



## MATHS

### BOOKS - MODERN PUBLISHERS MATHS (HINGLISH)

## STATISTICS

#### Illustrative Examples

1. Find the range of the series :

(i) 75, 85, 95, 105, 115, 125

(ii) 15, 18, 13, 16, 14, 13, 14, 19, 21

A. 50, 6

B. 40, 6

C. 50, 8

D. None of these

**Answer: C**



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**2.** Find the mean deviation from the mean for the following data  
12, 3, 18, 17, 4, 9, 17, 19, 20, 15, 8, 17, 2, 3, 16, 11, 3, 1, 0, 5



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**3.** If  $\bar{x}$  is the mean and Mean Deviation from mean is  $MD(\bar{x})$ , then find the number of observations lying between  $\bar{x} - MD(\bar{x})$  and  $\bar{x} + MD(\bar{x})$  from the following data :

22,24,30,27,29,31,25,28,41,42



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4. Find the mean deviation about the median for the following data: 3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21.

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5. 55, 34, 48, 38, 70, 44, 54, 46, 63, 42.

Find the mean deviation about the median.

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6. Find the mean deviation about the median for the following data:

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7. Coefficient of variation of two distributions are 60 and 70, and their standard deviations are 21 and 16, respectively. What are their arithmetic means.

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## Frequently Asked Questions

1. Find the Variance of the following data:  
6, 8, 10, 12, 14, 16, 18, 20, 22, 24

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2. Find the variance and standard deviation for the following data:

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3. 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. What are the correct mean and standard deviation?

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4. The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.

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1. Find the mean deviation from the mean for the following data :

6,7,10,12,13,4,8,12



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2. Find the mean deviation from the mean for the following data :

6.5,5,5.25,5.5,4.75,4.5,6.25,7.75,8.5



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3. Find the mean deviation from the mean for the following data :

(i) 13,15,16,15,18,15,14,18,17,10

(ii) 38,70,48,40,42,55,63,46,54,44

(iii) 37,48,50,23,47,58,29,27,31,40



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4. Calculate the mean deviation from the mean for the following data: 13, 17, 16, 14, 11, 13, 10, 16, 11, 18, 12, 17

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5. Find the mean deviation from mean for the following data :

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

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6. Find the mean deviation from mean for the following data :

$x_i$ :	3	5	7	9	11	13
$f_i$ :	2	7	10	9	5	1

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1. If  $\bar{x}$  is the mean and mean deviation from mean is  $MD(\bar{x})$ , then find the number of observations lying between  $\bar{x} - MD(\bar{x})$  and  $\bar{x} + MD(\bar{x})$  from the following data :

34,66,30,38,44,50,40,60,42,51

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## Exercise 15 B Short Answer Type Questions

1. Find the mean deviation from the median for the following data :

10,3,12,5,9,3,18,21,21,8,12,12

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2. Find the mean deviation from the median for the following data :

13,17,16,14,11,13,10,16,11,18,12,17

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3. Find the mean deviation from the median for the following data :

38,70,48,34,63,42,55,44,53,47

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4. The lengths (in cm) of 10 rods in a shop are given below:  
40.0,52.3,55.2,72.9,52.8,79.0,32.5,15.2,27.9,30.2 Find mean deviation from median (ii) find mean deviation from the mean also.

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## Exercise 15 C Short Answer Type Questions

1. Given that  $\bar{x}$  is the mean and  $\sigma^2$  is the variance of  $n$  observations  $x_1, x_2, \dots, x_n$ . Prove that the mean and variance of the observations  $ax_1, ax_2, \dots, ax_n$ , are  $a\bar{x}$  and  $a^2\sigma^2$  respectively ( $a \neq 0$ ).



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## Exercise 15 C Long Answer Type Question I

1. If  $\bar{x}$  is at mean of  $n$  values of  $x$ , then  $\sum_{i=1}^n (x_i - \bar{x}) = 0$  and if a has value other than  $\bar{x}$  then  $\sum_{i=1}^n (x_i - \bar{x})^2$  is less than  $\sum (x_i - a)^2$

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2. Find the mean and variance for the following data

2,4,5,6,8,17

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3. Find the mean and variance for the following data

(i) Find  $n$  natural numbers.

(ii) First 10 multiple of 3.

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4. (a) Find the variance and standard deviation for the following data :

65,58,68,44,48,45,60,62,60,50

(b) The scores of batsman A were :

48,80,58,44,52,65,73,56,64,50

Find the variance.



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5. (a) The scores of 10 students in a test, in which the maximum marks were 50 as follows :

28,36,34,28,48,22,35,27,19,41

Find the variance .

(b) Later on the maximum marks were increased to 100 , and accordingly each student's score was doubled . Find the variance of the new scores.



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6. A simple of 25 variates has mean 40 and standard deviation 5 and a second sample of 35 variates has mean 45 and the standard deviation 2. Find the mean and standard deviation of the two samples of variates , taken together.

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7. 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.

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8. The mean and standard deviation of 6 observations are 8 and 4 respectively . If each observation is multiplied by 2, find the new mean and new standard deviation of the resulting observation.



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## Objective A Multiple Choice Questions

1. The mean deviation about the mean for 3,8,4,10,6 is :

- A. 2
- B. 2.24
- C. 3
- D. 3.5

**Answer: B**



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2. In a series of  $2n$  observations, half of them equal  $a$  and the remaining half equal  $-a$ . If the S.D. of the observations is 2, then

$|a|$  equals (1)  $\frac{1}{n}$  (2)  $\sqrt{2}$  (3) 2 (4)  $\frac{\sqrt{2}}{n}$

A.  $\frac{1}{n}$

B.  $\sqrt{2}$

C. 2

D.  $\frac{\sqrt{2}}{n}$

**Answer: C**



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3. If the mean deviation of the numbers  $1, 1 + d, 1 + 2d, \dots, 1 + 100d$  from their mean is 255, then the  $d$  is equal to (1) 10.0 (2) 20.0 (3) 10.1 (4) 20.2

A. 10.0

B. 20.0

C. 10.1

D. 20.2

**Answer: C**

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4. If a variable takes discrete values

$$x + 4, x - \frac{7}{2}, x - \frac{5}{2}, x - 3, x - 2, x + \frac{1}{2}, x - \frac{1}{2}, x + 5, (x > 0)$$

then the median is

A.  $a - \frac{5}{4}$

B.  $a - \frac{1}{2}$

C.  $a - 2$



D.  $a + \frac{5}{4}$

**Answer: A**

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5. For a given distribution of marks mean is 35.16 and its standard deviation is 19.76. The coefficient of variation is :

- A.  $\frac{19.76}{35.16} \times 10$
- B.  $\frac{35.16}{19.76} \times 100$
- C.  $\frac{19.76}{35.16}$

D. None of these

**Answer: D**

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6. 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)  $a = 3, b = 4$

A.  $a=3, b=4$

B.  $a=0, b=7$

C.  $a=5, b=2$

D.  $a=1, b=6$

**Answer: A**



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7. If coefficient of variation is 60 and standard deviation is 24, then arithmetic mean is :

A.  $\frac{20}{7}$

B.  $\frac{7}{20}$

C.  $\frac{1}{40}$

D. 40

**Answer: D**



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**8.** Mean of  $n$  observations  $x_1, x_2, \dots, x_n$  is  $\bar{x}$ . If an observation  $x_q$  is replaced by  $x'_q$ , then the new mean is :

A.  $\bar{x} - x_q + x'_q$

B.  $\frac{(n-1)\bar{x} + x'_q}{n}$

C.  $\frac{(n-1)\bar{x} - x'_q}{n}$

D.  $\frac{n\bar{x} - x_q + x'_q}{n}$

**Answer: D**

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**9.** The sum of the first  $n$  odd natural number is

A.  $\sqrt{n}$

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

C.  $\frac{n^2 - 1}{3}$

D.  $n$

**Answer: C**

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10. 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  $x_1, x_2, \dots, x_9$  is

A. 9

B. 4

C. 3

D. 2

**Answer: D**

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11. If the coefficient of variation and standard deviation are 60 and 18 respectively, the arithmetic mean of distribution is :

A. 60

B. 30

C. 35

D. 21

**Answer: B**



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12. Find the mean and variance for each of the data :

6, 7, 10, 12, 13, 4, 8, 12

A. 8,  $\sqrt{26.25}$

B. 9,  $\sqrt{9.25}$

C. 8, 26.25

D. 9, 9.25

**Answer: D**

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**13.** The mean deviation of the data 3,10,10,4,7,10,5 from the mean is

A. 3

B. 2

C. 3.75

D. 2.57

**Answer: D**

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14. If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is :

A. 30

B. 21

C. 60

D. 35

**Answer: D**



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## Objective B Fill In The Blanks

1. Find the mean deviation from the mean for the data:  
6,7,10,12,13,4,8,20.





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2. The mean deviation from the mean for the data :  
9,12,18,3,5,3,10,12,21,12,21 is \_\_\_\_\_



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3. Find the mean deviation about the median for the data :  
36, 72, 46, 42, 60, 45, 53, 46, 51, 49



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4. If  $\bar{x}$  is at mean of  $n$  values of  $x$ , then  $\sum_{i=1}^n (x_i - \bar{x}) = 0$  and if a  
has \_\_\_\_\_ value \_\_\_\_\_ other \_\_\_\_\_ than  
 $\bar{x}$  then  $\sum_{i=1}^n (x_i - \bar{x})^2$  is less than  $\sum (x_i - a)^2$



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5. The variance of first  $n$  natural number is:

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6. Find the mean variance and standard deviation for the following data: 6,7,10,12,13,4,8,12

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## Objective C True False

1. The mean deviation from mean for the data :  
13,15,16,15,18,15,14,18,17,10 is

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2. The scores of a batsman in ten innings are :  
55,34,48,38,70,44,54,46,63,42 Find the mean deviation about the median.

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3. If the variance of the following data :

6,8,10,12,14,16,18,20,22 is  $K$ , then the value of  $\frac{K}{11}$  is

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**Objective D Very Short Answer Type Questions**

1. Find the mean deviation from median for the following data :

36,72,46,42,60,45,53,46,51,49



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2. Find the mean deviation from median for the following data :

9,12,18,3,5,3,10,12,21,12,21



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3. Find the variance for the following data :

65,58,68,44,48,45,60,62,60,50



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1. Find the mean deviation about the mean for the data :  
4, 7, 8, 9, 10, 12, 13, 17

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2. Find the mean deviation about the mean for the data :  
38, 70, 48, 40, 42, 55, 63, 46, 54, 44

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3. Find the mean deviation about the median for the data :  
13, 17, 16, 14, 11, 13, 10, 16, 11, 18, 12, 17

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4. Find the mean deviation about the median for the data :  
36, 72, 46, 42, 60, 45, 53, 46, 51, 49

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## Ncert File Exercise 15 2

1. Find the mean and variance for each of the data :  
6, 7, 10, 12, 13, 4, 8, 12

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2. Find the mean and variance for each of the data : First  $n$   
natural numbers

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3. Find the mean and variance for each of the data : First 10 multiples of 3.

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### Ncert File Exercise 15 3

1. The sum and sum of squares corresponding to length  $x$  (in cm) and weight  $y$  (in gm) of 50 plant products are given below

$$\sum_{i=1}^{50} x_i = 212, \quad \sum_{i=1}^{50} x_i^2 = 902.8, \quad \sum_{i=1}^{50} y_i = 261, \quad \sum_{i=1}^{50} y_i^2 = 1457.6$$

Which is more varyi

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### Miscellaneous Exercise

1. The mean and variance of eight observations are 9 and 9.25, respectively. If six of the observations are 6, 7, 10, 12, 12 and 13, find the remaining two observations.

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2. The mean and variance of 7 observations are 8 and 16, respectively. If five of the observations are 2, 4, 10, 12, 14. Find the remaining two observations.

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3. The mean and standard deviation of six observations are 8 and 4, respectively. If each observation is multiplied by 3, find the new mean and new standard deviation of the resulting observations.

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4. Given that  $\bar{x}$  is the mean and  $\sigma^2$  is the variance of  $n$  observations  $x_1, x_2, \dots, x_n$ . Prove that the mean and variance of the observations  $ax_1, ax_2, ax_3, \dots, ax_n$  are  $a\bar{x}$  and  $a^2\sigma^2$ ,

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5. The mean and standard deviation of 20 observations are found to be 10 and 2, respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation in each of the following cases. (i) If

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6. The mean and standard deviation of a group of 100 observations were found to be 20 and 3, respectively. Later on it was found that three observations were incorrect, which are recorded as 21, 21 and 18. Find the mean and standard deviation if the



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## Exercise

1. The mean and standard deviation of a set of  $n_1$ , observations are  $\bar{x}_1$  and  $s_1$ , respectively while the mean and standard deviation of another set of  $n_2$  observations are  $\bar{x}_2$  and  $s_2$ , respectively. Show that the standard deviation of the combined

set of  $(n_1 + n_2)$  observations is given by

$$S. D. = \sqrt{\frac{n_1(s_1)^2 + n_2(s_2)^2}{n_1 + n_2} + \frac{n_1 n_2 ((\bar{x})_1 - (\bar{x})_2)^2}{(n_1 + n_2)^2}}$$

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## Revision Exercise

1. The mean of first 11 terms of Fibonacci sequence :

1,1,2,3,5,8,13,21,34,55,89 is 21.1 . Calculate the standard deviation.

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2. If each of the observation  $x_1, x_2, \dots, x_n$  is increased by a where a is a negative or positive number, show that the variance remains unchanged.

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## Check Your Understanding

1. What is the range of the series :

15,18,13,16,14,13,14,19,21

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2. Find the mean deviation from the mean for the data :

6,7,10,13,4,8,12

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3. Find the mean deviation from the median for the data :

9,12,18,3,5,3,10,12,21,12,21

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4. What is the relationship between Root Mean Square Deviation (s) and Standard Deviation ( $\sigma$ ).

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5. Find the Variance of the following data:  
6, 8, 10, 12, 14, 16, 18, 20, 22, 24

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6. Find the mean and variance of first 10 multiples of 3.

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7. Find the mean and variance of the following data : 2,4,5,6,8,17

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8. The mean of first 11 terms of the sequence : 1,1,2,3,5,8,13,21,34,55,89 is 21.1 . Calculate the S.D.

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9. If  $\bar{x}$  is at mean of  $n$  values of  $x$ , then  $\sum_{i=1}^n (x_i - \bar{x}) = 0$  and if a has value other than  $\bar{x}$  then  $\sum_{i=1}^n (x_i - \bar{x})^2$  is less than  $\sum (x_i - a)^2$

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10. Coefficient of Variation



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## Competition File

1. 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)  $\frac{11}{2}$  (2) 2

(3)  $\frac{13}{2}$  (4)  $\frac{5}{2}$

A.  $\frac{5}{2}$

B.  $\frac{11}{2}$

C. 6

D.  $\frac{13}{2}$

**Answer: B**



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

A. 2

B. 3

C. 4

D. 5

**Answer: C**



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3. A scientist is weighing each of 28 fishes. Their mean weight worked out is 28 gm and a standard deviation of 2 gm . Later, it was found that the measuring scale was misaligned and always



under reported every fish weight by 4gm. The correct mean and standard deviation (in gm) of fishes are respectively :

A. 32, 2

B. 32, 4

C. 38, 2

D. 28, 4

**Answer: A**



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4. 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) median (2) mode (3) variance (4) mean

A. Median

B. Mode

C. Variance

D. Mean

**Answer: C**



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5. The variance of first 50 even natural numbers is

A. 833

B. 437

C.  $\frac{437}{4}$

D.  $\frac{833}{4}$

**Answer: A**

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6. 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. 16.8

B. 16

C. 15.8

D. 14

**Answer: D**

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7. If the standard deviation of the numbers 2, 3, a and 11 is 3.5,

then which of the following is true ? (1)  $3a^2 - 26a + 55 = 0$  (2)

$$3a^2 - 32a + 84 = 0 \quad (3) \quad 3a^2 - 34a + 91 = 0 \quad (4)$$

$$3a^2 - 23a + 44 = 0$$

A.  $3a^2 - 32a + 84 = 0$

B.  $3a^2 - 34a + 91 = 0$

C.  $3a^2 - 33a + 44 = 0$

D.  $3a^2 - 26a + 55 = 0$

**Answer: A**



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8. 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  $x_1, x_2, \dots, x_9$  is

A. 9

B. 4

C. 2

D. 3

**Answer: C**

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9. If the sum of the deviations of 50 observations from 30 is 50, then the mean of these observations is

A. 31

B. 30

C. 50

D. 51

**Answer: A**



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**10.** Standard deviation of four observations  $-1, 0, 1$  and  $k$  is  $\sqrt{5}$   
then  $k$  will be

A.  $2\sqrt{6}$

B. 1

C. 2

D.  $\sqrt{6}$

Answer: A



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## Chapter Test

1. 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)  $a = 3, b = 4$

A.  $a=3, b=4$

B.  $a=0, b=7$

C.  $a=5, b=2$

D.  $a=1, b=6$

**Answer: A**



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2. The mean deviation of the data 3,10,10,4,7,10,5 from the mean is

A. 3

B. 2

C. 3.75

D. 2.57

**Answer: D**



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3. What is the range of the series :

75,85,95,105,115,125 is \_\_\_\_



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4. Find the mean deviation from the mean for the following data :

4,7,8,9,10,12,13,17



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5. If  $\sigma^2$  is the variance of  $n$  observations  $x_1, x_2, \dots, x_n$ , prove that the variance of  $n$  observations  $ax_1, ax_2, \dots, ax_n$  is  $a^2\sigma^2$ , where  $a \neq 0$



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6. The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.



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7. The mean and variance of eight observations are 9 and 9.25, respectively. If six of the observations are 6, 7, 10, 12, 12 and 13, find the remaining two observations.



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