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## MATHS

## BOOKS - CHHAYA PUBLICATION

## MATHS (BENGALI ENGLISH)

## MEASURES OF DISPERSION

Illustrative Examples

1. Find the mena deviation about the (a)
median (b) mean in respect of the following
numbers :

46,79,26,85,39,65,99,29,56,72

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2. Calculate the mean deviation from the
mean and (ii) median for the following data,
relationg to heights of 100 children :

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3. Calculate the mean deviation (i) from the mean and (ii) from the median for the following data :

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4. Find the mena deviation about median for the following frequency distribution
5. Find the standard deviation of the following data :

49,63,46,58,52,60,54

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6. Find the mean of coefficient of variation
$=5 \%$ and variance $=4$.
$n=10, \Sigma x=20, \Sigma x^{2}=200$ then find the value of S.D

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8. Two variables $x$ and are related by
$y=3 x+10$. If the S.D. of x is 4 what will be
the S.D. of $y$ ?

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9. If the variance of first $n$ even natural nembers if 65 , find $n$.

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10. Find the S.D. of the following frequency distribution :

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11. Find the A.M. and S.D from the folowing frequency distribution:

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12. The mean and S.D. of sample of size 10 were
found to be 9.5 and 2.5 respectively. Later on
an additional observation became available.

This was 15 and was included in the original
sample. Find the mean and S.D. of the 11 observations.

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13. The mean and S.D. of 20 items were found
to be 12 and 6 respectively. On checking it was
discovered that items which should correctly
read as 11 and 21 had been wrongly taken as 15
nd 27 respectively. Find the correct values of mean and S.D.
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14. The mean of 5 observations is 4.4 and the variance is 8.24. If three of the five observations are 1,2 and 6, find the other two.

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15. The means of two samples of sizes 500 and 600 were respectively 186 and 175. The corresponding standard deviations were respectively 9 and 10. The variable studied was
height in centimetres. Obtain the mean and variance of the combined sample.

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16. Find the missing value from the following table :

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17. Find the coefficient of variation of the marks of Methematics and Physics, obtained by the students of a school.

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18. In two factories $A$ and $B$ engaged in the
same industry in an area, the average weekly wages and the S.D. in rupees are as follows:

Which factory A or B pays out larger amount as weekly wages ?

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19. In two factories $A$ and $B$ engaged in the same industry in an area, the average weekly wages and the S.D. in rupees are as follows:

What is the average wage of all workers in the two factories?

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20. In two factories $A$ and $B$ engaged in the same industry in an area, the average weekly wages and the S.D. in rupees are as follows :

Find the coefficient of variation in the case of each factory. What inference do you draw from a comparison of the two figures ?

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21. Find the coefficient of variation if the sum of squares of the deviations of 10 observations taken from the mean 50 is 250 .

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22. From the following data determine in which factory X or Y , there is greater variability in individual wages:
23. In an industrial establishment, the coefficients of variation of wages of male and
female workers were $55 \%$ and $70 \%$ respectively. The standard deviations were Rs.

22 and Rs. 15.40 respectively. Calculate the combined average wages for all workers if $80 \%$ of the workers were male.

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## 24. The values of mean and S.D. of the folowing

frequency distribution are 35.16 and 19.76 respectively :

Find the original frequency distribution [here, $d=\frac{x-A}{h}, \mathrm{x}$ stands for mid-values of class intervals, $A=$ assumed mean and $h=$ equal width of class intervals].

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25. Find appropriate measures of dispersion
from the following data :

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## Exercise 3 Mcq

1. For a frequency distribution mean deviation
from mean is computed by -

$$
\text { A. M. D. }=\frac{\Sigma f}{\Sigma f|d|}
$$

B. M. $D .=\frac{\Sigma d}{\Sigma f}$
C. M. $D .=\frac{\Sigma f d}{\Sigma f}$
D. $M . D .=\frac{\Sigma f|d|}{\Sigma f}$

## Answer: D

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2. The mean deviation of the series $a$, $a+d$, $a+2 d, \ldots, a+2 n$ from its mean is -

$$
\text { A. } \frac{(n+1) d}{2 n+1}
$$

B. $\frac{n d}{2 n+1}$
C. $\frac{n(n+1) d}{2 n+1}$
D. $\frac{(2 n+1) d}{n(n+1)}$

## Answer: C

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3. If v is the variance and $\sigma$ is the standard diveation then -

$$
\text { A. } v=\frac{1}{\sigma^{2}}
$$

> B. $v=\frac{1}{\sigma}$
> C. $v=\sigma^{2}$
> D. $v^{2}=\sigma$

## Answer: C

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4. A student gets marks in 10 subjects as 38 ,
$70,48,34,42,55,63,46,54$ and 44 . The mean deviation about mean is -
A. 6.6
B. 7.6
C. 8.6
D. 10.6

## Answer: C

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5. The mean deviation of the numbers $3,4,5,6,7$
from the mean is -
A. 25
B. 5
C. 1.2
D. 0

Answer: C

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## Exercise 3 Very Short Answer Type

1. What do you mean by a measure of dispersion ? What are the different measures of dispersion?

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2. Define :Median.

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3. Give the definition of standard deviation.

Discuss the advantages and disadvantages of using S.D. as a measure of dispersion.

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4. Define :Mean

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5. Find the mean deviation about the A.M. of each of the following distributions:

7,9,24,14,26

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6. Find the mean deviation about the A.M. of each of the following distributions:

2,4,6,8,10,12,14,16
7. Find the mean deviation about the A.M. of each of the following distributions :

70,65,68,70,75,73,80,70,83,86

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8. Calculate the value of M.D. about the median of each of the following distributions:

8,15,53,49,19,62,7,15,95,77
9. Calculate the value of M.D. about the median of each of the following distributions:

Rs. 46,79, 26,85,39,65,29,59,73

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10. Calculate the value of M.D. about the median of each of the following distributions:

12,48,30,62,98,75,94,112

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11. Calculate the value of M.D. about the median of each of the following distributions :

10,15,54,59,19,62,8,25,95,77,46

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12. Find the coefficuent of mean deviation (i)
about mean
(ii) about median of the following marks :

Marks : 70, 25, 50, 85, 45, 65, 20, 40
13. From the following array, find out the M.D. :

7,9,16,24,26,31,39

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14. Calculate the mean deviation about the
A.M. of the following distribution

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15. Find the value of S.D. of each of the following distributions:

4,5,6,6,7,8

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16. Find the value of S.D. of each of the following distributions :

4,8,10,12,16

D
17. Find the value of S.D. of each of the following distributions:
$1,2,3,4, \ldots 9,10$

## D Watch Video Solution

18. Find the Mean and S.D. of first $n$ natural numbers

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19. The S.D. of the first n odd integers is $\sqrt{85}$, find n .

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20. The S.D. calculated from a set of 32 observations is 5 . If the sum of the observations is 80 , what is the sum of the squares of these observations ?
21. The standard deviation of a set of 30 items
is 9.5 Find the standard deviation if every
items is decreased by 5 .

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22. The standard deviation of a set of 50 items
is 8 . Find the standard deviation, if each item
is multiplied by 2 .

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23. Prove that the standard deviation calculated from two values $x_{1}$ and $x_{2}$ of a vriable x is equal to half their difference.

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24. Find the mean if coefficient of variation
$=5 \%$ and variance $=4$.
25. Find the coefficient of variation if the sum of squares of the deviations of 25 observations taken from the mean 40 is 900 .

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26. If the co-efficient variance and standerd deviation of two frequency distribution are $60 \%$ and 18,15 respectively, then find the arithimetic mean of the two frequency distribution.

Exercise 3 Short Answer Type

1. Explain with examples the utility of measuring dispersion

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2. Define :Mode.
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3. Discuss the relative merits of mean deviation and standard deviation as measures of dispersion.

## - Watch Video Solution

4. Calculate the value of M.D. from the mean of
the following frequency distribution :

- Watch Video Solution


## 5. Find the mean deviation from the mean for

 the following data :- Watch Video Solution

6. Find the mean deviation from median of the

## following data :

7. Find the mean deviation about the median of the following frequency distribution :

D Watch Video Solution
8. Calculate the mean deviation from median of the following frequency distribution :

D Watch Video Solution
9. Calculate the mean deviation from median of the following frequency distribution :

## D Watch Video Solution

10. Find the mean deciation about the median for the following frequency distribution :

D Watch Video Solution
11. Find the mean deviation about median

## from the following data :

- Watch Video Solution

12. Determine the mean deviation from the
median for the following grouped frequency distribution :
13. Calculate the mean deviation about (a) median and (b) mean for the following frequency distribution :

## - Watch Video Solution

14. Calculate the average deviation from the mean for the following data :
15. A student obtained the mean and standard deviation of 100 observations as 40 and 5.1 respectively. It was later found that he had wrongly copied one observation as 50 , the correct figure being 40. Calculate the correct mean and correct standard deviation.

## D Watch Video Solution

16. The mean and the standard deviation of a
characteristic of 100 items were found to be

60 and 10 respectively. At the time of calculations, two items were wrongly take as 5 and 45 instead of 30 and 20. Calculate the corrected mean and corrected standard deviation.

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17. Find the S.D. in respect of each of the following frequency distributions:

Distribution of age of 570 members of a

## Parliament :

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18. Find the S.D. in respect of each of the following frequency distributions:

Frequency distribution of daily wages of 550 workers :

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19. Find the S.D. in respect of each of the following frequency distributions:

Values of variable and corresponding frequencies:

- Watch Video Solution

20. Find the S.D. of each of the following grouped frequency distributions :

Frequency distribution of wt. of 100 students :
21. Find the S.D. of each of the following grouped frequency distributions :

Frequency distribution of wages of 84 employee :

- Watch Video Solution

22. Find the S.D. of each of the following grouped frequency distributions:

The distribution of heights of the students of a college :

## D Watch Video Solution

23. Find the S.D. of each of the following grouped frequency distributions:

Frequency distribution of wages of 230
workers :

Find also the value of coefficient of variation of the above data.

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Exercise 3 Long Answer Type Questions

1. Find the standard deviation of the following

## - Watch Video Solution

2. Define S.D. Find the standard deviation from the following frequency distribution :

## - Watch Video Solution

3. Two samples of sizes 60 and 90 have 52 and

48 as the respective A.Ms. and 9 and 12 as the respective S.Ds. Find the A.M and S.D. of the combined sample of size 150.
4. Calculate the A.M. and the mean deviation
thereform, from the following frequency distribution:

## - Watch Video Solution

5. From the following data determine in which
factory X or Y , there is greater variability in
individiual wages:

## - Watch Video Solution

6. An analysis of weekly wages (in Rs.) paid to
workers in two firms $A$ and belonging to the same industry in an area shows the followinng result :

In which firm, a or B , there is greater variability in individual wages.
7. Two distributions have the same mean Rs.

7500 and standard deviations Rs. 9 and Rs. 12 respectively. If C.V. of the first distribution is $24 \%$, find the C.V. of the second distribution.

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8. In two firms $X$ and $Y$ engaged in the same industry, the average monthly wages and variances of distribution of wages are as
follows:
R

If C.V. of distribution of wages in firm $X$ is 22.1 \% find the C.V. of distribution of wages in firm $Y$.

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9. Two batsmen $A$ and $B$ made the following scores in a series of criket matches :

Who is more consistent player in scoring.

## Watch Video Solution

10. From the following data determine in which firm, $A$ or $B$ there is greater variability in individual wages :

## - Watch Video Solution

11. In two factories $A$ and $B$ engaged in the same industry in an area, the average weekly wages in rupees and the S.D, are as follows :

Find the coefficient of variation of the two
factories separately and in combination and comment on the result.

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12. From the data given below, state with reason which series is more variable.

## - Watch Video Solution

13. Find the coefficient of variation of the following data :

## D Watch Video Solution

14. Find the variance and coefficient of variation of the following frequency

## distribution :

15. Calculate the variance of the following distribution (correct upto 3 place afetr decimat) stating and necessary assumption :

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16. Find the semi-interquartile range for the following distribution :

Find also the median and its difference from the average of the two quartiles.

## D Watch Video Solution

17. Calculate the appropriate measure of dispersion from the following data :

D Watch Video Solution
18. The mean and variance of the six values of
a variate are 8 and $8 \frac{2}{3}$. If the four values of the variate be $4,9,11$ and 12 , find the other two values of the variate.

## D Watch Video Solution

19. The first of the two samples has 100 items
with mean 15 and S.D. 3 . If the whole group has
items with mean 15.6 and variance 13.44 , find
the mean and the S.D. of the second sample.
20. The mean and S.D. of income of 50 men are

Rs. 3200 and Rs. 525 respectively. The same for

40 women are Rs. 2,850 and Rs. 460 respectively. Find the S.D. of income for the combined group.

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21. From some financial statistics, it is found
that the monthly average electricial charges
was 2,460 and S.D. Rs. 120. The monthly average direct wages was Rs. 42,000 and S.D. Rs. 1,200 . State which is the more variable with proper reasons.

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22. The mean and the standard deviation of
the following frequency distribution of continuous variable are 31 and 15.9. Find the original frequency distribution :

Here $d^{\prime}=\frac{x-A}{h}$ where x stands for mid values, $A$ is the assumed mean and $h$ is the common width of the class intervals.

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## Sample Question For Competitive Exams A

 Integer Answer Type1. If the standard deviation $z_{1}, x_{2}, \ldots, x^{n}$ is
3.5, then standard deviation of
$-2 x_{1},-3,-2 x_{2},-3, \ldots,-2 x_{n}-3$ will
be -

## D Watch Video Solution

2. 

If
the
mean
of
$27+x, 31+x, 89+x, 107+x, 156+x \quad$ is
83 and the mean of
$130+x, 126+x, 68+x, 50+x, 1+x$ is 15
$M$, then the value of $M$ is -

D Watch Video Solution
3. If mean deviation is 12 and standard deviation is 5 K , then K is -

- Watch Video Solution

4. The variance of $2,4,6,8,10$ is -

## D Watch Video Solution

5. The following table giving the height distribution of the students

If the median is $31 M$, then the value of $M$ is -

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## Sample Question For Competitive Exams B Matrix Match Type

1. Match the entries given in left column with
those given in right column.
(D) Watch Video Solution
2. Match the entries given in left column with those given in right column.
( Watch Video Solution

Sample Question For Competitive Exams C Comprehension Type

1. There are natural numbers. Answer the
following questions considering first natural
numbers.

Mean of first n natural number is -

$$
\begin{aligned}
& \text { A. } \frac{n+1}{2} \\
& \text { B. } \frac{2^{n}+1}{2^{n}} \\
& \text { C. } \frac{n+1}{n-1} \\
& \text { D. } \frac{n-1}{2}
\end{aligned}
$$

Answer: A

## - Watch Video Solution

2. There are natural numbers. Answer the following questions considering first natural numbers.

Variance of first n natural numbers is -

$$
\begin{aligned}
& \text { A. } \frac{n^{2}-1}{6} \\
& \text { B. } \frac{n^{2}+1}{12} \\
& \text { C. } \frac{n^{2}+1}{12} \\
& \text { D. } \frac{n^{2}+1}{6}
\end{aligned}
$$

## Answer: B

3. There are natural numbers. Answer the following questions considering first natural numbers.

Mean of square of first $n$ natural numbers is -

$$
\begin{aligned}
& \text { A. } \frac{(n+1)(2 n+1)}{6} \\
& \text { B. } \frac{n+1}{12} \\
& \text { C. } \frac{n-1}{12} \\
& \text { D. } \frac{(n-1)(2 n-1)}{6}
\end{aligned}
$$

## Answer: A

## - Watch Video Solution

4. $x_{1}, x_{2}, x_{3}, \ldots, x_{n}$ is a series. Mean and variance of this series are $\bar{x}$ and $\sigma^{2}$ respectively.

If $x_{i}$ is expressed by $x_{i}{ }^{\prime}$, then the new mean will be -
A. $\bar{x}-x_{i}+x_{i}{ }^{\prime}$
B. $\frac{(n-1) \bar{x}+x_{i}{ }^{\prime}}{n}$
C. $\frac{n \bar{x}-x_{i}+x_{i}{ }^{\prime}}{n}$
D. none of these

## Answer: C

## D Watch Video Solution

5. $x_{1}, x_{2}, x_{3}, \ldots, x_{n}$ is a series. Mean and variance of this series are $\bar{x}$ and $\sigma^{2}$ respectively.

If 7 be added to each term of the series, then the new variance will be -
A. $\sigma^{2}$
B. $\sigma^{2}+7$
C. $\sigma^{2}+6$
D. $\sigma$

Answer: A

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## Sample Question For Competitive Exams D <br> Assertion Reason Type

1. Statement - I :Mean of square of first $n$
natural numbers is $\frac{(n+1)(2 n+1)}{6}$
Statement - II : $\Sigma n=\frac{n(n+1)}{2}$
A. Statement - I is true, Statement - II is
true and Statement - II is a correct
explanation for Statement - I.
B. Statement - I is true, Statement-II is true
but Statement - II is not a correct expalnation of Statement - I.

# C. Statement - I is true, Statement -II is 

## false.

D. Statement -I is false, Statement -II is true.

## Answer: B

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2. Statement I : Standard deviation of $\frac{a x+b}{c}$
is $\left|\frac{a}{c}\right| \sigma$
Statement - II : Statement - II Standard deviation $=\sigma \times \mid$ coefficient of $x \mid$
A. Statement - I is true, Statement - II is
true and Statement - II is a correct explanation for Statement - I.

B. Statement - II is true, Statement-II is true

but Statement - II is not a correct
expalnation of Statement - I.
C. Statement - I is true, Statement -II is
false.
D. Statement -I is false, Statement -II is true.

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