GOVERNMENT OF KARNATAKA

DEPARTMENT OF SCHOOL EDUCATION (PRE-UNIVERSITY)

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CHAPTERWISE MULTIPLE CHOICE QUESTIONS FOR COMPETATIVE EXAM

SUBJECT: MATHEMATICS – I PUC

NAME OF THE CHAPTER: STATISTICS

Mean:

Mean for ungrouped data:

Let $x_1, x_2, x_3, \dots x_n$ be n observations. Then their Mean, $\bar{x} = \frac{x_1+x_2+x_3+\cdots+x_n}{n} = \frac{\sum x}{n}$

Mean for grouped data:

Let $x_1, x_2, x_3, \dots x_n$ be n observations with frequencies $f_1, f_2, f_3, \dots f_n$ respectively.

Then their Mean *is* $\bar{x} = \frac{1}{N}\sum_{i=1}^{n} f_i x_i$

where $N = \sum_{i=1}^{n} f_i$

Combined Mean:

$$\bar{x} = \frac{n_1x_1 + n_2x_2}{n_1 + n_2},$$

Where,

x_1 is the mean of n_1 number of observations

x_2 is the mean of n_2 number of observations

Properties of Arithmetic Mean

If arithmetic mean of $x_1, x_2, x_3, \dots, x_n$ is $\bar{x}$, then

(i) arithmetic mean of $x_1 \pm a$, $x_2 \pm a$, $x_3 \pm a$, …, $x_n \pm a$ is $\bar{x} \pm a$

(ii) arithmetic mean of $ax_1, ax_2, ax_3, \dots, ax_n$ is $a\bar{x}$

(iii) arithmetic mean of $\frac{x_1}{a}, \frac{x_2}{a}, \frac{x_3}{a}, \dots, \frac{x_n}{a}$ is $\frac{\bar{x}}{a}$

Median:

$$\text{Median} = \begin{cases} \left(\frac{n+1}{2}\right)^{th} \text{ observation}, & \text{if n is odd} \\ \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2} \text{ observation}, & \text{if n is even} \end{cases}$$

Median for continuous frequency distribution

$$M = l + \frac{\left(\frac{N}{2} - C\right)}{f} \times h$$

Here $\frac{N}{2}$ gives median class interval, whose cumulative frequency is just greater than or equal to $\frac{N}{2}$,

N – is the sum of frequencies,

l- lower limit,

f – frequency of current class,

h - width of the median class,

C - the cumulative frequency of the class just preceding the median class.

Mode:

Mode for symmetrical distribution = Mean = Median

Mode for asymmetrical distribution = 3(Median) – 2(Mean)

Mean deviation about mean [M.D. ($\bar{x}$)]

For ungrouped data:

M.D ($\bar{x}$) $= \frac{1}{n}\sum_{i=1}^{n}|x_i - \bar{x}|$, where $\bar{x}$ is the mean given by $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$

For grouped data:

M.D ($\bar{x}$) $= \frac{1}{N}\sum_{i=1}^{n} f_i\,|x_i - \bar{x}|$, where $\bar{x}$ is the mean given by $\bar{x} = \frac{1}{N}\sum_{i=1}^{n} f_i\,x_i$ and $N = \sum_{i=1}^{n} f_i$

Mean deviation about median [M.D. (M)]

- For ungrouped data: M.D.(M) $= \frac{1}{n}\sum_{i=1}^{n}|x_i - M|$, Where M is the median
- For grouped data: M.D.(M) $= \frac{1}{N}\sum_{i=1}^{n} f_i\,|x_i - M|$, where M is the median and $N = \sum_{i=1}^{n} f_i$

Variance & Standards Deviation:

Let $x_1, x_2, x_3, \ldots, x_n$ be n observations with $\bar{x}$ as mean.

(i) The variance denoted by σ^2 is given by $\sigma^2 = \frac{1}{n}\sum(x_i - \bar{x})^2$

(ii) The standard deviation denoted by σ is given by $\sigma = \sqrt{\frac{1}{n}\sum\ (x_i - \bar{x})^2}$

(iii) Standard deviation for a discrete frequency distribution is given by $\sigma = \sqrt{\frac{1}{N}\sum f_i(x_1 - \bar{x})^2}$

(iv) $\sigma^2 = \frac{1}{n}\sum(x_i - \bar{x})^2 = \frac{\sum x_i^2}{n} - (\bar{x})^2$

(v) Combined variance of two data sets

$$\sigma^2 = \frac{1}{n_1+n_2}\left[n_1\sigma_1^2 + n_2\sigma_2^2 + \frac{n_1 n_2}{n_1+n_2}(\overline{x_1} - \overline{x_2})^2\right]$$

Some important Results on Variance:

- ✔ Variance of first ' n ' natural numbers: $\sigma^2 = \frac{n^2-1}{12}$
- ✔ Standard deviation of first ' n ' natural numbers: $\sigma = \sqrt{\frac{n^2-1}{12}}$
- ✔ Variance of first ' n ' odd natural numbers: $\sigma^2 = \frac{n^2-1}{3}$
- ✔ Variance of first ' n ' even natural numbers: $\sigma^2 = \frac{n^2-1}{3}$

Properties of Variance

Let $x_1, x_2, x_3, \ldots, x_n$ be n observations with variance σ^2 and standard deviation σ. Then

- variance of $x_1 \pm k, x_2 \pm k, x_3 \pm k \ldots, x_n \pm k$ is σ^2
- Standard deviation of $x_1 \pm k, x_2 \pm k, x_3 \pm k, \ldots, x_n \pm k$ is σ.
- variance of $kx_1, kx_2, kx_3, \ldots, kx_n$ is $k^2\sigma^2$
- Standard deviation of $kx_1, kx_2, kx_3, \ldots, kx_n$ is kσ
- From above results $\mathrm{Var}(aX + b) = a^2\mathrm{Var}(X)$

Relationship between measure of dispersion : 9(Q.D.) = 7.5 (M.D.) = 6(S.D.)

(a) $\text{Q.D.} = \frac{5}{6}\text{(M.D.)}$

(b) $\text{QD} = \frac{2}{3}(\text{S.D})$

(c) $\text{M.D.} = \frac{4}{5}(\text{S.D.})$

Coefficient Of Variation:

$\text{C.V} = \frac{\sigma}{\bar{x}} \times 100$, where σ is the standard deviation and $\bar{x}$ is the arithmetic mean

MEAN AND MEDIAN

1. **Mean of 20 observations is 15.5. Later it was found that the observation 24 was misread as 42. The corrected mean is** ***(Average)***

   (A) 14.2 (B) 14.8 (C) 14.0 (D) 14.6

2. **If the mean of four observations is 20 and when a constant c is added to each observation, the mean becomes 22 . The value of c is** ***(Easy)***

   (A) -2 (B) 2 (C) 4 (D) 6

3. **Given (i) 85 observations which are not sorted and (ii) 150 observations which are sorted and arranged in an increasing order.**
   The median values of (i) & (ii) respectively can be found as ***(Average)***

   (A) (i) 43^{rd} observation (ii) A.M. of 75^{th} and 76^{th} observation

   (B) (i) 43^{rd} observation (ii) 76^{th} observation

   (C) (i) cannot be found (ii) cannot be found

   (D) None of these

4. **If the mean of n observations $1^2, 2^2, 3^2, \ldots, n^2$ is $\frac{46n}{11}$, then n is equal to** ***(Average)***

   (A) 11 (B) 12 (C) 23 (D) 22

5. **In a batch of 15 students, if the marks of 10 students who passed are $70, 50, 95, 40, 60, 70, 80, 90, 75, 80$ then the median marks of all the 15 students is** ***(Difficult)***

   (A) 40 (B) 50 (C) 60 (D) 70

6. **The mean of six numbers is 30. If one number is excluded, the mean of the remaining numbers is 29. The excluded number is** ***(Easy)***

   (A) 29 (B) 30 (C) 35 (D) 45

7. **The arithmetic mean of a set of observations is $\bar{x}$. If each observation is divided by α, then it is increased by 10, the mean of the new series is:** ***(Average)***

   (A) $\frac{\bar{x}}{\alpha}$ (B) $\frac{\bar{x}+10}{\alpha}$ (C) $\frac{\bar{x}+10\alpha}{\alpha}$ (D) $\alpha\bar{x} + 10$

8. **The observations $29, 32, 48, 50, x, x + 2, 72, 78, 84, 95$ are arranged in ascending order. What is the value of x if the median of the data is 63?** ***(Average)***

   (A) 61 (B) 62 (C) 62.5 (D) 63

9. **The mean of 13 observations is 14. If the mean of the first 7 observations is 12 and that of the last 7 observations is 16 , what is the value of the 7^{th} observation?** ***(Average)***

   (A) 12 (B) 13 (C) 14 (D) 15

10. **The average of 5 quantities is 6, the average of three of them is 4, then the average of remaining two numbers is** ***(Easy)***

(A) 9 (B) 6 (C) 10 (D) 5

11. **The mean of a set of 20 observation is 19.3. The mean is reduced by 0.5 when a new observation is added to the set. The new observation is** ***(Average)***

(A) 19.8 (B) 8.8 (C) 9.5 (D) 30.8

12. **Consider the following data which represents the runs scored by two batsmen in their last ten matches as**

Batsman A: $30, 91, 0, 64, 42, 80, 30, 5, 117, 71$

Batsman B: $53, 46, 48, 50, 53, 53, 58, 60, 57, 52$

Which of the following is/are true about the data?

I. Mean of batsman A runs is 53.

II. Median of batsman A runs is 42.

III. Mean of batsman B runs is 53.

IV. Median of batsman B runs is 53. ***(Difficult)***

(A) Only I is true

(B) I and III are true

(C) I, III and IV are true

(D) All are true

MEAN DEVIATION

13. **Find the mean deviation about the mean for the data $4, 7, 8, 9, 10, 12, 13, 17$** ***(Average)***

(A) 3 (B) 24 (C) 10 (D) 8

14. **Assertion:** The mean deviation of the data 2,9,9,3,6,9,4 from the mean is 2.57

Reason: For individual observation, Mean deviation $(\bar{X}) = \frac{\Sigma|x_i - \bar{x}|}{n}$ (Difficult)

(A) Assertion is correct, reason is correct; reason is a correct explanation for assertion.

(B) Assertion is correct, reason is correct; reason is not a correct explanation for assertion

(C) Assertion is correct, reason is incorrect

(D) Assertion is incorrect, reason is correct.

15. **The mean deviation about the mean of the data $3, 10, 10, 4, 7, 10, 5$:** ***[2015]***

(A)3 (B)2 (C)75 (D)2.57

16. **The mean deviation about the mean for the data $4, 7, 8, 9, 10, 12, 13, 17$ is** ***[2025]***

(A) 4.03 (B) 10 (C) 3 (D) 8.5

17. **Find the mean deviation about the mean for the data.** ***(Average)***

x_i	5	10	15	20	25
f_i	7	4	6	3	5

(A) 6 (B) 7.3 (C) 8 (D) 6.32

18. **The mean deviation from the mean of the set of observations $-1, 0$ and 4 is** ***(Average)***

(A) 3 (B) 1 (C) -2 (D) 2

19. **Consider the following data**

x_i	15	21	27	30	35
f_i	3	5	6	7	8

Then, the mean deviation about the median for the data is ***(Average)***

(A) 5 (B) 5.3 (C) 5.1 (D) 5.2

20. **Find the mean deviation about the median for the data given below:**

$11, 3, 8, 7, 5, 14, 10, 2, 9$ ***(Average)***

(A) 3 (B) 2 (C) 5 (D) 4

STANDARD DEVIATION

21. **If for a distribution $\Sigma(x-5)=3$,**

$\Sigma(x-5)^2=43$ and the total number of items is 18. Find the standard deviation.

(Average)

(A) 1.53 (B) 1.43 (C) 1.55 (D) None of these

22. **The standard deviation of a distribution is 30 and each item is raised by 3 , then new S.D.is** ***(Easy)***

(A) 32 (B) 28 (C) 27 (D) None of these

23. **From a frequency distribution consisting of 18 observations, the mean and the standard deviation were found to be 7 and 4 respectively. But on comparison with the original data, it was found that a figure 12 was miscopied as 21 in calculations. Find the correct standard deviation.** ***(Difficult)***

(A) 3.5 (B) 4.5 (C) 5.5 (D) 2.5

24. **The mean and variance for the data $6, 7, 10, 12, 13, 4, 8, 12$ respectively are** ***(Average)***

(A) $8, \sqrt{26.25}$ (B) $9, \sqrt{9.25}$ (C) 8,26.25 (D) 9,9.25

25. **The mean and standard deviation of 100 observations were calculated as 40 and 5.1, respectively by a student who took by mistake 50 instead of 40 for one observation. Find the correct mean.** ***(Average)***

(A) 38.9 (B) 37.9 (C) 39.9 (D) 36.9

26. **If each of the observations $x_1, x_2, \ldots, x_n$ is increased by ' a', where a is negative or positive number, then the variance** ***(Easy)***

(A) same (B) increased by a^2 times

(C) decreased by a^2 times (D) None of these

27. **The variance of the numbers $2, 3, 11$ and x is $\frac{49}{4}$. Find the value of x.** ***(Average)***

(A) $6, \frac{14}{3}$ (B) $6, \frac{14}{5}$ (C) $6, \frac{16}{3}$ (D) $4, \frac{13}{5}$

28. **Standard deviation of the first $2n+1$ natural numbers is equal to** ***(Average)***

(A) $\sqrt{\frac{n(n+1)}{2}}$ (B) $\sqrt{\frac{n(n+1)(2n+1)}{3}}$ (C) $\sqrt{\frac{n(n+1)}{3}}$ (D) $\sqrt{\frac{n(n-1)}{2}}$

29. **The variance of first 50 even natural numbers is** ***(Easy)***

(A) $\frac{833}{4}$ (B) 833 (C) 437 (D) $\frac{437}{4}$

30. **Find the S. D. of first 10 multiples of 3.** ***(Average)***

(A) 8.61 (B) 8.21 (C) 8.51 (D) 8.31

31. **The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1,2 and 6 , find the other two observations.** ***(Easy)***

(A) 4,9 (B) 3,9 (C) 4,4 (D) 9,9

32. **The standard deviations of two sets containing 10 and 20 members are 2 and 3 respectively measured from their common mean 5. The S.D. for the whole set of 30 members is** ***(Average)***

(A)$\frac{2}{\sqrt{3}}$ (B)$\sqrt{6}$ (C) $\sqrt{\frac{22}{3}}$ (D)$\sqrt{3}$

33. **If $x_1, x_2, \ldots \ldots x_{18}$ are observations such, that $\sum_{j=1}^{18}(x_j - 8) = 9$ and $\sum_{j=1}^{18}(x_j - 8)^2 = 45$, then the standard deviation of these observations is** ***(Average)***

(A) $\sqrt{\frac{81}{34}}$ (B) 5 (C) $\sqrt{5}$ (D) $\frac{3}{2}$

34. **If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is** ***[2014]***

(A)60 (B)30 (C)35 (D)21

35. **Mean and standard deviation of 100 items are 50 and 4 respectively. The sum of all squares of the items is** ***[2019 ,2026]***

(A)261600 (B)266000 (C)256100 (D)251600

36. **The Standard Deviation of the data 6, 7, 8, 9, 10 is** ***[2020]***

(A) $\sqrt{10}$ (B) 2 (C) 10 (D) $\sqrt{2}$

37. **The Standard Deviation of the numbers 31,32, 33 …. . 46, 47 is** ***[2021]***

(A) $\sqrt{\frac{17}{12}}$ (B) $\sqrt{\frac{47^2-1}{12}}$ (C) $2\sqrt{6}$ (D) $4\sqrt{3}$

38. **If the standard deviation of the numbers $-1, 0, 1, k$ is $\sqrt{5}$ where $k > 0$ then k is equal to** ***[2022]***

(A) $2\sqrt{\frac{10}{3}}$ (B) $2\sqrt{6}$ (C) $4\sqrt{\frac{5}{3}}$ (D) $\sqrt{6}$

39. **The mean of 100 observations is 50 and their standard deviation is 5. Then the sum of squares of all observations is** ***[2013]***

(A) 250000 (B) 255000 (C) 50000 (D) 252500

40. **Let a, b, c, d and e be the observations with mean m and standard deviation S . The standard deviation of the observations $a + k, b + k, c + k, d + k$ and $e + k$ is** ***[2024]***

(A) Ks (B) S + k (C) $\frac{S}{r}$ (D) S

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