Assignments

Attempt any 20 (twenty) Questions. Each carries same marks.

1. Show that $\sum_{i=1}^{n} x_i^2 \sum_{i=1}^{n} y_i^2 \geq \left(\sum_{i=1}^{n} x_i y_i \right)^2$.

2. Show that $A.M. \geq G.M. \geq H.M$.

3. For any three positive numbers x, y, z satisfying the condition $x + y + z = 1$, prove that $\frac{8}{27} \geq (1-x)(1-y)(1-z) \geq 8xyz$.

4. For three positive numbers a, b and c, not all equal, prove that, (a+b+c)(bc+ca+ab)>9abc.

5. For any three positive quantities p, q and r satisfying the condition pqr = c^3, prove that (1+p)(1+q)(1+r) ≥ $(1+c)^3$.

6. If a_1, a_2,……….,a_n be n positive quantities, prove that, $(a_1 + a_2 + ... + a_n)\left(\frac{1}{a_1} + \frac{1}{a_2} + ... + \frac{1}{a_n}\right)$

7. If $y = f(x)$ be a monotonically increasing (or decreasing) function of x, then median of y is given by, $\tilde{y} = f(\tilde{x})$ where $\tilde{x}$ and $\tilde{y}$ denote respectively the median of x and y.

8. The sum of absolute deviations of a set of observations is minimum when deviations are taken from median.

9. Find the mean, standard deviation and mean deviation about mean of first 'n' natural numbers.

10. Find the formula of combined A.M, G.M, H.M. and variance of two series $(x_{11}, x_{12}........, x_{1n_1})$ and $(y_{11}, y_{12}........, y_{1n_2})$ of sizes n_1 and n_2 respectively.

11. If 'n' values of a variable are in geometric progression, then prove that, G.M. of the observations is the G.M. of A.M. and H.M. of the observations.

12. Show that sum of deviations from mean of 'n' numbers is equals to zero.

13. Show that sum of squares of deviation is least when it is taken about mean.

14. For any set of observations $x_1, x_2, \ldots\ldots, x_n$ prove that $\frac{\sum_i x_i^2}{n} \geq \left(\bar{x}^2\right)$.

15. If there are two groups containing n_1 and n_2 observations, $\bar{x}_1$ and $\bar{x}_2$ being the respective arithmetic means, then prove that, A.M. of all the $(n_1 + n_2)$ observations taken together must lie between the individual means.

16. For a variable x taking the values 0,1,2,……..n, the cumulative frequencies of more than type are $F_0, F_1, \ldots\ldots\ldots, F_n$. Show that $\bar{x} = \frac{\sum_{i=1}^{n} F_i}{F_0}$.

17. Calculate the weighted A.M. of the first 'n' natural numbers, the weight of the number i being (i+2).

18. Find the weighted H.M. of first natural numbers with weight proportional to the corresponding value.

19. In a frequency table, the upper boundary of each class interval has a constant ratio to the lower boundary, show that GM is given by,

$$\log G = x_o + \frac{C}{N}\sum_{i=1}^{n} f_i (i-1),$$

where x_0 is the logarithm of the mid point of the first class interval and C is the logarithm of the ratio between and lower boundary.

20. Show that range remains unaffected by a change of origin but is affected by a change of scale.

21. If the relation between two variables x and y is $2x - 3y = 4$, find the relation between their ranges.

22. For a given set of observations $x_1, x_2, \ldots\ldots, x_n$ on a variable x, mean deviation about mean is given by, $\frac{1}{n}\sum_{i=1}^{n}|x_i - \bar{x}| = \frac{2}{n}\sum_{x_i < \bar{x}}(\bar{x} - x_i) = \frac{2}{n}\sum_{x_i > \bar{x}}(x_i - \bar{x})$ where, $\sum_{x_i < \bar{x}}(\bar{x} - x_i)$ and $\sum_{x_i > \bar{x}}(x_i - \bar{x})$ are sum of those values of x which are less than A.M. and sum of those values of x which are more than A.M.

23. Mean deviation remains unaffected by a change of origin but is affected by a change of scale.

24. Show that S.D. is not affected by change origin but by scale, where as mean is affected by both.

25. Quartile deviation remains unaffected by a change of origin but is affected by a change of scale.

26. Show that for any set of observations S.D. can not exceed range.

27. Show that for any set of observations S.D. never less than M.D. about mean.

28. Show that for any set of observations, $\frac{R^2}{2n} \le S^2 \le \frac{R^2}{4}$.

29. For a given set of observations, the difference between arithmetic mean and median can not exceed the standard deviation.

30. Suppose that, a variable assumes the a, b and $(n-2)$ other values all being equal to $\frac{a+b}{2}$. Prove that, the standard deviation is given by $\frac{|a-b|}{\sqrt{2n}}$.

31. Find the mean deviation from mean and standard deviation of the series $a, a+d, a+2d, \ldots\ldots\ldots\ldots, a+2nd$.

32. Show that Pearson's second measure of Skewness always lies between -3 and +3, both inclusive.

33. Show that quartile measure of skewness lies between -1 and +1.

34. Prove that $(i)\beta_2 \ge 1$, $(ii)\beta_2 \ge \beta_1$, $(iii)\beta_2 \ge \beta_1 + 1$