+n$ 2) $\bar{x}+\frac{n}{2}$ 3) $\bar{x}+\frac{n+1}{2}$ 4) $\bar{x}+(n+1)$

12. The number of observations in a group is 40. If the average of first 10 is 4.5 and that of the remaining 30 is 3.5, then the average of the whole group is

1) $\frac{1}{5}$ 2) $\frac{15}{4}$ 3) 6 4) 8

13. The frequency distribution of the marks obtained by 100 students in a test carrying 50 marks Then the mean is

Marks	0-9	10-19	20-29	30-39	40-49
No. of students	8	15	20	45	12

1) 28.3 2) 28 3) 27.3 4) 26.4

14. For the given frequency table the arithmetic mean was found to be nearly Rs. 28.07.

Income (in Rs.)	15	20	25	30	35	40
No. of workers	8	12	f_1	16	f_2	10

If the total number of workers is 75, then the missing frequencies f_1, f_2 are respectively

1) 14, 15 2) 15, 14 3) 13, 16 4) 12, 17

15. The mean marks got by 300 students in the subject of statistics was 45. The mean of the top 100 was known to be 70 and the mean of the last 100 was known to be 20, then the mean of the remaining 100 students is

1) 45 2) 58 3) 68 4) 88

16. The minimum value of $(x-6)^2+(x+3)^2+(x-8)^2+(x+4)^2+(x-3)^2$ is

1) 114 2) 141 3) 104 4) 2

Geometric Mean and Harmonic Mean :

17. Geometric mean of 2, 2^2, 2^3, ..., 2^n is

1) 2 2) $2^{\frac{n}{2}}$ 3) $2^{\frac{n+1}{2}}$ 4) $2^{\frac{n(n+1)}{2}}$

18. If $M_{g.x}$ is the geometric mean of N x's and $M_{g.y}$ is the geometric mean of N y's, then the geometric mean M_g of the $2N$ values is

1) $\sqrt[N]{M_{g.x}M_{g.y}}$ 2) $\sqrt{M_{g.x}M_{g.y}}$ 3) $M_{g.x}M_{g.y}$ 4) $(M_{g.x}M_{g.y})^2$

19. If for two positive quantities A.M. = 24.5, G.M. = 24.375 then H.M. =

1) 24 2) 24.125 3) 24.5 4) 24.25 nearly

20. The H.M. of the numbers 1/5, 1/10, 1/15, 1/20, 1/25, 1/30, 1/35 is

1) 1/20 2) 1/16 3) 1/15 4) 1/13

21. A man travels at a speed of 20 Km/hr. and then returns at a speed of 30 Km/hr. His average speed of whole journey is

1) 25 Km/hr 2) 24.5 Km/hr 3) 24 Km/hr. 4) 25.5 Km/hr

22. An automobile driver travels from plane to a hill station 120 Km distant at an average speed of 30 Km per hour. He then makes the return trip at an average speed of 25 Km per hour. He covers another 120 KM distance on plane at an average speed of 50 KM per hour. His average speed over the distance of 360 KM will be

1) $\frac{30+25+50}{3}$ km/hr. 2) $(30.25.50)^{1/3}$ km/hr. 3) $\frac{3}{\frac{1}{30}+\frac{1}{25}+\frac{1}{50}}$ km/hr 4) 105 km/hr.

23. A cyclist covers his first three miles at an average speed of 8 m.p.h, another two miles at 3 m.p.h. and the last two miles at 2 m.p.h. The average speed for the entire journey is (in m.p.h.) nearly

1) 3 2) 2.4 3) 3.8 4) 3.43

Median and partition values :

24. The median of 31, 16, 19, 25, 14, 13, 12, 4, 28, 45 is

1) 14 2) 20 3) 17.5 4) 12

25. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observations of the set is increased by 2, then the median of the new set

1) is decreased by 2 2) is two times the original median
3) remains the same as that of the original set 4) is increased by 2

26. If a variable takes the discrete values $\alpha+4$, $\alpha-\frac{7}{2}$, $\alpha-\frac{5}{2}$, $\alpha-3$, $\alpha-2$, $\alpha+\frac{1}{2}$, $\alpha-\frac{1}{2}$, $\alpha+5$ where $(\alpha>0)$ then the Median is

1) $\alpha-\frac{1}{2}$ 2) $\alpha-2$ 3) $\alpha-\frac{5}{4}$ 4) $\alpha+\frac{1}{2}$

27. The minimum value of $|x-6|+|x+3|+|x-8|+|x+4|+|x-3|$ is

1) 11 2) 21 3) 31 4) 42

28. The mean and median of 100 items are 50 and 52 respectively. The value of the largest item is 100. It was later found that it is actually 110. Then the true mean and median are

1) 50.1,52 2) 51, 52 3) 50, 52 4) 50, 51

29. From a frequency distribution, $c = 3$, $l = 65.5$, $f = 42$, $m = 23$, $N = 102$ then median is (l = lower limit of the median class, m = cumulative frequency of the class preceeding the median class, N = total frequency, f = frequency of the median class, c = width of the median class)

1) 65.5 2) 67.50 3) 66.93 4) 66.43

30. The median of the frequency distribution

Wages	20-30	30-40	40-50	50-60	60-70
No.of workers	3	5	20	10	5

1) 45 2) 45.75 3) 46 4) 46.75

31.

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	180	f_1	34	180	136	f_2	50

If the total frequency is 685 and median is $42\frac{7}{12}$ then the missing frequencies are

1) 81, 24 2) 80, 25 3) 82, 23 4) 83, 22

32. The median of the data

Mid value	115	125	135	145	155	165	175	185	195
Frequency	6	25	48	72	116	60	38	22	3

is

1) 153.79 2) 153.91 3) 165.18 4) 165.93

33. The median of the data

Marks obtained	<20	<30	<40	<50	<60	<70	<80	<90	<100
No. of students	0	4	16	30	46	66	82	92	100

is

1) 62 2) 64 3) 63 4) 52

34. The median of the data

Class Interval	110-119	120 -129	130-139	140-149	150-159	160-169	170-179
Frequency	5	25	40	65	45	25	5

is

1) 134.5 2) 144.5 3) 154.5 4) 145.38

Mode :

35. Mode of the distribution

Marks	4	5	6	7	8
No.of Students	3	5	10	6	1

is

1) 5 2) 5.28 3) 6 4) 6.28

36. If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is

1) 24.0 2) 25.5 3) 20.5 4) 22.0

37. If the difference between mean and mode is 63, then difference between mean and median is

1) 21 2) 31.5 3) 48.5 4) 189

38. A data consists of two 2's, four 4's, six 6's, three 8's, and 10. Then the mode of data is

1) 2 2) 4 3) 6 4) 8

39. The starting value of the model class of a distribution is 20. The frequency of the model class is 18. The frequencies of the classes preceeding and succeeding are 8, 10 and the width of the model class is 5, then mode is

1) 18.5 2) 20.5 3) 21.4 4) 22.78

40. The mode for the frequency distribution

Class Interval	0-4	4-8	8-12	12-16
Frequency	4	8	5	6

is

1) 5 2) 5.28 3) 6 4) 6.29

Mean Deviation :

41. Mean deviation from the mean for data 6, 7, 10, 12, 13, 4, 8, 12 is

1) 2.35 2) 2.75 3) 3.35 4) 3.75

42. If the mean deviation of the numbers 1, $1 + d$, $1 + 2d$,....., $1 + 100d$ from their mean is 255, then the d is equal to :

1) 20.0 2) 10.1 3) 20.2 4)10.0

43. Mean deviation from mean of the data

Marks	10	15	20	25	30
No.of Students	2	4	6	8	5

is

1) 5 2) 5.2 3) 5.12 4) 5.5

44. Mean deviation from median for the data 3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21 is

1) 4.27 2) 5.47 3) 5.27 4) 5.67

45. If mean deviation through median is 15 and median is 450, then coefficient of mean deviation is

1) 1/30 2) 30 3) 15 4) 45

46. In a moderately asymmetrical distribution S.D. is 20 then the mean deviation is

1) 20/3 2) 16 3) 40 4) 20

Standard Deviation and Variance

47. The mean and S.D. of 1, 2, 3, 4, 5, 6 is

1) $\frac{7}{2}, \sqrt{\frac{35}{12}}$ 2) 3, 3 3) $\frac{7}{2}, \sqrt{3}$ 4) $3, \frac{35}{12}$

48. For a series the information available is $n = 10$, $\sum x = 60, \sum x^2 = 1000$. The standard deviation is

1) 8 2) 64 3) 24 4) 128

49. The sum of 10 items is 12 and sum of their squares is 18, then standard deviation is :

1) –3/5 2) 6/5 3) 4/5 4) 3/5

50. Coefficient of variation of a distribution is 60 and its standard deviation is 21, then its arithmetic mean is :

1) 36 2) 37 3) 35 4) 38

51. The median and S.D. of a distribution are 20 and 4 respectively. If each item is increased by 2, the new median and S.D. are:

1) 20, 6 2) 22, 6 3) 18, 6 4) 22, 4

52. The variance of first 10 positive integral multiples of 3 is

1) 64.25 2) 54.25 3) 70.25 4) 74.25

53. In a series of $2n$ observations, half of them equals to a and remaining half equals to $-a$. If the standard deviation of the observations is 2, then $|a|$ equals to

1) $\frac{1}{n}$ 2) $\sqrt{2}$ 3) 2 4) $\frac{\sqrt{2}}{n}$

54. If $\sum_{i=1}^{18}(x_i-8)=9$ and $\sum_{i=1}^{18}(x_i-8)^2=45$ then the standard deviation of $x_1, x_2, \ldots, x_{18}$ is

1) $\frac{4}{9}$ 2) $\frac{9}{4}$ 3) $\frac{3}{2}$ 4) $\frac{1}{2}$

55. Mean of 40 terms is 25 and S.D. is 4, then the sum of the squares of all terms is

1) 25640 2) 25000 3) 25645 4) 35645

56. Let $x_1, x_2, \ldots, x_n$ be n observations such that $\sum x_i^2 = 400$ and $\sum x_i = 80$. Then a possible value of n among the following is

1) 15 2) 18 3) 9 4) 12

57. In an experiment with 15 observations on x, the following results were available $\sum x^2 = 2830$ $\sum x = 170$. One observation that was 20 was found to be wrong and was replaced by the correct value 30. Then the corrected variance is

1) 8.33 2) 78.00 3) 188.66 4) 177.33

58. For a group of 50 male workers, the mean and S.D. of their daily wages are Rs. 630 and Rs. 90 respectively. For a group of 40 female workers, these are Rs. 540 and Rs. 60 respectively. The S.D. of these 90 workers is

1) 60 2) 70 3) 80 4) 90

59. Suppose a population A has 100 observations 101, 102, ..., 200; and another population B has 100 observations 151, 152, ..., 250. If V_A and V_B represent the variances of the two populations respectively, then $\frac{V_A}{V_B}$ is

1) $\frac{9}{4}$ 2) $\frac{4}{9}$ 3) $\frac{2}{3}$ 4) 1

60. If standard deviation of 1, 2, 3, 4, ...,10 is σ then standard deviation of 11, 12,...,20 is

1) $\sigma+10$ 2) 10σ 3) σ 4) 5σ

61. The standard deviation of a variable x is σ. The standard deviation of the variable $\frac{ax+b}{c}$ where a, b, c are constants is

1) $\left(\frac{a}{c}\right)\sigma$ 2) $\left|\frac{a}{c}\right|\sigma$ 3) $\left|\frac{a^2}{c^2}\right|\sigma$ 4)(a) σ

62. The marks of some students were listed out of 75. The S.D. of marks was found to be 9. Subsequently the marks were raised to a maximum of 100 and variance of new marks was calculated. The new variance is

1) 144 2) 122 3) 81 4) 75

63. The mean of five observations is 4 and their variance is 5.2. If three of these observations are 1, 2 and 6. Then the other two are

1) 2 and 9 2) 3 and 9 3) 4 and 7 4) 5 and 6

64. Consider the statements.
1) Mode can be computed from histogram
2) Median is not independent of change of scale
3) Variance is independent of change of origin and scale. Which of the following is correct?
1) Only (1) 2) Only (2) 3) Only (1) and (2) 4) (1),(2) and (3)

65. The mean of the numbers a,b, 8, 5, 10 is 6 and the variance is 6.80. Then which one of the following gives possible values of a and b ?
1) $a = 0, b = 7$ 2) $a = 5, b = 2$ 3) $a = 1, b = 6$ 4) $a = 3, b = 4$

66. Statement - I : The variance of first n even natural numbers is $\frac{n^2-1}{4}$
Statement - II : The sum of first n natural numbers is $\frac{n(n+1)}{2}$ and the sum of squares of first n natural numbers is $\frac{n(n+1)(2n+1)}{6}$.
1) Statement-I is true , Statement - II is true ; Statement-II is correct explanation for Statement-I
2) Statement-I is true , Statement-II is true ; Statement - II is not correct explanation for Statement - I
3) Statement - I is true ; Statement - II is false
4) Statement - I is false ; Statement - II is true

67. For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data set is
1) $\frac{5}{2}$ 2) $\frac{11}{2}$ 3) 6 4) $\frac{13}{2}$

68. If the mean deviation about the median of the numbers a, $2a$, ..., $50a$ is 50, then $|a|$ equals:
1) 4 2) 5 3) 2 4) 3

69. Let x_1, x_2 ..... x_n be n observations, and let $\bar{x}$ be their arthimetic mean and σ^2 be their vaariance.
Statement 1: Variance of $2x_1, 2x_2 \ldots 2x_n$ is $4\sigma^2$
Statement 2 : Arithmetic mean of $2x_1, 2x_2$ .... $2x_n$ is $4\bar{x}$
1) Statement 1 is false, Statement 2 is true
2) Statement 1 is true, Statement 2 is true, Statement 2 is correct explanation for Statement 1
3) Statement 1 is true, Statement 2 is true, Statement 2 is not a correct explanationfor Statement 1
4) Statement 1 is true, Statement 2 is false

70. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given ?
1) mean 2) median 3) mode 4) variance

71. The variance of first 50 even natural numbers is :
1) $\frac{833}{4}$ 2) 833 3) 437 4) $\frac{437}{4}$

72. The mean of the data set comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3,4 and 5 are added to the data, then the mean of the resultant data, is :

1) 16.8 2) 16.0 3) 15.8 4) 14.0

Numerical value type questions

73. In a moderately asymmetric frequency distribution it is known that mean is 42.32, median is 43, then the value of mode is ..... .

74. If $\sum_{i=1}^{5}(x_i-10)=5$ and $\sum_{i=1}^{5}(x_i-10)^2=20$ then standard deviation of observation $2x_1+7$, $2x_2+7$, $2x_3+7$, $2x_4+7$, $2x_5+7$ is equal to ..... .

75. For two sets, each of size 5, the variences are given to be 4 and 5 and the corresponding means are given to be 2 and 4 respectively. The variances of the combined date set is ..... .

76. If the algebriac sum of deviations of 20 observations from 30 is 19, then the mean of observation is ..... .

77. Consider the frequency distribution of the given number

Value	1	2	3	4
frequency	5	4	6	f

If the mean is known to be 2 then the value of f is ..... .

78. Mean deviation from median for the following data 340, 150, 210, 240, 300, 310, 320, is approximately equal to ..... .

79. In a class of 100 students the average amount of pocket money is Rs. 35 per student. If the average is Rs. 22 for girls and Rs. 50 for boys then the number of girls in the class is ..... .

80. In an experiment with 12 observations on x, the following results were available $\Sigma x^2=2830$, $\Sigma x=170$. one observation that was 20 found to be wrong and was replaced by correct value 30, then the correct variance is ..... .

81. The mean of the 10 observations is 10 and their standard deviation is 2.5. Then the sum of the series of all the observations ..... .

82. The variance of 20 observations is 3.6. If each observation is multiplied by 2 then the new variance of the resulting observations is ..... .

83. The average marks of 10 students in a class was 60 with a standard deviation 4, while the average marks of other 10 students was 40 with a standard deviation 6. If all the 20 students are taken together their deviation will be ..... .

84. Mean deviation about mean from the following data

x_i	3	9	17	23	27
f_i	8	10	12	9	5

f is ..... .

PRACTICE SHEET

EXERCISE

Arithmetic Mean :

1. The A.M. of the series ${}^nC_0, {}^nC_1, {}^nC_2, \ldots\ldots {}^nC_n$ is

   1) $\frac{2^n}{n+1}$ 2) $\frac{2^n}{n}$ 3) $\frac{2^{n-1}}{n+1}$ 4) $\frac{1}{n+1}$

2. The mean of marks obtained in an examination by a group of 100 students was found to be 49.96. The mean of the marks obtained in the same examination by another group of 200 students was 52.32, then the mean of the marks obtained by both the groups of students taken together is

   1) 51.5 2) 52 3) 52.5 4) 53

3. If 5 is added to each and every item of a data, then the A.M. is

   1) 5 times to the first A.M. 2) increased by 5 to the first A.M.

   3) equal to the first A.M. 4) decreased by 5 to the first A.M.

4. Six faces of a balanced die are numbered from integers 1 to 6. This die is tossed 60 times and the frequency distribution of the integers obtained is given below. Then the mean of the grouped data is

Integer	1	2	3	4	5	6
Frequency	8	9	10	16	9	8

   1) 3.25 2) 3.55 3) 3.45 4) 3.35

5. The mean of 20 observations is 15. On checking it was found that two observations were wrongly copied as 3 and 6. If wrong observations are replaced by correct values 8 and 4, then the correct mean is

   1) 15 2) 15.15 3) 16.15 4) 17

6. Mean of 100 observations is 45. It was later found that two observations 19 and 31 were incorrectly recorded as 91 and 13. Then the correct mean is

   1) 44.0 2) 44.46 3) 45.00 4) 45.54

7. The A.M. of set of 50 numbers is 38. If two numbers of the set, namely 55 and 45 are discarded, then A.M. of the remaining set of numbers is

   1) 38.5 2) 37.5 3) 36.5 4) 36.0

8. The simple and weighted arithmetic means of the first n natural numbers, the weights being the corresponding numbers are respectively

   1) $\frac{n+1}{2}, \frac{2n+1}{2}$ 2) $\frac{n+1}{2}, \frac{2n+1}{4}$ 3) $\frac{n+1}{2}, \frac{2n+1}{3}$ 4) n, n^2

9. A group of 10 items has mean 6. If the mean of 4 of these items is 7.5, then the mean of the remaining items is

   1) 6.5 2) 5.5 3) 4.5 4) 5.0

10. The mean weight of 150 students in a certain class is 60 kilograms. The mean weight of boys in the class is 70 kilograms and that of the girls is 55 kilograms, then the number of boys and girls are

    1) 100,50 2) 50,100 3) 75,75 4) 60, 90

11. The average salary of male employees in a firm was Rs. 520 and that of females was Rs. 420. The mean salary of all the employees was Rs. 500. The percentage of male and female employees are

    1) 30, 70 2) 80, 20 3) 40, 60 4) 50, 50

12. The mean age of a combined group of men and women is 30 years. If the mean age of men and women are respectively 32 and 27, then the percentage of women in the group is

1) 30 2) 40 3) 50 4) 60

13. The mean of a set of observations is $\bar{x}$. If each observation is divided by $\alpha(\neq 0)$ and it is increased by 10, then the mean of the new set is

1) $\frac{\bar{x}}{\alpha}$ 2) $\frac{\bar{x}+10}{\alpha}$ 3) $\frac{\bar{x}+10\alpha}{\alpha}$ 4) $\alpha\bar{x}+10$

14. If the mean of a set of observations $x_1, x_2, \ldots, x_{10}$ is 20 then the mean of $x_1+4, x_2+8, x_3+12, \ldots, x_{10}+40$ is

1) 34 2) 42 3) 38 4) 40

Geometric and Harmonic Mean

15. The geometric mean of 5, 8, 10, 15, 20, 25, 30, 35 is

1) 16.9 2) $10(9)^{1/7}$ 3) 18 4) $10\left(\frac{63}{2}\right)^{1/8}$

16. The geometric mean of 10 observations on a certain variable was calculated as 16.2. It was later discovered that one of the observations was wrongly recorded as 12.9; infact it was 21.9. The correct geometric mean is

1) $\left(\frac{(16.2)^9\times 21.9}{12.9}\right)^{1/10}$ 2) $\left(\frac{(16.2)^{10}\times 21.9}{12.9}\right)^{1/10}$ 3) $\left(\frac{(16.2)^{10}\times 12.9}{21.9}\right)^{1/10}$ 4) $\left(\frac{(16.2)^{11}\times 21.9}{12.9}\right)^{1/11}$

17. A man moves from A to B. A large part of the distance is uphill and he gets a mileage of only 10 miles per gallon of gasoline. On the return trip, he makes 15 miles per gallon, then the average of his mileage (assuming that the distance from A to B is 60 miles) is

1) 12 2) 11 3) 10 4) 20

18. An aeroplane flies around a square, the sides of which measure 100 miles each. The aeroplane covers at a speed of 100 mph the first side, at 200 mph the second side, at 300 mph the third side and 400 mph the fourth side. The average speed of the aeroplane around the square is

1) 190 mph 2) 195 mph 3) 192 mph 4) 200 mph

Median and Partition Values :

19. The median of 111, 129, 143, 118, 120, 125, 170, 162 is

1) 127 2) 118 3) 111 4) 135

20. The test marks in statistics for a class are 20, 24, 27, 38, 18, 42, 35, 21, 44, 18, 31, 36, 41, 26,29. The median score of the class is

1) 8 2) 21 3) 29 4) 31

21. The median of a series is 10. Two additional observations 7 and 20 are added to the series. The median of new series is

1) 9 2) 20 3) 7 4) 10

22. Marks scored by 100 students in a 25 marks unit test of Mathematics are as following

Marks	0-5	5-10	10-15	15-20	20-25
Students	10	18	42	23	7

Their median is

1) 12 2) 12.62 3) 12.3 4) 12.7

23.

Wages (Rs.)	60-70	50-60	40-50	30-40	20-30
No. of Labour	5	10	f_1	5	f_2

If the total frequency is 43 and median is 46.75 then the missing frequencies are

1) 18, 5 2) 20, 3 3) 17, 6 4) 15, 8

Mode :

24. The mode of 3, 3, 7, 4, 5, 3, 5, 6, 8, 9, 5, 3, 5, 3, 6, 9, 7, 4 is

1) 4 2) 7 3) 3 4) 5

25. For data 4, 5, 5, 7, 6, 6, 3, 2, 5, 7, 6, 7 the number of modes is

1) 3 2) 2 3) 1 4) 12

26. If in a moderately skewed distribution, the values of mode and mean are 6λ and 9λ respectively, then value of median is

1) 8λ 2) 6λ 3) 7λ 4) 5λ

27. In a moderately skewed distribtuion, the values of mean and median are 5 and 6 respectively. The value of mode for such distribtution is

1) 8 2) 11 3) 16 4) 12

Mean deviations :

28. The mean deviation of first 7 natural numbers from their mean is

1) 7/2 2) 3/2 3) 12/7 4) 7/12

29. Mean deviation of first three odd numbers from their mean is

1) 3 2) 1 3) 2 4) 4/3

30. Mean deviation of 39, 40, 40, 41, 41, 42, 42, 43, 43, 44, 44, 45 from their median is

1) 15 2) 1.5 3) 42 4) 35

31. The mean deviation from mean of the data 90, 100, 125, 115, 110 is

1) 10 2) 10.4 3) 10.6 4) 10.8

Standard Deviation and Variance :

32. The standard deviation of 1, 2, 3, 4, 5, 6, 7 is

1) 4 2) 2 3) $\sqrt{7}$ 4) 3

33. The standard deviation of 15 items is 6 and each item is decreased by 1. Then the standard deviation of new data is

1) 5 2) 7 3) $\frac{91}{15}$ 4) 6

34. The standard deviation for the set of the numbers 1, 4, 5, 7, 8 is 2.45. If 10 is added to each number then new standard deviation is

1) 2.45 2) 24.5 3) 0.245 4) 12.45

35. Mean of 100 observations is 50 and S.D. is 10. If 5 is subtracted from each observation and then it is divided by 4, then the new mean and S.D. are

1) 11.25, 6.25 2) 11.25, 2.5 3) 11.25, 10 4) 11.35, 3.5

36. If the standard deviation of $x_1, x_2, \ldots, x_n$ is 3.5, then the standard deviation of $-2x_1-3, -2x_2-3, \ldots\ldots, -2x_n-3$ is

1) –7 2) –4 3) 7 4) 1.75

37. If the standard deviation of 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 is K, then the standard deviation of 10, 11, 12, ..., 19 is

1) K 2) K+10 3) $K+\sqrt{10}$ 4) 10K

38. The variance of first 20 - natural numbers is

1) $\frac{399}{4}$ 2) $\frac{379}{12}$ 3) $\frac{133}{2}$ 4) $\frac{133}{4}$

39. The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking it was found that one item 8 was incorrect. If it is replaced by 12, then the mean and variance are respectively

1) 10.2, 4.01 2) 10.1, 3.69 3) 10.2, 3.96 4) 10.2, 3.76

40. The mean of two samples of sizes 200 and 300 were found to be 25, 10 respectively. Their standard deviations were 3 and 4 respectively. The variance of combined sample of size 500 is

1) 64 2) 65.2 3) 67.2 4) 64.2

VII. Miscellaneous Models

41. A statistical measure which cannot be determined graphically is

1) Median 2) Mode 3) Harmonic Mean 4) Mean

42. The measure which takes into account all the data items is

1) Mean 2) Median 3) Mode 4) none

43. An O - give is used to determine

1) Mean 2) Median 3) Mode 4) Harmonic Mean

44. Which of the following is most unstable average ?

1) Mode 2) Median 3) Mean 4) Geometric Mean

45. Which of the following is affected mostly by extreme observations ?

1) Median 2) Mode 3) Harmonic Mean 4) Arithmetic Mean

46. Which of following is correct relation for a moderately asymmetrical distribution ?

1) A.M. – M_o = 3 (A.M. – M_d) 2) A.M. – M_o = 2 (A.M. – M_d)

3) M_d = 2 A.M. – 3 M_d 4) A.M. + M_o = 3 (A.M. – M_d)

47. Which of following is affected least by extreme observations ?

1) mode 2) median 3) G.M. 4) H.M.

48. The most stable measure of central tendency is

1) median 2) mode 3) mean 4) harmonic mean

49. Variance is independent of change of

1) origin only 2) scale only

3) origin and scale both 4) scale but not by origin

50. If $\sum_{i=1}^{9}(xi-5)=9$ and $\sum_{i=1}^{9}(xi-5)^2=45$ then the mean deviation of the 9 items $x_1\ x_2\ x_3.....x_9$ is——

1) 2 2) 3 3) 4 4) 9

51. The variance of first 50 even natural numbers is :

1) $\frac{833}{4}$ 2) 833 3) 437 4) $\frac{437}{4}$

Numerical value type questions

52. If the standard deviation of the data 1, 3, 5, 7, ... 2013 is d then d is ..... .

53. If $\sum_{i=1}^{18}(x_i-18)=9$ and $\sum_{i=1}^{18}(x_i-18)^2=45$ then the standard deviation of the observations $x_1, x_2, ...x_{18}$ is ..... .

54. If in a frequency distribution the mean and median are 21.2 and 22.5 respectively, then its mode approximately is ..... .

55. The variance of the data 6,8,12,13,15,16,20,22 is ..... .

56. The mean marks of 120 students is 20. It was later discorrected that two marks were wrongly taken as 50 and 80 instead of 15 and 18, the correct mean of marks is ..... .

57. A group of 10 items, has arithmetic mean 6. If A.M of 4 of them is 7 then mean of remaining items is ..... .

58. If $\sum_{i=1}^{9}(x_i-99)=27$ and $\sum_{i=1}^{9}(x_i-99)^2=307$ then the mean of the squares of the deviation of $x_1, x_2, ... x_9$ from their A.M is ..... .

59. The mean of 10 observations is 16.3 by an error one observation is registered as 32 instead of 23. Then the correct mean is ..... .

60. The harmonic mean of the numbers 2,3,4, is ..... .

61. The average value of the median of 2, 8, 3, 7, 6, 7, 4 and the mode of 2, 9, 3, 4, 9, 6, 9 is ..... .

62. Standard deviation of 3, 5, 7, 9, 11, 13 is ..... .

63. The mean of first 3 items is 14 and the mean of next 2 items is 18. The mean of all five items is ..... .

64. If 6,5,8 and 3 occur with frequencies 4, 2, 5 and 1 respectively then AM is ..... .

KEY SHEET

LECTURE SHEET

1) **3**	2) **3**	3) **4**	4) **3**	5) **4**	6) **2**	7) **2**	8) **3**	9) **2**	10) **1**
11) **3**	12) **2**	13) **1**	14) **2**	15) **1**	16) **1**	17) **3**	18) **2**	19) **4**	20) **1**
21) **3**	22) **3**	23) **4**	24) **3**	25) **3**	26) **3**	27) **2**	28) **1**	29) **2**	30) **4**
31) **3**	32) **1**	33) **1**	34) **4**	35) **3**	36) **1**	37) **1**	38) **3**	39) **4**	40) **4**
41) **2**	42) **2**	43) **3**	44) **3**	45) **1**	46) **2**	47) **1**	48) **1**	49) **4**	50) **3**
51) **4**	52) **4**	53) **3**	54) **3**	55) **1**	56) **2**	57) **2**	58) **4**	59) **1**	60) **3**
61) **2**	62) **1**	63) **3**	64) **3**	65) **4**	66) **4**	67) **2**	68) **1**	69) **4**	70) **4**
71) **2**	72) **4**	73) **44.36**		74) **3.46**		75) **5.5**		76) **30.95**	
77) **–0.5**		78) **52.86**		79) **53.57**		80) **52.5**		81) **4062.5**	
82) **14.4**		83) **11.2**		84) **7.09**					

PRACTICE SHEET

1) **1**	2) **1**	3) **4**	4) **2**	5) **2**	6) **2**	7) **2**	8) **3**	9) **4**	10) **2**
11) **2**	12) **2**	13) **3**	14) **2**	15) **4**	16) **2**	17) **1**	18) **3**	19) **1**	20) **3**
21) **4**	22) **2**	23) **2**	24) **3**	25) **1**	26) **1**	27) **1**	28) **3**	29) **4**	30) **2**
31) **2**	32) **2**	33) **4**	34) **1**	35) **2**	36) **3**	37) **1**	38) **4**	39) **3**	40) **3**
41) **3**	42) **1**	43) **2**	44) **1**	45) **4**	46) **1**	47) **2**	48) **3**	49) **1**	50) **1**
51) **2**	52) **581.39**		53) **1.5**	54) **25.1**		55) **26.25**		56) **19.19**	
57) **5.33**		58) **25.11**		59) **15.4**		60) **2.77**		61) **7.5**	
62) **3.41**		63) **15.6**		64) **6.42**					