MHT-CET
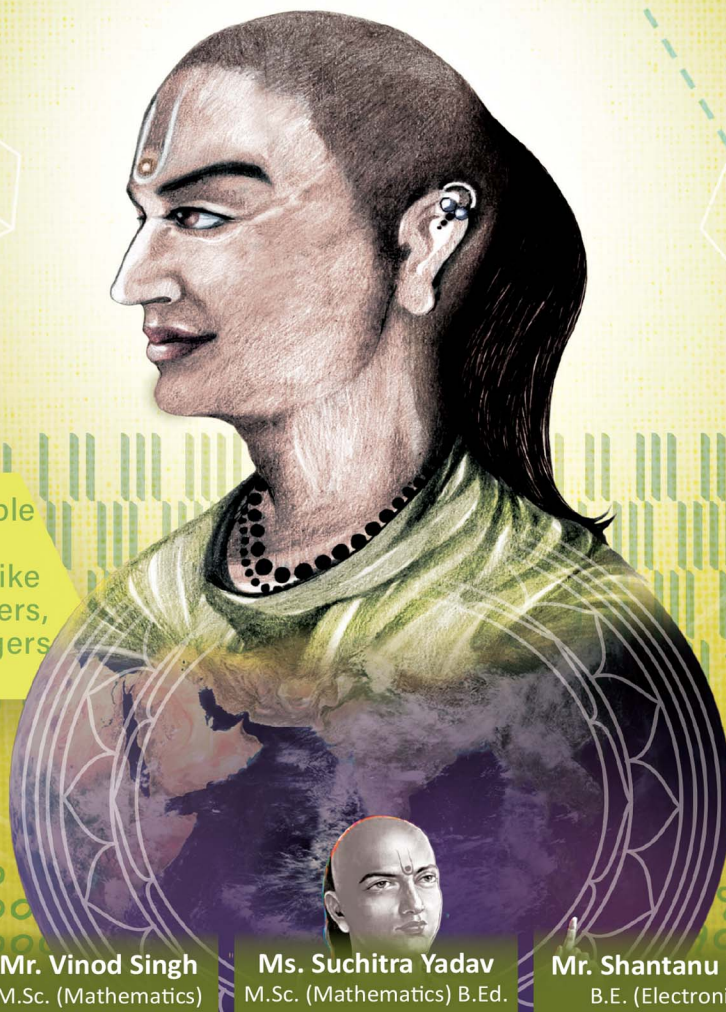
TRIUMPH

MATHEMATICS

PART 1

BASED ON THE LATEST SYLLABUS OF MHT-CET

2285 MCQs

Aryabhata provided simple solutions to complex mathematical problems like summing the first n integers, the squares of these integers and also their cubes.

Std. XI

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MHT-CET TRIUMPH

MATHEMATICS

2285 MCQs

Based on the latest Syllabus of MHT-CET

PART 1   Std. XI

♦ ♦ ♦ **Salient Features** ♦ ♦ ♦

☞ Includes relevant chapters of Std. XI as per the latest MHT-CET Syllabus

☞ Includes '2285' MCQs

☞ Quick Review and exhaustive subtopic wise coverage of MCQs

☞ Solved Previous Years' MHT-CET questions till 2023

☞ Evaluation Test for each chapter

☞ Includes **Smart Keys** (Caution, Shortcuts & Thinking Hatke)

☞ 'Real-world applications' in each chapter

☞ Answer keys for all the chapters and Evaluation Tests at the end of book

☞ *Solutions to MCQs and Evaluation Test can be accessed through Q.R. code given at the end of each chapter*

Printed at: **Print to Print,** Mumbai

"Don't follow your dreams; chase them!" A quote by Richard Dumbrill is perhaps the most pertinent for one who is aiming to crack entrance examinations held after Std. XII. We are aware of the aggressive competition a student appearing for such career-defining examinations experiences and hence wanted to create books that develop the necessary knowledge, tools, and skills required to excel in these examinations.

For the syllabus of **MHT-CET**, 80% of the weightage is given to the syllabus for XIIth standard while only 20% is given to the syllabus for XIth standard (with inclusion of only selected topics).

We believe that although the syllabus for Std. XII and XI and MHT-CET is aligned, the outlook for studying the subject should be altered based on the nature of the examination. To score well in the MHT-CET, a student has to be not just good with the concepts but also quick to complete the test successfully. Such ingenuity can be developed through sincere learning and dedicated practice.

As a first step to MCQ solving, students should start with elementary questions. Once momentum is gained, complex MCQs with a higher level of difficulty should be practised. Such holistic preparation is the key to succeeding in the examination!

Target's **Triumph MHT-CET Mathematics Standard XI** book which covers relevant chapters of Std. XI has been designed to achieve the above objectives. Beginning with basic MCQs, the book proceeds to develop competence to solve complex MCQs. It offers ample practice of recent questions from MHT-CET examinations. It also includes solutions (via QR codes) that provide explanations to help students learn how to solve the MCQs. Relevant solutions are complemented by Alternate Methods.

The sections of **Quick Review** and **MCQs (Classical, Critical, Concept Fusion, Previous Years' MHT-CET Questions, Evaluation Test)** form the backbone of every chapter and ensure adequate revision.

To optimise learning efficiency, multiple study techniques are included in every chapter in the form of **Smart Keys** *(Shortcuts, Caution & Thinking Hatke)*.

All the features of this book pave the way for a student to excel in the examination. The features are designed keeping the following elements in mind: Time management, easy memorization or revision, and non-conventional yet simple methods for MCQ solving. The features of the book presented on the next page will explain more about them!

We hope the book benefits the learner as we have envisioned.

Publisher

Edition: Second

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.
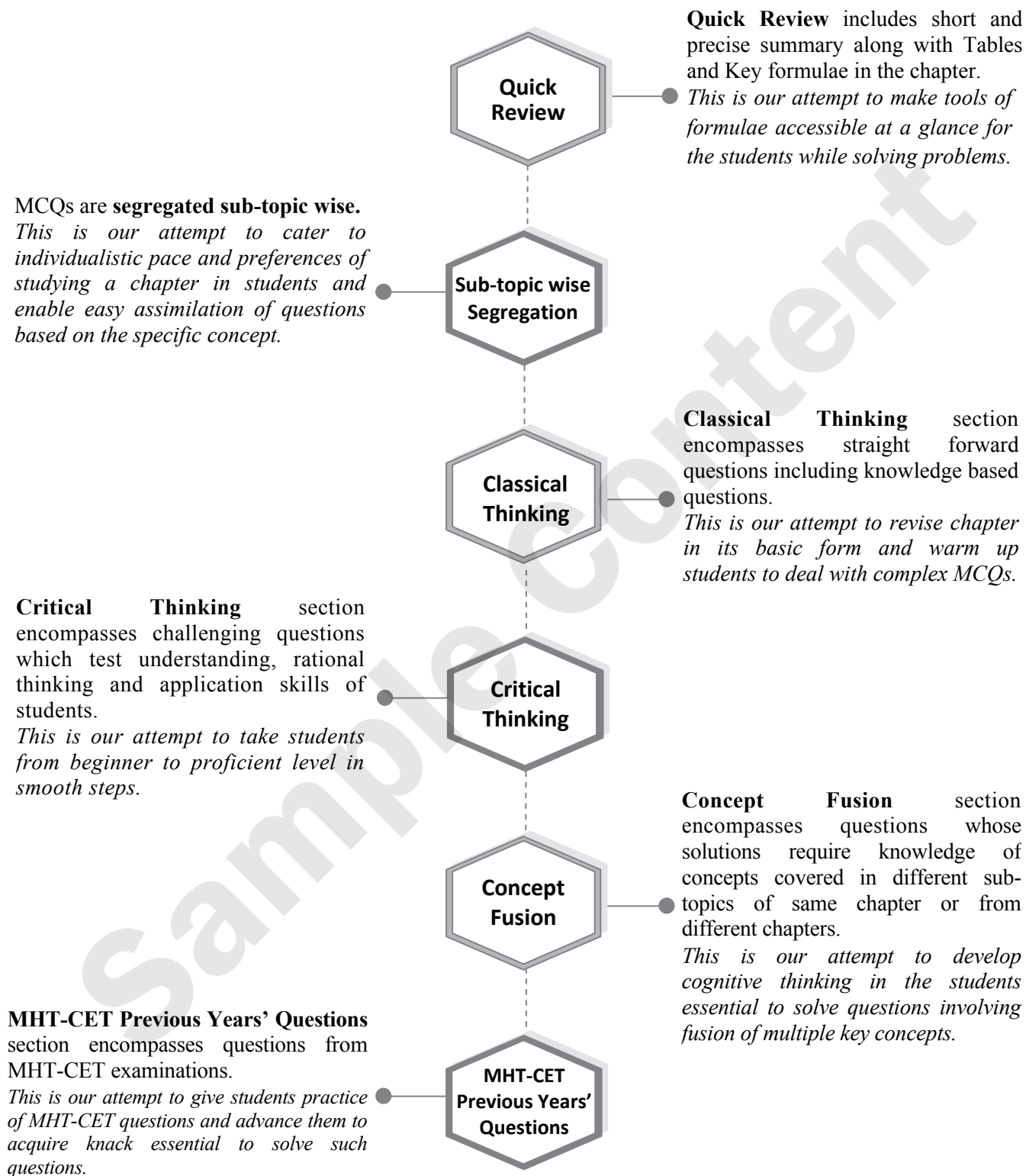Please write to us on: mail@targetpublications.org

Quick Review

Quick Review includes short and precise summary along with Tables and Key formulae in the chapter.
This is our attempt to make tools of formulae accessible at a glance for the students while solving problems.

MCQs are **segregated sub-topic wise.**
This is our attempt to cater to individualistic pace and preferences of studying a chapter in students and enable easy assimilation of questions based on the specific concept.

Sub-topic wise Segregation

Classical Thinking

Classical Thinking section encompasses straight forward questions including knowledge based questions.
This is our attempt to revise chapter in its basic form and warm up students to deal with complex MCQs.

Critical Thinking section encompasses challenging questions which test understanding, rational thinking and application skills of students.
This is our attempt to take students from beginner to proficient level in smooth steps.

Critical Thinking

Concept Fusion section encompasses questions whose solutions require knowledge of concepts covered in different sub-topics of same chapter or from different chapters.
This is our attempt to develop cognitive thinking in the students essential to solve questions involving fusion of multiple key concepts.

Concept Fusion

MHT-CET Previous Years' Questions section encompasses questions from MHT-CET examinations.
This is our attempt to give students practice of MHT-CET questions and advance them to acquire knack essential to solve such questions.

MHT-CET Previous Years' Questions

FEATURES

Evaluation Test

Evaluation Test encompasses questions based on concepts covered in the entire chapter.
This is our attempt to allow self-assessment of the chapter

Smart Keys comprise a set of remarkable study techniques contrived to benefit students.
This is our attempt to promote quick, innovative, and divergent thinking as well as enable the students to perceive the underlying depth and implications of concepts.

Smart Keys

Caution

Caution apprises students about mistakes often made while solving MCQs.

Shortcuts incorporate important theoretical or formula based short tricks, beneficial in solving MCQs.

Shortcuts

Thinking Hatke

Thinking Hatke reveals quick witted approach to crack the specific question.

Each chapter includes **real-world applications or examples** related to the concept discussed.
This is our attempt to link learning to the life and make students conscious of how Mathematics is related to everything we see, feel, touch and taste.

Real-world applications

QR Code includes
- Solutions to MCQs and Evaluation Test for each chapter

QR Code

MHT-CET PAPER PATTERN

- There will be three papers of Multiple Choice Questions (MCQs) in 'Mathematics', 'Physics and Chemistry' and 'Biology' of 100 marks each.

- Duration of each paper will be 90 minutes.

- Questions will be based on the syllabus prescribed by Maharashtra State Board of Secondary and Higher Secondary Education with approximately 20% weightage given to Std. XI and 80% weightage will be given to Std. XII curriculum.

- Difficulty level of questions will be at par with JEE (Main) for Mathematics, Physics, Chemistry and at par with NEET for Biology.

- There will be no negative marking.

- Questions will be mainly application based.

- Details of the papers are as given below:

Paper	Subject	Approximate No. of Multiple Choice Questions (MCQs) based on		Mark(s) Per Question	Total Marks
		Std. XI	Std. XII		
Paper I	Mathematics	10	40	2	100
Paper II	Physics	10	40	1	100
	Chemistry	10	40		
Paper III	Biology	20	80	1	100

- Questions will be set on

  i.   the entire syllabus of Std. XII of Physics, Chemistry, Mathematics and Biology subjects and

  ii. chapters / units from Std. XI curriculum as mentioned below:

Sr. No.	Subject	Chapters / Units of Std. XI
1	Physics	Motion in a plane, Laws of motion, Gravitation, Thermal properties of matter, Sound, Optics, Electrostatics, Semiconductors
2	Chemistry	Some Basic Concepts of Chemistry, Structure of Atom, Chemical Bonding, Redox Reactions, Elements of Group 1 and Group 2, States of Matter: Gaseous and Liquid States, Basic Principles and techniques of Chemistry, Adsorption and Colloids, Hydrocarbons
3	Mathematics	Trigonometry - II, Straight Line, Circle, Measures of Dispersion, Probability, Complex Numbers, Permutations and Combinations, Functions, Limits, Continuity
4	Biology	Biomolecules, Respiration and Energy Transfer, Human Nutrition, Excretion and osmoregulation

CONTENTS

Practice test Papers are the only way to assess your preparedness for the Exams.

Scan the adjacent QR code to know more about our **"MHT-CET Mathematics Test Series with Answer Key & Solutions"** book for the MHT-CET Entrance examination.

Chapter

8

Measures of Dispersion

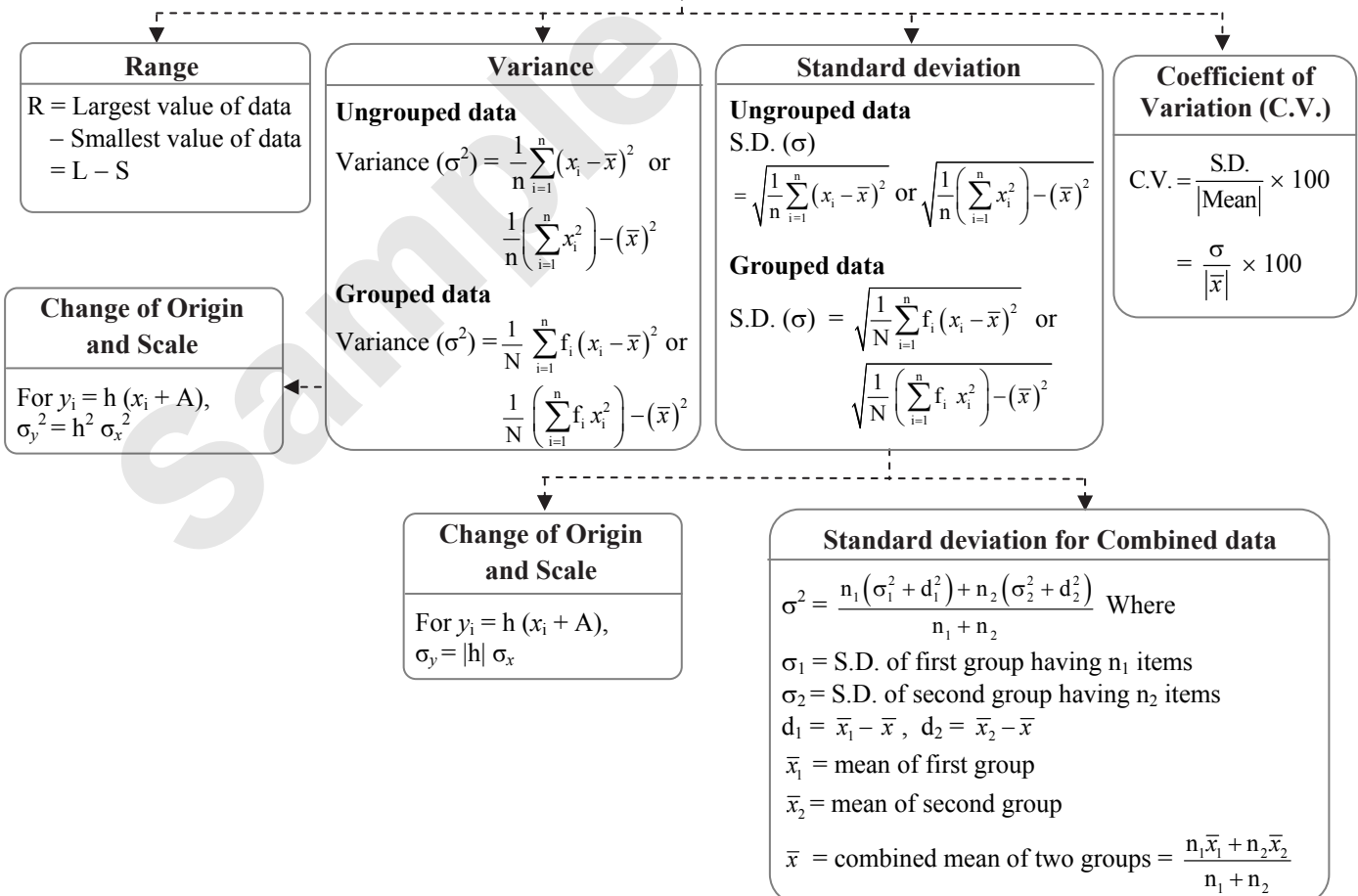*Application of Measures of Dispersion in Financial Planning*

Measures of dispersion, such as the standard deviation, can be Helpful in assessing the risk associated with investments. Investors and financial analysts use these measures to understand how much the returns of a particular investment may vary over time. A higher dispersion indicates higher risk, which can influence investment decisions.

Chapter Outline

8.1   Range, Variance and Standard Deviation

8.2   Standard Deviation for Combined data, Coefficient of variation

♦ ♦ ♦ **Quick Review** ♦ ♦ ♦

Measures of Dispersion

Range

R = Largest value of data
 − Smallest value of data
= L − S

Variance

Ungrouped data

Variance $(\sigma^2) = \dfrac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ or

$\dfrac{1}{n}\left(\sum_{i=1}^{n} x_i^2\right) - (\bar{x})^2$

Grouped data

Variance $(\sigma^2) = \dfrac{1}{N}\sum_{i=1}^{n} f_i(x_i - \bar{x})^2$ or

$\dfrac{1}{N}\left(\sum_{i=1}^{n} f_i x_i^2\right) - (\bar{x})^2$

Standard deviation

Ungrouped data

S.D. (σ)

$= \sqrt{\dfrac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$ or $\sqrt{\dfrac{1}{n}\left(\sum_{i=1}^{n} x_i^2\right) - (\bar{x})^2}$

Grouped data

S.D. $(\sigma) = \sqrt{\dfrac{1}{N}\sum_{i=1}^{n} f_i(x_i - \bar{x})^2}$ or

$\sqrt{\dfrac{1}{N}\left(\sum_{i=1}^{n} f_i x_i^2\right) - (\bar{x})^2}$

Coefficient of Variation (C.V.)

$\text{C.V.} = \dfrac{\text{S.D.}}{|\text{Mean}|} \times 100$

$= \dfrac{\sigma}{|\bar{x}|} \times 100$

Change of Origin and Scale

For $y_i = h(x_i + A)$,
$\sigma_y^2 = h^2 \sigma_x^2$

Change of Origin and Scale

For $y_i = h(x_i + A)$,
$\sigma_y = |h|\,\sigma_x$

Standard deviation for Combined data

$\sigma^2 = \dfrac{n_1\left(\sigma_1^2 + d_1^2\right) + n_2\left(\sigma_2^2 + d_2^2\right)}{n_1 + n_2}$ Where

σ_1 = S.D. of first group having n_1 items

σ_2 = S.D. of second group having n_2 items

$d_1 = \bar{x}_1 - \bar{x}$, $d_2 = \bar{x}_2 - \bar{x}$

$\bar{x}_1$ = mean of first group

$\bar{x}_2$ = mean of second group

$\bar{x}$ = combined mean of two groups $= \dfrac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$

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Shortcuts

1. Standard deviation $\leq$ Range. i.e., Variance $\leq$ (Range)^2

2. S.D. of first n natural numbers is $\sqrt{\dfrac{n^2 - 1}{12}}$.

Classical Thinking

8.1 Range, Variance and Standard Deviation

1. Which of the following is not a measure of dispersion?
   (A) Mean
   (B) Variance
   (C) Standard deviation
   (D) Range

2. Which of the following is a measure of dispersion?
   (A) Mean
   (B) Median
   (C) Mode
   (D) Standard deviation

3. The range of
   90, 50, 72, 69, 85, 100, 73, 85, 93 is
   (A) 100   (B) 93
   (C) 50   (D) 43

4. If the range of 15, 14, x, 25, 30, 35 is 23, then the least possible value of x is
   (A) 14   (B) 12
   (C) 13   (D) 11

5. The range of the following data is

Wages in thousands	No. of workers
10 – 20	53
20 – 30	35
30 – 40	20
40 – 50	12

   (A) 53   (B) 30
   (C) 40   (D) 12

6. Variance is independent of change of
   (A) origin only
   (B) scale only
   (C) origin and scale both
   (D) none of these

7. If each observation of a raw data whose variance σ^2 is multiplied by h, then the variance of the new set is
   (A) σ^2 (B) $h^2\sigma^2$
   (C) $h\sigma^2$ (D) $h + \sigma^2$

8. The variance for the following frequency distribution is

C.I.	2 – 4	4 – 6	6 – 8	8 – 10
f_i	3	4	2	1

   (A) 1.89   (B) 3.56
   (C) 4.57   (D) 2.34

9. If V is the variance and σ is the standard deviation, then
   (A) $V^2 = \sigma$ (B) $V = \sigma^2$
   (C) $V = \dfrac{1}{\sigma}$ (D) $V = \dfrac{1}{\sigma^2}$

10. The variance of the data 2, 4, 6, 8, 10 is
    (A) 6   (B) 7
    (C) 8   (D) None of these

11. The variance of first 20 natural numbers is
    (A) $\dfrac{133}{4}$ (B) $\dfrac{279}{12}$ (C) $\dfrac{133}{2}$ (D) $\dfrac{399}{4}$

12. For a frequency distribution, standard deviation is computed by applying the formula
    (A) $\dfrac{\sum f_i(x_i - \bar{x})}{\sum f_i}$ (B) $\dfrac{\sqrt{\sum f_i(x_i - \bar{x})^2}}{\sum f_i}$
    (C) $\sqrt{\dfrac{\sum f_i(x_i - \bar{x})^2}{\sum f_i}}$ (D) $\sqrt{\dfrac{\sum f_i(x_i - \bar{x})}{\sum f_i}}$

13. The S.D. of 7 scores 1, 2, 3, 4, 5, 6, 7 is
    (A) 4   (B) 2
    (C) $\sqrt{7}$ (D) $\sqrt{2}$

14. The standard deviation of the data 6, 5, 9, 13, 12, 8, 10 is
    (A) $\sqrt{\dfrac{52}{7}}$ (B) $\dfrac{52}{7}$
    (C) $\sqrt{6}$ (D) 6

15. If the S.D. of $x_1, x_2, \ldots, x_n$ is 5, then the S.D. of $x_1 + 5, x_2 + 5, x_3 + 5, \ldots, x_n + 5$, is
    (A) 0   (B) 10
    (C) 5   (D) 25

16. If standard deviation of a variate x is 10, then S.D. of the variate $(50 + 5x)$ will be
    (A) 10   (B) 50   (C) 500   (D) 100

17. Mean and standard deviation of 100 items are 50 and 4 respectively. The sum of all squares of the items is
(A) 256100   (B) 261600
(C) 251600   (D) 266000

18. If the S.D. of a set of observations is 8 and if each observation is divided by -2, then S.D. of the new set of observations will be
(A) -4 (B) -8 (C) 8   (D) 4

19. 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) $3a^2 - 23a + 44 = 0$

20. If X is a random variable such that $\sigma(x) = 2.6$, then $\sigma(1 - 4x)$ is equal to
(A) 7.8   (B) -10.4
(C) 13   (D) 10.4

21. If the S.D. of $y_1, y_2, y_3, \ldots, y_n$ is 6, then the variance of $y_1 - 3, y_2 - 3, y_3 - 3, \ldots, y_n - 3$, is
(A) 6   (B) 36
(C) 3   (D) 27

8.2 Standard Deviation for Combined data, Coefficient of variation

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
(A) $\dfrac{5}{2}$ (B) $\dfrac{11}{2}$
(C) 6   (D) $\dfrac{13}{2}$

2. For a given distribution of marks, mean is 35.16 and its standard deviation is 19.76. Then coefficient of variation is
(A) $\dfrac{35.16}{19.76}$ (B) $\dfrac{19.76}{35.16}$
(C) $\dfrac{35.16}{19.76} \times 100$ (D) $\dfrac{19.76}{35.16} \times 100$

3. If the C.V. and standard deviation of a distribution are 50 and 20 respectively, then its mean is
(A) 40   (B) 30   (C) 20   (D) 35

4. If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is
(A) 60   (B) 30   (C) 35   (D) 21

5. If the coefficient of variation and variance of a frequency distribution are 7.2 and 3.24 respectively, then its mean is
(A) 45   (B) 25   (C) 20   (D) 16

6. In a series of observations, coefficient of variation is 16 and mean is 25, then the variance is
(A) 4   (B) 8   (C) 12   (D) 16

7. The C.V. for the set of observations 55, 54, 52, 53, 56, 58, 52, 50, 51, 49 is
(A) 2.64   (B) 3.74
(C) 4.98   (D) 5.78

8. If the coefficient of variation of a distribution is 45% and the mean is 12, then its standard deviation is
(A) 5.2   (B) 5.3
(C) 5.4   (D) None of these

9. If the mean of 10 observations is 50 and the sum of the squares of the deviations of the observations from the mean in 250, then the coefficient of variation of those observations is
(A) 25   (B) 50   (C) 10   (D) 5

♦ ♦ ♦ **Critical Thinking** ♦ ♦ ♦

8.1 Range, Variance and Standard Deviation

1. The variance of first 50 even natural numbers is
(A) 437   (B) $\dfrac{437}{4}$
(C) $\dfrac{833}{4}$ (D) 833

2. The variance of the following frequency distribution

CI:	0 – 6	6 – 12	12 – 18
f_i:	2	4	6

is
(A) 24   (B) 12   (C) 20   (D) 25

3. The mean and variance of n observations $x_1, x_2, x_3, \ldots, x_n$ are 5 and 0 respectively. If $\sum_{i=1}^{n} x_i^2 = 400$, then the value of n is equal to
(A) 80   (B) 25   (C) 20   (D) 16

4. 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 $\dfrac{V_A}{V_B}$ is
(A) 1   (B) $\dfrac{9}{4}$ (C) $\dfrac{4}{9}$ (D) $\dfrac{2}{3}$

5. The mean and variance of seven observations are 8 and 16, respectively. If 5 of the observations are 2, 4, 10, 12, 14, then the product of the remaining two observations is
(A) 45 (B) 49
(C) 48 (D) 40

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?
(A) a = 5, b = 2 (B) a = 1, b = 6
(C) a = 3, b = 4 (D) a = 0, b = 7

7. Suppose values taken by a variable x are such that $a \leq x_i \leq b$, where x_i denotes the value of x in the ith case for i = 1, 2, …, n. Then
(A) $a \leq \text{Var}(x) \leq b$
(B) $a^2 \leq \text{Var}(x) \leq b^2$
(C) $\dfrac{a^2}{4} \leq \text{Var}(x)$
(D) $(b-a)^2 \geq \text{Var}(x)$

8. For a data consisting of 15 observations x_i, i = 1, 2, 3, …, 15 the following results are obtained : $\sum_{i=1}^{15} x_i = 170$; $\sum_{i=1}^{15} x_i^2 = 2830$. If one of the observation namely 20 was found wrong and was replaced by its correct value 30, then the corrected variance is
(A) 80 (B) 78
(C) 76 (D) 75

9. The standard deviation of the numbers 31, 32, 33, …, 46, 47 is
(A) $\sqrt{\dfrac{17}{12}}$ (B) $\sqrt{\dfrac{47^2-1}{12}}$
(C) $2\sqrt{6}$ (D) $4\sqrt{3}$

10. The mean and S.D. of the marks of 200 candidates were found to be 40 and 15 respectively. Later, it was discovered that a score of 40 was wrongly read as 50. The correct mean and S.D. respectively are
(A) 14.98, 39.95 (B) 39.95, 14.98
(C) 39.95, 224.5 (D) None of these

11. A scientist is weighing each of 30 fishes. Their mean weight worked out is 30 gm and standard deviation of 2 gm. Later, it was found that the measuring scale was misaligned and always under reported every fish weight by 2 gm. The correct mean and standard deviation (in gm) of fishes are respectively
(A) 32, 4 (B) 28, 2
(C) 28, 4 (D) 32, 2

12. What is the standard deviation of the following series

Measurements	0–10	10–20	20–30	30–40
Frequency	1	3	4	2

(A) 81 (B) 7.6
(C) 9 (D) 2.26

13. In a series of 2n observations, half of them equal to a and remaining half equal to − a. If the standard deviation of the observations is 2, then |a| equals
(A) $\dfrac{\sqrt{2}}{n}$ (B) $\sqrt{2}$
(C) 2 (D) $\dfrac{1}{n}$

8.2 Standard Deviation for Combined data, Coefficient of variation

1. For a certain data, following information is available. Obtain the combined standard deviation.

	X	Y
Mean	13	17
S. D.	3	2
Size	20	30

(A) 9.84 (B) 1.54
(C) 3.14 (D) 15.4

2. The means of two samples of sizes 60 and 120 respectively are 35.4 and 30.9 and the standard deviations are 4 and 5. Obtain the standard deviation of the sample of size 180 obtained by combining the two samples.
(A) 5.15 (B) 26.5
(C) 32.4 (D) 51.5

3. From the following data available for 5 pairs of observations of two variables x and y, obtain the combined S.D. for all 10 observations. Where,
$$\sum_{i=1}^{n} x_i = 30, \ \sum_{i=1}^{n} y_i = 40, \ \sum_{i=1}^{n} x_i^2 = 220, \ \sum_{i=1}^{n} y_i^2 = 340$$
(A) 7 (B) 2.65
(C) 8 (D) 4

4. The mean height of 200 students is 65 inches. The mean heights of boys and girls are 70 inches and 62 inches respectively and the standard deviations are 8 and 10 respectively. Find the number of boys and the combined S.D.
(A) 75 and 10.07
(B) 125 and 10.07
(C) 75 and 101.5
(D) 125 and 101.5

5. The S.D. and C.V. for the data 75, 78, 80, 86, 91, 88, 83 is
(A) 4.98 and 5.67   (B) 5.29 and 6.37
(C) 4.98 and 6.37   (D) 5.29 and 5.67

6. The variance and C.V. for the following frequency distribution is

x_i	60	61	62	63	64	65	66
f_i	3	10	11	13	7	5	1

(A) 2.12 and 2.33   (B) 3.12 and 3.33
(C) 1.46 and 2.33   (D) 1.46 and 3.33

7. Coefficient of variations of two distributions are 55 and 65 and their deviations are 22 and 39 respectively. Their arithmetic means are respectively
(A) 15, 20   (B) 40, 60
(C) 30, 50   (D) None of these

8. Two teams A and B have the same mean and their coefficients of variation are 4, 2 respectively. If σ_A, σ_B are the standard deviations of teams A, B respectively then the relation between them is.
(A) $\sigma_A = \sigma_B$ (B) $\sigma_B = 2\sigma_A$
(C) $\sigma_A = 2\sigma_B$ (D) $\sigma_B = 4\sigma_A$

♦ ♦ ♦   **MHT-CET Previous Years' Questions**   ♦ ♦ ♦

1. If 1 is added to first 10 natural numbers, then variance of the numbers so obtained is **[2021]**
(A) 8.25   (B) 3.87
(C) 6.5   (D) 2.87

2. If the variance of the numbers 2, 3, 11 and x is $\dfrac{49}{4}$, then the values of x are **[2021]**
(A) $6, \dfrac{14}{3}$ (B) $4, \dfrac{13}{5}$
(C) $6, \dfrac{16}{3}$ (D) $6, \dfrac{14}{5}$

3. Following data shows the information about marks obtained in Physics, Chemistry, Mathematics and Biology by 100 students in a class. Then _____ subject shows the highest variability in marks

	Physics	Chemistry	Mathematics	Biology
Mean	20	25	23	27
S.D.	3	2	4	5

[2021]
(A) Mathematics   (B) Chemistry
(C) Biology   (D) Physics

4. Given that total of 16 values is 528 and sum of the squares of deviation from 33 is 9158. The variance is **[2021]**
(A) 562.73   (B) 570.375
(C) 574.375   (D) 572.375

5. If the standard deviation of data is 12 and mean is 72, then coefficient of variation is **[2021]**
(A) 15.67%   (B) 14.67%
(C) 13.67%   (D) 16.67%

6. The arithmetic mean of marks in Mathematics for four divisions A, B, C and D were 80, 75, 70 and 72 respectively. Their standard deviations were 12, 6, 8 and 10 respectively. Then division _____ has more uniformity. **[2021]**
(A) D   (B) B   (C) C   (D) A

7. For the set of 50 observations, the sum of their squares is 3050, their arithmetic mean is 6. Hence the standard deviation of these observations is **[2021]**
(A) 5   (B) 3   (C) 4   (D) 6

8. The variance of first 10 multiples of 3 is **[2022]**
(A) 74.25   (B) 73.15
(C) 70.15   (D) 74.15

9. If the standard deviation of first n natural numbers is 2, then the value of n is **[2022]**
(A) 4   (B) 6   (C) 5   (D) 7

10. For the following frequency distribution

X	5	6	7	8	10
Frequency	3	7	4	2	4

The variance is **[2022]**
(A) 2.49   (B) 2.85
(C) 2.18   (D) 2.37

11. If for some positive $x \in R$, the frequency distribution of the marks obtained by 20 students in a certain test, is as follows:

Marks	2	3	5	7
Frequency	$(x+1)^2$	$2x-5$	$x^2 - 3x$	x

Then the mean of the marks is **[2022]**
(A) 3.0   (B) 2.5
(C) 2.8   (D) 3.2

12. For given data N = 60, $\sum x^2$ = 18000 and $\sum x$ = 960, then variance of data is **[2022]**
(A) 44 (B) 54
(C) 34 (D) 22

13. The sum of 10 values is 12 and then sum of their squares is 16.9, then their standard deviation (S.D.) is **[2022]**
(A) 0.005 (B) 5
(C) 0.5 (D) 0.05

14. If both mean and the standard of 50 observations $x_1, x_2, \ldots, x_{50}$ are equal to 16, then mean of $(x_1 - 5)^2, (x_2 - 5)^2, \ldots,(x_{50} - 5)^2$ is **[2022]**
(A) 357 (B) 377
(C) 397 (D) 378

15. The variance and mean of 15 observations are respectively 6 and 10. If each observation is increased by 8 then the new variance and new mean of resulting observations are respectively. **[2022]**
(A) 14, 10 (B) 6, 10
(C) 14, 18 (D) 6, 18

16. If the mean and S.D. of the data 3, 5, 7, a, b are 5 and 2 respectively, then a and b are the roots of the equation **[2023]**
(A) $x^2 - 10x + 18 = 0$
(B) $2x^2 - 20x + 19 = 0$
(C) $x^2 - 10x + 19 = 0$
(D) $x^2 - 20x + 18 = 0$

17. Mean and variance of six observations are 8 and 16 respectively. If each observation is multiplied by 3, then new variance of the resulting observations is **[2023]**
(A) 16. (B) 48.
(C) 24. (D) 144.

18. If both mean and variance of 50 observations $x_1, x_2, \ldots, x_{50}$ are equal to 16 and 256 respectively, then mean of $(x_1 - 5)^2, (x_2 - 5)^2, \ldots (x_{50} - 5)^2$ is
(A) 357 (B) 387
(C) 377 (D) 397

19. If the variance of the numbers –1, 0, 1, k is 5, where k > 0, then k is equal to **[2023]**
(A) $2\sqrt{\dfrac{10}{3}}$ (B) $2\sqrt{6}$
(C) $4\sqrt{\dfrac{5}{3}}$ (D) $\sqrt{6}$

20. For 20 observations of variable x, if $\sum (x_i - 2) = 20$ and $\sum (x_i - 2)^2 = 100$, then the standard deviation of variable x is **[2023]**
(A) 2 (B) 3
(C) 4 (D) 9

21. Variance of first 2n natural numbers is **[2023]**
(A) $\dfrac{4n^2 + 1}{12}$ (B) $\dfrac{(2n-1)^2}{12}$
(C) $\dfrac{n^2}{3} - 1$ (D) $\dfrac{4n^2 - 1}{12}$

22. The variance of 20 observations is 5. If each observation is multiplied by 2, then variance of resulting observations is **[2023]**
(A) 5 (B) 10 (C) 4 (D) 20

♦ ♦ ♦ **Evaluation Test** ♦ ♦ ♦

1. The variance of α, β and γ is 9, then variance of 5α, 5β and 5γ is
(A) 45 (B) $\dfrac{9}{5}$
(C) $\dfrac{5}{9}$ (D) 225

2. The S.D. of the first n natural numbers is
(A) $\dfrac{n+1}{2}$
(B) $\sqrt{\dfrac{n(n+1)}{2}}$
(C) $\sqrt{\dfrac{n^2-1}{12}}$
(D) None of these

3. The S.D. of a variate x is σ. Then S.D. of the variate $\dfrac{ax+b}{c}$ where a, b, c are constant, is
(A) $\left(\dfrac{a}{c^2}\right)\sigma$ (B) $\left|\dfrac{a}{c}\right|\sigma$
(C) $\left(\dfrac{a^2}{c^2}\right)\sigma$ (D) None of these

4. If $x_1, x_2, \ldots, x_{18}$ 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 observation is
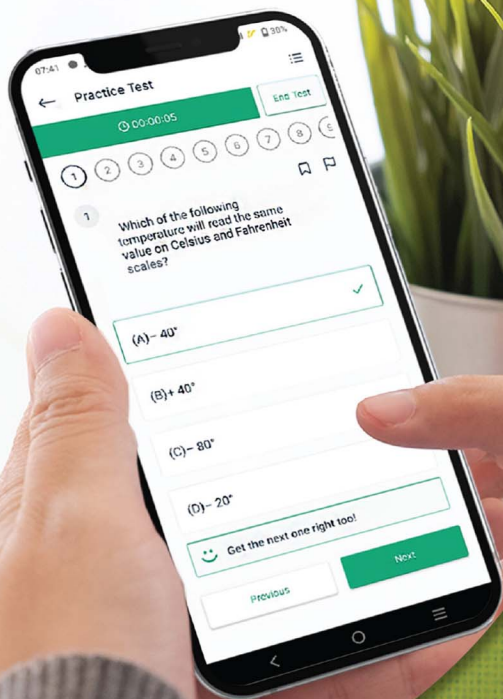(A) $\sqrt{\dfrac{81}{34}}$ (B) 5 (C) $\sqrt{5}$ (D) $\dfrac{3}{2}$

5. For a frequency distribution, standard deviation is computed by applying the formula

(A) $\sigma = \sqrt{\left(\dfrac{\sum fd}{\sum f}\right) - \dfrac{\sum fd^2}{\sum f}}$

(B) $\sigma = \sqrt{\dfrac{\sum fd^2}{\sum f} - \left(\dfrac{\sum fd^2}{\sum f}\right)^2}$

(C) $\sigma = \sqrt{\left(\dfrac{\sum fd}{\sum f}\right)^2 - \dfrac{\sum fd^2}{\sum f}}$

(D) $\sigma = \sqrt{\dfrac{\sum fd^2}{\sum f} - \left(\dfrac{\sum fd}{\sum f}\right)^2}$

6. The means of five observations is 4 and their variance is 5.2. If three of these observations are 1, 2 and 6, then the other two are

(A) 2 and 9 (B) 3 and 8
(C) 4 and 7 (D) 5 and 6

7. One set containing five numbers has mean 8 and variance 18 and the second set containing 3 numbers has mean 8 and variance 24. Then the variance of the combined set of numbers is

(A) 42 (B) 20.25
(C) 18 (D) None of these

Answer Key of the chapter: *Measures of Dispersion* & Evaluation Test is given at the end of the book.

Solutions to the relevant questions of this chapter & Evaluation Test can be accessed by scanning the adjacent QR code in *Quill - The Padhai App.*