CHAPTER

15

Statistics

1. If $\sum_{i=1}^{9}(x_i-5)=9$ and $\sum_{i=1}^{9}(x_i-5)^2=45$, then the standard deviation of the 9 items $x_1, x_2, ..., x_9$ is
(a) 3 (b) 9 (c) 4 (d) 2
(2018)

2. The mean of a set of 30 observations is 75. If each observation is multiplied by a non-zero number λ and then each of them is decreased by 25, their mean remains the same. Then λ is equal to
(a) 2/3 (b) 10/3 (c) 1/3 (d) 4/3
(Online 2018)

3. If the mean of the data : 7, 8, 9, 7, 8, 7, λ, 8 is 8, then the variance of this data is
(a) 2 (b) $\frac{7}{8}$ (c) $\frac{9}{8}$ (d) 1
(Online 2018)

4. The mean and the standard deviation(s.d.) of five observations are 9 and 0, respectively. If one of the observations is changed such that the mean of the new set of five observations becomes 10, then their s.d. is :
(a) 0 (b) 1 (c) 4 (d) 2
(Online 2018)

5. The mean age of 25 teachers in a school is 40 years. A teacher retires at the age of 60 years and a new teacher is appointed in his place. If now the mean age of the teachers in this school is 39 years, then the age (in years) of the newly appointed teacher is
(a) 25 (b) 35 (c) 30 (d) 40
(2017)

6. The sum of 100 observations and the sum of their squares are 400 and 2475, respectively. Later on, three observations, 3, 4 and 5 were found to be incorrect. If the incorrect observations are omitted, then the variance of the remaining observations is
(a) 8.00 (b) 8.25 (c) 9.00 (d) 8.50
(2017)

7. If the standard deviation of the numbers 2, 3, a and 11 is 3.5, then which of the following is true?
(a) $3a^2 - 26a + 55 = 0$ (b) $3a^2 - 32a + 84 = 0$
(c) $3a^2 - 34a + 91 = 0$ (d) $3a^2 - 23a + 44 = 0$
(2016)

8. If the mean deviation of the numbers 1, $1 + d$, ..., $1 + 100d$ from their mean is 255, then a value of d is
(a) 10.1 (b) 5.05 (c) 20.2 (d) 10
(Online 2016)

9. The mean of 5 observations is 5 and their variance is 124. If three of the observations are 1, 2 and 6; then the mean deviation from the mean of the data is
(a) 2.5 (b) 2.6 (c) 2.8 (d) 2.4
(Online 2016)

10. 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
(a) 15.8 (b) 14.0 (c) 16.8 (d) 16.0
(2015)

11. A factory is operating in two shifts, day and night, with 70 and 30 workers respectively. If per day mean wage of the day shift workers is ₹ 54 and per day mean wage of all the workers is ₹ 60, then per day mean wage of the night shift workers (in ₹) is
(a) 66 (b) 69 (c) 74 (d) 75
(Online 2015)

12. The variance of first 50 even natural numbers is
(a) 833 (b) 437 (c) $\frac{437}{4}$ (d) $\frac{833}{4}$
(2014)

13. 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?
(a) median (b) mode
(c) variance (d) mean
(2013)

14. Let $x_1, x_2, ..., x_n$ be n observations, and let $\bar{x}$ be their arithmetic mean and σ^2 be their variance.
Statement 1 : Variance of $2x_1, 2x_2, ..., 2x_n$ is $4\sigma^2$.
Statement 2 : Arithmetic mean of $2x_1, 2x_2, ..., 2x_n$ is $4\bar{x}$.
(a) Statement 1 is true, Statement 2 is true; Statement 2 is not a correct explanation for Statement 1.
(b) Statement 1 is true, Statement 2 is false.
(c) Statement 1 is false, Statement 2 is true.
(d) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
(2012)

15. If the mean deviation about the median of the numbers a, $2a$, ..., $50a$ is 50, then $|a|$ equals
(a) 4 (b) 5 (c) 2 (d) 3
(2011)

16. 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
(a) $\frac{5}{2}$ (b) $\frac{11}{2}$ (c) 6 (d) $\frac{13}{2}$
(2010)

17. Statement-1 : The variance of first n even natural numbers is $\frac{n^2-1}{4}$

Statement-2 : The sum of first n natural numbers is $\frac{n(n+1)}{2}$ and the sum of squares of first n natural numbers is $\frac{n(n+1)(2n+1)}{6}$
(a) Statement 1 is true, Statement 2 is true; Statement 2 is not a correct explanation for Statement 1.
(b) Statement 1 is true, Statement 2 is false.
(c) Statement 1 is false, Statement 2 is true.
(d) Statement 1 is true, Statement 2 is true; Statement 2 is a correct explanation for Statement 1.
(2009)

18. If the mean deviation of numbers 1, $1 + d$, $1 + 2d$, ..., $1 + 100d$ from their mean is 255, then the d is equal to
(a) 20.0 (b) 10.1
(c) 20.2 (d) 10.0 *(2009)*

19. 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?
(a) $a = 3, b = 4$ (b) $a = 0, b = 7$
(c) $a = 5, b = 2$ (d) $a = 1, b = 6$ *(2008)*

20. The average marks of boys in class is 52 and that of girls is 42. The average marks of boys and girls combined is 50. The percentage of boys in the class is
(a) 80 (b) 60
(c) 40 (d) 20. *(2007)*

21. 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 V_A/V_B is
(a) 1 (b) 9/4
(c) 4/9 (d) 2/3. *(2006)*

22. Let x_1, x_2, ..., 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
(a) 18 (b) 15
(c) 12 (d) 9. *(2005)*

23. In a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately
(a) 20.5 (b) 22.0
(c) 24.0 (d) 25.5. *(2005)*

24. In a series of $2n$ observations, half of them equal a and remaining half equal $-a$. If the standard deviation of the observations is 2, then $|a|$ equals
(a) 2 (b) $\sqrt{2}$
(c) $\frac{1}{n}$ (d) $\frac{\sqrt{2}}{n}$ *(2004)*

25. Consider the following 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 these is/are correct?
(a) only (1) and (2) (b) only (2)
(c) only (1) (d) (1), (2) and (3) *(2004)*

26. 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
(a) is decreased by 2
(b) is two times the original median
(c) remains the same as that of the original set
(d) is increased by 2 *(2003)*

27. 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
(a) 188.66 (b) 177.33
(c) 8.33 (d) 78.00 *(2003)*

28. In a class of 100 students there are 70 boys whose average marks in a subject are 75. If the average marks of the complete class is 72, then what is the average marks of the girls?
(a) 73 (b) 65
(c) 68 (d) 74 *(2002)*

ANSWER KEY

1. (d)	**2.** (d)	**3.** (d)	**4.** (d)	**5.** (b)	**6.** (c)	**7.** (b)	**8.** (a)	**9.** (c)	**10.** (b)	**11.** (c)	**12.** (a)
13. (c)	**14.** (b)	**15.** (a)	**16.** (b)	**17.** (c)	**18.** (b)	**19.** (a)	**20.** (a)	**21.** (a)	**22.** (a)	**23.** (c)	**24.** (a)
25. (a)	**26.** (b)	**27.** (d)	**28.** (b)								

Explanations

1. (d) : The standard deviation is independent of change of origin. So, put $x_i - 5 = y_i$

$\therefore$ Given equations become $\sum_{i=1}^{9} y_i = 9$ and $\sum_{i=1}^{9} y_i^2 = 45$

$$SD = \sqrt{\frac{1}{n}\sum y_i^2 - \left(\frac{\Sigma y_i}{n}\right)^2} = \sqrt{\frac{45}{9} - \left(\frac{9}{9}\right)^2} = \sqrt{5-1} = \sqrt{4} = 2$$

2. (d) : Let $x_1, x_2, ..., x_{30}$ be 30 observations.

Given, $\frac{x_1 + x_2 + ... + x_{30}}{30} = 75$

Each observation is multiplied by λ and decreased by 25

$\therefore$ New observations are $\lambda x_1 - 25, \lambda x_2 - 25, ..., \lambda x_{30} - 25$.

Now, new mean = $\frac{(\lambda x_1 - 25) + (\lambda x_2 - 25) + ... + (\lambda x_{30} - 25)}{30}$

$= \frac{\lambda(x_1 + x_2 + ... + x_{30})}{30} - \left(\frac{25 \times 30}{30}\right) = \lambda(75) - 25$

A.T.Q., $\lambda(75) - 25 = 75 \Rightarrow \lambda(75) = 100 \Rightarrow \lambda = \frac{100}{75} = \frac{4}{3}$.

3. (d) : Let the mean of the given observations is

$\therefore \bar{x} = \frac{7+8+9+7+8+7+\lambda+8}{8} = 8 \quad [\because \bar{x} = 8 \text{ (given)}]$

$\Rightarrow 54 + \lambda = 64 \Rightarrow \lambda = 64 - 54 = 10$

Now, $\Sigma x_i^2 = (7)^2 + (8)^2 + (9)^2 + (7)^2 + (8)^2 + (7)^2 + (10)^2 + (8)^2$

$= 49 + 64 + 81 + 49 + 64 + 49 + 100 + 64 = 520$

Variance, $\sigma^2 = \frac{\sum x_i^2}{n} - (\bar{x})^2$ $\therefore$ Variance $= \frac{520}{8} - (8)^2 = 65 - 64 = 1$

4. (d) : Let a, b, c, d, e be five observations.

$\therefore$ S.D. = $\sqrt{\frac{\Sigma(a-\bar{x})^2}{5}} = 0 \Rightarrow \Sigma(a - \bar{x})^2 = 0$

$\Rightarrow (a - \bar{x})^2 + (b - \bar{x})^2 + (c - \bar{x})^2 + (d - \bar{x})^2 + (e - \bar{x})^2 = 0$

$\Rightarrow a - \bar{x} = b - \bar{x} = c - \bar{x} = d - \bar{x} = e - \bar{x} = 0$

$\Rightarrow a = b = c = d = e = \bar{x} \Rightarrow a = b = c = d = e = 9$

Now, $\bar{x} = 9 \therefore a + b + c + d + e = 9 \times 5 = 45$

Let x be the change in term. Then,

New sum $= a + b + c + (d + x) + e = 5 \times 10 = 50 \Rightarrow x = 5$

$\therefore$ New observations becomes, 9, 9, 9, 14, 9

New S.D. = $\sqrt{\frac{\Sigma(a-\bar{x})^2}{5}} = \sqrt{\frac{1^2+1^2+1^2+4^2+1^2}{5}} = \sqrt{\frac{20}{5}} = 2.$

5. (b) : Mean age of 25 teachers in a school = 40 years

$\Rightarrow \frac{x_1 + x_2 + ... + x_{25}}{25} = 40 \Rightarrow x_1 + x_2 + ... + x_{25} = 1000$

Let A be the age of new teacher. Then according to question, we have $x_1 + x_2 + ... + x_{25} - 60 + A =$

$\Rightarrow 1000 - 60 + A = 39 \times 25 = 975 \Rightarrow A = 975 - 940 = 35$

6. (c) : Incorrect $\sum_{i=1}^{100} x_i = 400$ and incorrect $\sum_{i=1}^{100} x_i^2 = 2475$

Now incorrect observations 3, 4 and 5 are omitted.

$\therefore$ Correct $\sum_{i=1}^{97} x_i = 400 - 3 - 4 - 5 = 388$

and correct $\sum_{i=1}^{97} x_i^2 = 2475 - 3^2 - 4^2 - 5^2 = 2475 - 50 = 2425$

Now, Variance $(\sigma^2) = \frac{\sum x_i^2}{N} - \left(\frac{\sum x_i}{N}\right)^2 = \frac{2425}{97} - \left(\frac{388}{97}\right)^2$

$= 25 - 16 = 9$

7. (b) : By formula,] 3K 3$= \sqrt{\frac{\sum \quad ^7}{\quad} - \left(\frac{\sum}{\quad}\right)^7}$

Now, $\frac{9>}{9} = \frac{9+>+ \quad ^7 +676}{9} - \left(\frac{6;\ +}{9}\right)^7$

$\Rightarrow 49 \cdot 4 = 4(134 + a^2) - (256 + 32a + a^2)$

$\Rightarrow 3a^2 - 32a + 84 = 0$

8. (a) : Given numbers are $1, 1 + d, 1 + 2d, ..., 1 + 100d$

$\therefore n = 101$

$\therefore$ Mean, $\bar{x} = \frac{1}{101}[1 + (1 + d) + (1 + 2d) .... (1 + 100d)]$

$= \frac{1}{101} \times \frac{101}{2}[2 + 100d] = 1 + 50d$

$\therefore$ Mean deviation from mean

$= \frac{1}{101}\left[\,|1 - (1 + 50d)| + |(1 + d) - (1 + 50d)| + ... + |(1 + 100d) - (1 + 50d)|\,\right]$

$= \frac{2d}{101}(1 + 2 + 3 .... + 50) = \frac{2d}{101} \times \frac{50 \times 51}{2} = \frac{2550}{101}d$

Now, $\frac{2550}{101}d = 255$ (Given) $\Rightarrow d = 10.1$

9. (c) : Let the other two observations be x and y.

According to question, Mean = 5

$a + b + 9 = 25 \Rightarrow a + b = 16$ …(i)

Also, variance = 124

$\Rightarrow \frac{\Sigma x_i^2}{n} - (\bar{x})^2 = 124 \Rightarrow \frac{1 + 4 + 36 + a^2 + b^2}{5} - 25 = 124$

$\Rightarrow a^2 + b^2 = 704$ …(ii)

$\Rightarrow (a + b)^2 - 2ab = 704 \Rightarrow -2ab = 448$ …(iii)

Now, $(a - b)^2 = a^2 + b^2 - 2ab = 704 + 448$ (using (ii) & (iii))

$\Rightarrow (a - b)^2 = 1152 \Rightarrow a - b = 24\sqrt{2}$ …(iv)

On solving (i) and (iv), we get

$a = 8 + 12\sqrt{2}$, $b = 8 - 12\sqrt{2}$

$\therefore$ Mean deviation about mean $= \frac{\Sigma |x_i - \bar{x}|}{n}$

$$= \frac{|1-5|+|2-5|+|6-5|+|8+12\sqrt{2}-5|+|8-12\sqrt{2}-5|}{5} = \frac{14}{5} = 2.8$$

10. **(b) :** Given, $\sum \ = 7: ;$
Now sum of all observations
= (256 – 16) + (3 + 4 + 5) = 240 + 12 = 252
Also, the number of observations now become 18.

Hence, new mean = $\frac{7:7}{6=} = 69$

11. **(c) :** Let average wage of night shift workers be x.
Now, $(70 \times 54) + (30 \times x) = 60 \times 100$
$\Rightarrow \quad 3780 + 30x = 6000 \Rightarrow 30x = 2220 \quad \Rightarrow \quad x = 74$

12. **(a) :** We have $\alpha^2 = \frac{\Sigma x_i^2}{h} - \left(\frac{\Sigma x_i}{h}\right)^2$

$\Sigma x_i^2 = 2^2 + 4^2 + ... + 100^2 = 4\{1^2 + 2^2 + ... + 50^2\} = \frac{4\cdot 50 \times 51 \times 101}{6}$

$\therefore \quad \frac{\Sigma x_i^2}{50} = \frac{4 \times 51 \times 101}{6} = 3434 \qquad \left(\frac{\Sigma x_i}{50}\right)^2 = \left(\frac{2\cdot 50 \cdot 51}{2\times 50}\right)^2 = 2601$

$\therefore \quad \alpha^2 = 3434 - 2601 = 833$

13. **(c) : 1st solution :** Variance doesn't change with the change of origin.

2nd solution : $\sigma_1^2 = \frac{1}{n}\sum(x_i - \bar{x})^2$

$\sigma_2^2 = \frac{1}{n}\sum\{(x_i + 10) - (\bar{x} + 10)\}^2$ Hence ${\sigma_1}^2 = {\sigma_2}^2$

14. **(b) :** $x_1, x_2, x_3, ... x_n$, A.M. = $\bar{x}$, Variance = σ^2

Statement 2 : A.M. of $2x_1, 2x_2, ..., 2x_n = \frac{2(x_1 + x_2 + ... + x_n)}{n} = 2\bar{x}$

Given A.M. $= 4\bar{x}$ $\therefore$ Statement 2 is false.

15. **(a) :** Median is the mean of 25th and 26th observation.

$M = \frac{25a + 26a}{2} = 25.5a$

$MD(M) = \frac{\sum |r_i - M|}{N} \Rightarrow \quad 50 = \frac{1}{50}\{2|a| \times (0.5 + 1.5 + ... + 24.5)\}$

$\Rightarrow \quad 2500 = 2|a| \cdot \frac{25}{2} \cdot 25. \quad \therefore \quad |a| = 4$

16. **(b) : 1st solution:** $\left.\begin{matrix}\sigma_1^2 = 4 \\ \sigma_2^2 = 5\end{matrix}\right\} \begin{matrix}\bar{x} = 2 \\ \bar{y} = 4\end{matrix}$

We have $\frac{\sum x_i}{5} = 2 \quad \Rightarrow \quad \sum x_i = 10$ Similarly, $\sum y_i = 20$

$\sigma_1^2 = \left(\frac{1}{5}\sum x_i^2\right) - \bar{x}^2 \quad \Rightarrow \quad 4 = \frac{1}{5}\sum x_i^2 - 4$

$\Rightarrow \quad \frac{1}{5}\sum x_i^2 = 8. \quad \therefore \quad \sum x_i^2 = 40.$

$\sigma_2^2 = \left(\frac{1}{5}\sum y_i^2\right) - \bar{y}^2 \quad \Rightarrow \quad 5 = \frac{1}{5}\sum y_i^2 - 16$

$\Rightarrow \quad \frac{1}{5}\sum y_i^2 = 21. \quad \therefore \quad \sum y_i^2 = 105$

$\sigma^2 = \frac{1}{10}\left(\sum x_i^2 + \sum y_i^2\right) - \left(\frac{\bar{x} + \bar{y}}{2}\right)^2$

$= \frac{1}{10}(40 + 105) - 9 = \frac{145 - 90}{10} = \frac{55}{10} = \frac{11}{2}.$

2nd solution : $\sigma_1^2 = 4, \ n_1 = 5, \ \bar{x}_1 = 2$

$\sigma_2^2 = 5, \ n_2 = 5, \ \bar{x}_2 = 4$

$\bar{x}_{12} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2} = \frac{5 \times 2 + 5 \times 4}{10} = 3$

$d_1 = (\bar{x}_1 - \bar{x}_{12}) = -1, \quad d_2 = (\bar{x}_2 - \bar{x}_{12}) = 1$

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

$= \sqrt{\frac{5.4 + 5.5 + 5.1 + 5.1}{10}} = \sqrt{\frac{55}{10}} = \sqrt{\frac{11}{2}} \quad \therefore \ \sigma^2 = \frac{11}{2}$

17. **(c) :** Sum of first n even natural numbers

$= 2 + 4 + 6 + ... + 2n = 2(1 + 2 + ... + n) = 2 \cdot \frac{n(n+1)}{2} = n(n+1)$

Mean $(\bar{x}) = \frac{n(n+1)}{n} = n + 1$

Variance $= \frac{1}{n}(\sum x_i)^2 - (\bar{x})^2 = \frac{1}{n}(2^2 + 4^2 + ... + (2n)^2) - (n+1)^2$

$= \frac{1}{n} \cdot 2^2(1^2 + 2^2 + ... + n^2) - (n+1)^2 = \frac{4}{n} \cdot \frac{n(n+1)(2n+1)}{6} - (n+1)^2$

$= \frac{2}{3} \cdot (n+1)(2n+1) - (n+1)^2 = \frac{(n+1)}{3}[2(2n+1) - 3(n+1)]$

$= \frac{(n+1)}{3} \cdot (n-1) = \frac{n^2 - 1}{3}$

18. **(b) :** The numbers are $1, 1 + d, 1 + 2d, ..., 1 + 100d$.
The numbers are in A.P.
Then mean = 51st term = $1 + 50d = \bar{x}$ (say)

Mean deviation (M.D.) $= \frac{1}{n}\sum_{i=1}^{101}|x_i - \bar{x}|$

$= \frac{1}{101}[50d + 49d + 48d + ... + d + 0 + d + 2d + ... + 50d]$

$= \frac{1}{101} \cdot 2d(1 + 2 + ... + 50) = \frac{1}{101} \cdot 2d \cdot \frac{50 \cdot 51}{2} = \frac{50 \cdot 51}{101}d$

But M.D. = 255 (given) $\Rightarrow \quad \frac{50 \cdot 51}{101}d = 255$

$\Rightarrow \quad d = \frac{101 \times 255}{50 \times 51} = \frac{101 \times 255}{2550} = 10.1$

19. **(a) :** The mean of $a, b, 8, 5, 10$ is 6 $\Rightarrow \frac{a + b + 8 + 5 + 10}{5} = 6$

$\Rightarrow a + b + 23 = 30 \quad \Rightarrow \quad a + b = 7$ ...(1)

Again, variance $= \frac{\sum(x_i - A)^2}{n} = 6.8$

$\Rightarrow \quad \frac{(a-6)^2 + (b-6)^2 + 4 + 1 + 16}{5} = 6.8$

$\Rightarrow a^2 + b^2 - 12(a + b) + 36 + 21 + 72 = 5 \times 6.8 = 34$
$\Rightarrow a^2 + b^2 - 12 \times 7 + 72 + 21 = 34$
$\therefore a^2 + b^2 = 25$ ...(2)
using (1) we have

$a^2 + (7 - a)^2 = 25 \Rightarrow a^2 + 49 - 14a + a^2 = 25$

$\Rightarrow a^2 - 7a + 12 = 0 \quad \therefore \quad a = 3, 4$ which gives $b = 3, 4$

20. (a) : Let x and y are number of boys and girls in a class respectively.

$\frac{52x+42y}{x+y} = 50 \Rightarrow x = 4y \Rightarrow \frac{x}{y} = \frac{4}{1}$ and $\frac{x}{x+y} = \frac{4}{5}$

Required percentage $= \frac{x}{x+y} \times 100 = \frac{4}{5} \times 100 = 80\%$.

21. (a) : Series A = 101, 102, 103, ..., 200

Series B = 151, 152, 153, ..., 250

Series B is obtained by adding a fixed quantity to each item of series A, we know that variance is independent of change of origin. So both series have the same variance so ratio of their variances is 1.

22. (a) : Root mean square of numbers ≥ A.M. of the numbers

$\Rightarrow \sqrt{\frac{400}{n}} \geq \frac{80}{n} \Rightarrow \frac{20}{\sqrt{n}} \geq \frac{80}{n} \Rightarrow \sqrt{n} \geq 4 \Rightarrow n \geq 16$

$\Rightarrow n = 17$ but not given in choice.

$\therefore n = 18$ is correct number.

23. (c) : Mode = 3 median – 2 mean

$= 3 \times 22 - 2 \times 21 = 3(22 - 14) = 3 \times 8 = 24$.

24. (a) : According to problem

X	Value of X	d = value of $X - \bar{X}$	$(X - \bar{X})^2$
x_1	a	a	a^2
x_2	a	a	a^2
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
x_n	a	a	–
x_{n+1}	$-a$	$-a$	a^2
x_{n+2}	$-a$	$-a$	a^2
–	–	–	–
–	–	–	–
–	–	–	–
x_{n+n}	$-a$	$-a$	a_2
$\Sigma X = 0$			$\sum(X - \bar{X})^2 = 2na^2$

$\therefore \bar{X} = \frac{\Sigma X}{N} = \frac{0}{2n} = 0$

Now $S.D = \sqrt{\frac{\sum(X - \bar{X})^2}{N}} = \sqrt{\frac{\sum X^2}{N} - (\bar{X})^2}$

$2 = \sqrt{\frac{2na^2}{2n} - 0}$; $2 = \sqrt{a^2}$; $2 = |a|$

25. (a) : Mode can be computed by histogram

Median will be changed if data's are changed. So, (2) is correct.

Variance depends on change of scale. So, (3) is not correct.

26. (b) : Total number of observations are 9 which is odd which means median is 5th item now we are increasing 2 in the last four items which does not effect its value. The new median remains unchanged.

27. (d) : $\sum x = 170$ and $\sum x^2 = 2830$

Increase in $\sum x = 10 \Rightarrow \sum x' = 170 + 10 = 180$

Increase in $\sum x^2 = 900 - 400 = 500$ then

$\sum x'^2 = 2830 + 500 = 3330$

$\sigma^2 = \frac{1}{15} \times 3330 - \left(\frac{1}{15} \times 180\right)^2 = 222 - (12)^2 = 78$

28. (b) : Using $\bar{x} = \frac{(x_1 + x_2 + ... + x_{100})}{100} = 72$

$\therefore x_1 + ... + x_{100} = 7200$ ...(i)

Again $\frac{x_1 + x_2 + ... + x_{70}}{70} = 75$

$x_1 + ... + x_{70} = 75 \times 70$ ...(ii)

$\therefore$ Average marks of 30 girls $= \frac{7200 - 5250}{30} = 65$