CBSE

COMPETENCY Based Questions

MATHEMATICS

1037 Practice Questions

CHAPTERWISE & SUBTOPICWISE FOR SECTION A & E

As per the latest circular and sample paper released by CBSE

TYPES OF QUESTIONS:

- Multiple Choice Questions
- Assertion Reason Questions
- Case/source Based Questions

Class X

Target Publications® Pvt. Ltd.

Written as per Competency Based Assessment adopted by CBSE from (National Education Policy) NEP 2020 for Class X

CBSE
COMPETENCY
Based Questions

MATHEMATICS

(SECTION A & E)

Class X

Salient Features

- Written as per the Latest Syllabus
- Includes '1037' Questions for practice
- Subtopic-wise segregation of questions for efficient practice
- Extensive coverage of **Multiple Choice Questions, Assertion-Reason and Case/Source Based Questions**
- Covers selective Textual Exercise Questions, Exemplar Questions and Previous years Board Questions
- Quick Review of each chapter to facilitate quick revision
- Contains detailed Solutions to difficult MCQs and Assertion & Reason type of questions.
- Includes Selective Solved Questions from Previous Years' Board Papers updated upto year 2023
- Includes selective solved questions from SQP (2022-23 and 2023-24), Practice Questions and Handbook (2022-23) released by CBSE
- 6 Self-Assessment Tests (Solutions can be accessed through QR code)

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

P.O. No. 7822

TEID: 2618

PREFACE

Competency Based Assessment is recently adopted by CBSE from National Education Policy 2020 for Board Examination of Class X. Target's **"CBSE Competency Based Questions Mathematics Class X"** is a complete, thorough, critically analysed, and extensively drafted book to cater to Competency Based Assessment for sections A and E of the Question paper for the Board Examination.

Since Competency Focused Questions in the form of MCQs/Case Based Questions, Source-Based Integrated Questions, or any other type constitute **50%** (40 out of 80 marks) of the weightage of the question paper, we wanted to create a book that would specifically strengthen the competency of students for the two sections consisting of MCQs, Assertion-Reason, and Case/Source Based Questions.

This book aims to provide comprehensive and thorough preparation material of MCQs, Assertion-Reason and Case/Source Based Questions to excel in the exam.

The flow of subtopics within the chapter is purposely kept aligned with the latest NCERT textbook to foster a sense of familiarity in the students. Complete coverage of topics in this book would prove to be a strong source of foundational practise for the Board Examination.

The **Subtopic-wise** segregation for each chapter of this book helps the students practise questions smoothly and at their own pace.

Each chapter begins with **Synopsis** to offer crisp revision to students in efficient form of pointers, tables, charts, etc., followed by a **Quick Review.**

The question types **Multiple Choice Questions, Assertion-Reason** and **Case/Source based Questions** have been specially created and compiled keeping the following objectives in mind: to help students revise concepts as well as prepare them to solve complex questions that require strenuous effort and understanding of multiple-concepts. The assortment of questions also encompasses questions based on real life situations and application based questions and promotes higher order thinking in students.

To aid students, solutions are provided for questions wherever deemed necessary.

Self-Assessment Tests (solutions provided in PDF format via QR codes) placed at the end of the book allow students to gauge their preparedness for each chapter.

We hope that the book builds up the necessary knowledge and skillset in the students required to crack **Multiple Choice Questions, Assertion-Reason** and **Case/Source based Questions** and boosts their confidence required to succeed in the examination.

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

A book affects eternity; one can never tell where its influence stops.

COURSE STRUCTURE 2023 - 24

Units	Unit Name	Marks
I	Number Systems	06
II	Algebra	20
III	Coordinate Geometry	06
IV	Geometry	15
V	Trigonometry	12
VI	Mensuration	10
VII	Statistics and Probability	11
	Total	**80**

Unit I: Number Systems

1. **Real Number** **(15) Periods**
   Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}, \sqrt{3}, \sqrt{5}$

Unit II: Algebra

1. **Polynomials** **(8) Periods**
   Zeros of a polynomial. Relationship between zeros and coefficients of quadratic polynomials.

2. **Pair Of Linear Equations In Two Variables** **(15) Periods**
   Pair of linear equations in two variables and graphical method of their solution, consistency/inconsistency. Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution, by elimination. Simple situational problems.

3. **Quadratic Equations** **(15) Periods**
   Standard form of a quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula. Relationship between discriminant and nature of roots. Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. **Arithmetic Progressions** **(10) Periods**
   Motivation for studying Arithmetic Progression Derivation of the n^{th} term and sum of the first n terms of A.P. and their application in solving daily life problems.

Unit III: Coordinate Geometry

Coordinate Geometry **(15) Periods**
Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula. Section formula (internal division).

Unit IV: Geometry

1. **Triangles** **(15) Periods**
   Definitions, examples, counter examples of similar triangles.

i. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

ii. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.

iii. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.

iv. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.

v. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.

2. Circles **(10) Periods**

Tangent to a circle at, point of contact

i. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.

ii. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

Unit V: Trigonometry

1. Introduction To Trigonometry **(10) Periods**

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios whichever are defined at 0° and 90°. Values of the trigonometric ratios of 30°, 45° and 60°. Relationships between the ratios.

2. Trigonometric Identities **(15) Periods**

Proof and applications of the identity $\sin^2 A + \cos^2 A = 1$. Only simple identities to be given.

3. HEIGHTS AND DISTANCES: Angle Of Elevation, Angle Of Depression. **(10)Periods**

Simple problems on heights and distances. Problems should not involve more than two right triangles. Angles of elevation / depression should be only 30°, 45°, and 60°.

Unit VI: Mensuration

1. Areas Related To Circles **(12) Periods**

Area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only.

2. Surface Areas And Volumes **(12) Periods**

Surface areas and volumes of combinations of any two of the following: cubes, cuboids, spheres, hemispheres and right circular cylinders/cones.

Unit VII: Statistics And Probability

1. Statistics **(18) Periods**

Mean, median and mode of grouped data (bimodal situation to be avoided).

2. Probability **(10) Periods**

Classical definition of probability. Simple problems on finding the probability of an event.

MATHEMATICS-Standard
QUESTION PAPER DESIGN
CLASS – X (2023-24)

Time: 3 Hours **Max. Marks: 80**

Sr. no.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	43	54
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	19	24
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	18	22
	Total	**80**	**100**

Intermal Assessment	**20 Marks**
Pen Paper Test and Multiple Assessment (5 + 5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks

MATHEMATICS-Basic
QUESTION PAPER DESIGN
CLASS – X (2023-24)

Time: 3 Hours **Max. Marks: 80**

Sr. no.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	60	75
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	12	15
3	**Analysing :** Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions	8	10
	Total	**80**	**100**

Intermal Assessment	**20 Marks**
Pen Paper Test and Multiple Assessment (5 + 5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks

CONTENTS

Note: **1.** **** mark represents Textual question.***
2. ***⌘ mark represents NCERT Exemplar question.***

CHAPTER 1

Real Numbers

Content and Concepts

Synopsis

1.1 The Fundamental Theorem of Arithmetic

Theorem 1.1:

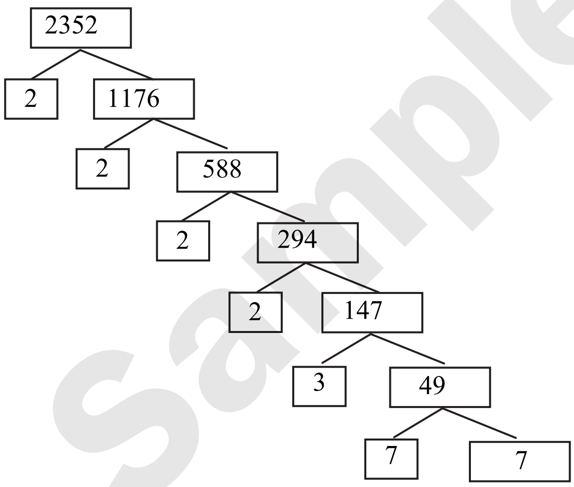
Every composite number can be expressed (factorised) as a product of primes and this factorisation is unique, apart from the order in which the prime factors occur.

This fundamental theorem of arithmetic helps us to find HCF and LCM of the numbers.

This method is also called the **prime factorisation method**.

Example:

Consider a composite number 2352.



$\Rightarrow$ Prime factorization of 2352 is

$$2352 = 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7$$
$$= 2^4 \times 3 \times 7^2$$

HCF and LCM:

HCF = Product of the smallest power of each common prime factor in the numbers.

LCM = Product of the greatest power of each prime factor in the numbers.

Relation between HCF and LCM of any two positive integers:

For any two positive integers a and b, HCF $(a, b) \times$ LCM $(a, b) = a \times b$

Things to Remember

- HCF of two numbers is always a factor of their LCM.
- LCM is always a multiple of HCF.
- HCF $(p, q, r) \times$ LCM $(p, q, r) \neq p \times q \times r$, where p, q, r are positive integers. However, the following results hold good for three numbers p, q and r:

  LCM (p, q, r)
  $$= \frac{p.q.r.\text{HCF}(p,q,r)}{\text{HCF}(p,q).\text{HCF}(q,r).\text{HCF}(p,r)}$$
  HCF (p, q, r)
  $$= \frac{p.q.r.\text{LCM}(p,q,r)}{\text{LCM}(p,q).\text{LCM}(q,r).\text{LCM}(p,r)}$$

1.2 Revisiting Irrational Numbers

Rational Number:

A number r is called a rational number, if it can be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Examples:

$-1, 0, \frac{2}{3}, \frac{3}{5}, 1$, etc are rational numbers.

Irrational Number:

A number s is called a irrational number, if it cannot be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Examples:

$\sqrt{3}$, $\sqrt{5}$, $2+\sqrt{8}$, π, $-\sqrt{3}$, $-\sqrt{5}$ etc. are irrational numbers.

Theorem 1.2:
Let p be a prime number. If p divides a^2, then p divides a, where a is a positive integer.

Example:
Let prime number p be 5 and $a = 15$

$\Rightarrow\ a^2 = 225$

Here, p divides a^2 i.e., $\frac{a^2}{p} = \frac{225}{5} = 45$

$\Rightarrow p$ divides a i.e., $\frac{a}{p} = \frac{15}{5} = 3$

Quick Review

Real Numbers

The Fundamental Theorem of Arithmetic

Every composite number can be expressed (factorised) as a product of primes and this factorisation is unique, apart from the order in which the prime factors occur.

Example:
$60 = 2 \times 2 \times 3 \times 5$

Relation between LCM and HCF of two numbers

For any two positive integers a and b
HCF $(a, b) \times$ LCM $(a, b) = a \times b$

Competency Based Questions

1.1 The Fundamental Theorem of Arithmetic

Multiple Choice Questions

1. 225 can be expressed as ***[CBSE (Basic) 2020]***
   (A) 5×3^2 (B) $5^2 \times 3$
   (C) $5^2 \times 3^2$ (D) $5^3 \times 3$

2. If prime factorization of 7560 is expressible as $2^3 \times 3^p \times q \times 7$, then the values of p and q are respectively ____ and _____.
   (A) 2, 3 (B) 5, 3
   (C) 3, 5 (D) 5, 2

3. Least prime factor of m is 17 and least prime factor of n is 11, then the least prime factor of m + n = ___.
   (A) 2
   (B) 5
   (C) 143
   (D) Cannot be determined

4. HCF of 144 and 198 is ***[CBSE(Basic) 2020]***
   (A) 9 (B) 18 (C) 6 (D) 12

5. $\sqrt{n}$ is a natural number such that $n > 1$. Which of these can DEFINITELY be expressed as a product of primes?
   [CBSE Competency Focused Practice Questions 2022-23]
   i. $\sqrt{n}$ ii. n iii. $\frac{\sqrt{n}}{2}$
   (A) only (ii)
   (B) only (i) and (ii)
   (C) all (i), (ii) and (iii)
   (D) cannot be determined without knowing n

6. The HCF and the LCM of 12, 21, 15 respectively are ***[CBSE (Standard) 2020]***
   (A) 3, 140 (B) 12, 420
   (C) 3, 420 (D) 420, 3

⌘7. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then HCF (a, b) is
   (A) xy (B) xy^2
   (C) x^3y^3 (D) x^2y^2

⌘8. If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; a, b being prime numbers, then LCM (p, q) is
   (A) ab (B) a^2b^2
   (C) a^3b^2 (D) a^3b^3

9. LCM of $2^3 \times 3^2$ and $2^2 \times 3^3$ is ***[CBSE 2012]***
   (A) 2^3 (B) 3^3
   (C) $2^3 \times 3^3$ (D) $2^2 \times 3^2$

10. The total number of factors of a prime number is ***[CBSE (Standard) 2020]***
   (A) 1 (B) 0
   (C) 2 (D) 3

11. If ‘n’ is a natural number, then which of the following numbers end with zero? ***[CBSE (Standard) 2023]***
   (A) $(3 \times 2)^n$ (B) $(2 \times 5)^n$
   (C) $(6 \times 2)^n$ (D) $(5 \times 3)^n$

12. Find the product of HCF and LCM for the numbers 45 and 105.
   (A) 4275 (B) 4725
   (C) 4525 (D) 4755

13. If the product of two numbers is 3240 and their LCM is 360, find their HCF.
(A) 6 (B) 5
(C) 10 (D) 9

14. Given that LCM (91, 26) = 182, then HCF (91, 26) is ***[CBSE 2011]***
(A) 13 (B) 26
(C) 7 (D) 9

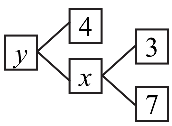
15. Two positive numbers have their HCF as 12 and their product as 6336. The number of pairs possible for the numbers is:
[CBSE 2021 - 22]
(A) 2 (B) 3 (C) 4 (D) 1

⌘16. If the HCF of 65 and 117 is expressible in the form $65m - 117$, then the value of m is
(A) 4 (B) 2 (C) 1 (D) 3

17. If the HCF of 55 and 99 is expressible in the form $55m - 99$, then the value of m is
[CBSE 2011]
(A) 4 (B) 2
(C) 1 (D) 3

18. If the HCF of 567 and 693 is expressible in the form $567x + 693 \times (-4)$, find x.
(A) 4 (B) 2
(C) 5 (D) 3

19. The values of x and y in the given figure are



(A) $x = 10; y = 14$ (B) $x = 21; y = 84$
(C) $x = 21; y = 25$ (D) $x = 10; y = 40$

20. For any natural number n, 8^n does not end with which of the following digits?
(A) 6 (B) 4
(C) 2 (D) 5

21. Express $5 \times 11 \times 13 + 13$ as a product of primes.
(A) $2^3 \times 7 \times 13$ (B) $3^2 \times 7 \times 13$
(C) $2^3 \times 5 \times 13$ (D) $5 \times 11 \times 13$

22. Let p be a prime number and k be a positive integer. If p divides k^2, then which of these is DEFINITELY divisible by p?

$\frac{k}{2}$	k	$7k$	k^3

[CBSE Competency Focused Practice Questions 2022-23]
(A) only k
(B) only k and $7k$
(C) only k, $7k$ and k^3
(D) all $\frac{k}{2}$, k, $7k$ and k^3

⌘23. The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
(A) 10 (B) 100
(C) 504 (D) 2520

24. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 24 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?
(A) 48 (B) 54
(C) 72 (D) 36

25. Three bells toll at intervals of 12, 15, 18 minutes respectively. If they start tolling together, after how many minutes they next toll together?
(A) 60 (B) 180
(C) 90 (D) 108

26. Find the smallest number which when increased by 11 is exactly divisible by both 198 and 486.
(A) 10681 (B) 5335
(C) 5346 (D) 16027

27. For a morning walk, three persons steps off together. Their steps measure 80 cm, 85 cm and 90 cm respectively. What is the minimum distance each should walk to show that they can cover the distance in complete steps?
(A) 12325 cm (B) 12330 cm
(C) 12240 cm (D) 12320 cm

28. Find the smallest number which leaves remainders 18 when divided by 27 and 33.
(A) 297 (B) 279
(C) 315 (D) 612

29. Find the greatest 5 digits number exactly divisible by 20, 18 and 28.
(A) 99540 (B) 98280
(C) 97020 (D) 99560

30. Find the smallest 6 digits number exactly divisible by 20, 18 and 28.
(A) 102060 (B) 100800
(C) 100080 (D) 100818

31. Find the greatest 4 digits number which leaves remainder 12 when divided by 105, 175 and 70.
(A) 9987 (B) 9462
(C) 9998 (D) 9963

32. Find the smallest 5 digits number which leaves remainder 12 when divided by 105, 175 and 70.
(A) 10500 (B) 11562
(C) 10512 (D) 11550

⌘33. The largest number which divides 70 and 125, leaving remainders 5 and 8, respectively, is
(A) 13 (B) 65
(C) 875 (D) 1750

34. A school library has 280 science journals and 300 maths journals. Students were told to stack these journals in such a way that each stack contains equal number of journals. Then the numbers of stacks of science and maths journals respectively are ____.
(A) 14 and 15 (B) 15 and 14
(C) 28 and 20 (D) 20 and 28

35. Find the maximum number of students among whom 2002 books and 1040 notebooks can be distributed in such a way that each student gets the same number of books and the same number of notebooks.
(A) 39 (B) 13 (C) 26 (D) 52

36. Find the least number of square tiles required to cover the floor of 630 m long and 531 m broad.
(A) 9 (B) 4130
(C) 81 (D) 2360

37. Let a and b be two positive integers such that $a = p^3q^4$ and $b = p^2q^3$, where p and q are prime numbers. If HCF(a, b) = p^mq^n and LCM(a, b) = p^rq^s, then $(m + n)(r + s)$ =
[CBSE SQP (Standard) 2022 – 23]
(A) 15 (B) 30 (C) 35 (D) 72

Assertion & Reason

For question numbers 38 to 40, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.

38. **Assertion (A) :** If two numbers have 18 as their HCF, then 380 can't be their LCM.
Reason (R) : LCM × HCF = Product of two numbers

39. **Assertion (A) :** Prime factorisation of 7650 is $2 \times 3 \times 5^2 \times 17$.
Reason (R) : Prime factorisation of 6006 is $2 \times 3 \times 7 \times 11 \times 13$.

40. **Assertion (A) :** If product of two numbers is 5780 and their HCF is 17, then their LCM is 340
Reason (R) : HCF is always a factor of LCM
[CBSE SQP (Standard) 2022 – 23]

Case / Source Based Questions

41. To enhance the reading skills of grade V students, the school nominates you and two of your friends to set up a class library. There are two sections- section A and section B of grade V. There are 48 students in section A and 54 students in section B.

i.. Write 54 as a product of its primes.

ii. What is the minimum number of books you will acquire for the class library, so that they can be distributed equally among students of Section A or Section B?

OR

ii. After reading activity, students are supposed to submit the books at library counters in their respective sections. On each counter same number at students are to be attended. Find the maximum number of students that can be attended on each counter.

iii. $2 \times 3 \times 5 \times 7 \times 11 + 11$ is a
(A) Prime number
(B) Composite number
(C) Neither prime nor composite
(D) None of the above

42. A seminar is being conducted by an Educational Organization, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 65, 91 and 117 respectively.

i. In each room, the same number of participants are to be seated and all of them being in the same subject, hence find the maximum number participants that can accommodated in each room.

ii. What is the minimum number of rooms required during the event?

OR

ii. The LCM of 65, 91 and 117 is

iii. The product of HCF and LCM of 65, 91 and 117 is

(A) 692055 (B) 35360
(C) 45500 (D) 53235

1.2 Revisiting Irrational Numbers

Multiple Choice Questions

1. Sum of the two rational numbers is
   (A) always irrational.
   (B) always rational.
   (C) either rational or irrational.
   (D) always non-zero.

2. The sum of two irrational numbers is
   (A) always irrational.
   (B) always rational.
   (C) either rational or irrational.
   (D) always non-zero.

3. The sum of a rational and an irrational numbers is
   (A) is always irrational.
   (B) is always rational.
   (C) is either rational or irrational.
   (D) is always positive.

⌘4. The product of a nonzero rational and an irrational number is
   (A) always irrational.
   (B) always rational.
   (C) rational or irrational.
   (D) one.

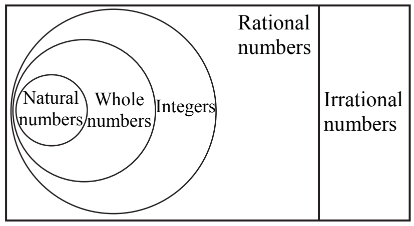
5. The reciprocal of an irrational number is ***[CBSE 2012]***
   (A) an integer (B) a rational
   (C) a natural number (D) an irrational

6. The product of two irrational numbers is ***[CBSE 2012]***
   (A) always a rational.
   (B) always an irrational.
   (C) one.
   (D) always a non-zero number.

7. $\pi - \dfrac{22}{7}$ is ***[CBSE 2012]***
   (A) a rational number.
   (B) an irrational number.
   (C) a prime number.
   (D) an even number.

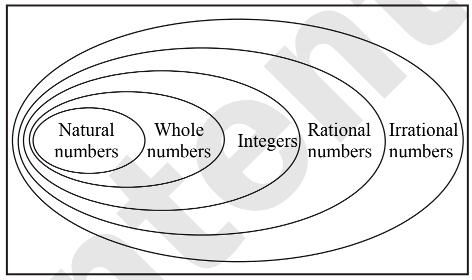
8. Two representations of real numbers are shown below.

Real numbers



Representation 1

Real numbers



Representation 2

Which one is correct?
   (A) Representation 1
   (B) Representation 2
   (C) Both
   (D) None

9. Find the smallest natural number which divides 2205 to make its square root a rational number.
   (A) 3 (B) 5 (C) 9 (D) 15

Assertion & Reason

For question numbers 10 to 11, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is true, but Reason (R) is false.
(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A) :** $\dfrac{1}{\sqrt{2}}$ is a rational number.
    Reason (R) : The reciprocal of an irrational number is an irrational.

11. **Assertion (A) :** $\sqrt{3}$ is an irrational number.
    Reason (R) : Square root of a prime number is rational.

Answer key and Solutions

1.1 The Fundamental Theorem of Arithmetic

1. (C)
$225 = 3 \times 3 \times 5 \times 5 = 5^2 \times 3^2$

2. (C)
$7560 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 7$
$= 2^3 \times 3^3 \times 5 \times 7$
$\Rightarrow$ $p = 3$ and $q = 5$

3. (A)
17 and 11 are the least prime factors of m and n respectively.
i.e., 2 is not the prime factor of both the numbers.
$\Rightarrow$ m and n are odd numbers.
$\Rightarrow$ m + n is an even number.
$\Rightarrow$ 2 is the least prime factor of m + n.

4. (B)
$144 = 2^4 \times 3^2$
$198 = 2 \times 3^2 \times 11$
HCF $(26, 91) = 2 \times 3^2 = 18$

5. (B)
Given that $\sqrt{n}$ is a natural number.
$\Rightarrow$ $\sqrt{n}$ can be expressed as a product of primes.
$\Rightarrow$ (i) is true.
Also, n is a perfect square.
$\Rightarrow$ n also can be expressed as a product of prime numbers.
$\Rightarrow$ (ii) is true.
If $\sqrt{n}$ is an odd number then $\frac{\sqrt{n}}{2}$ cannot be express as a product of primes.
$\Rightarrow$ (iii) is not always true.

6. (C)
$12 = 2^2 \times 3$
$21 = 3 \times 7$
$15 = 3 \times 5$
HCF $(12, 21, 15) = 3$
LCM $(12, 21, 15) = 2^2 \times 3 \times 5 \times 7 = 420$

7. (B) **8. (C)**

9. (C) **10. (C)**

11. (B)

12. (B)
HCF × LCM = product of two numbers
$\Rightarrow$ HCF × LCM $= 45 \times 105$
$= 4725$

13. (D)
HCF × LCM = product of two numbers
$\Rightarrow$ HCF $\times 360 = 3240$
$\Rightarrow$ HCF $= \frac{3240}{360} = 9$

14. (A)
We know that LCM × HCF = Product of two numbers
$\therefore$ $182 \times$ HCF $= 91 \times 26$
$\therefore$ $7 \times$ HCF $= 91$
$\therefore$ HCF = 13

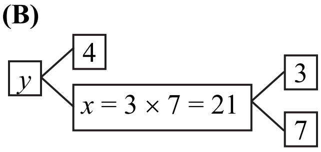
15. (A)
Product = 6336, HCF = 12
Let the numbers be $12x$ and $12y$, where x and y are co-primes.
Product = 6336
$\Rightarrow (12x)(12y) = 6336$
$\Rightarrow xy = \frac{6336}{12 \times 12} = 44$
As x and y are co-primes,
Possible pairs are (1, 44) and (4, 11)

16. (B)
$65 = 5 \times 13$
$117 = 3^2 \times 13$
HCF (65, 117) = 13
$\therefore$ $13 = 65m - 117$
$\therefore$ $65m = 130$
$\therefore$ $m = 2$

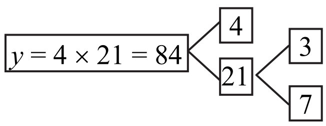
17. (B)
$55 = 5 \times 11$
$99 = 3^2 \times 11$
HCF (55, 99) = 11
$\therefore$ $11 = 55m - 99$
$\therefore$ $55m = 110$
$\therefore$ $m = 2$

18. (C)
$567 = 3^4 \times 7$
$693 = 3^2 \times 7 \times 11$
HCF $(567, 693) = 3^2 \times 7 = 63$
$\therefore$ $63 = 567x + 693 \times (-4)$
$\therefore$ $567x = 2835$
$\therefore$ $x = 5$

19. (B)



$\therefore$



20. **(D)**

If the number 8^n, for any natural number n, ends with the digit five, then it is divisible by 5. That is, the prime factorization of 8^n contains the prime 5. This is not possible because prime factorisation of $8^n = (2^3)^n = 2^{3n}$; so the only prime in the factorisation of 8^n is 2 and the uniqueness of the fundamental theorem of arithmetic guarantees that there are no other primes in the factorization of 8^n.

So, there is no natural number n for which 8^n ends with the digit five.

21. **(A)**

$5 \times 11 \times 13 + 13 = (5 \times 11 + 1) \times 13$
$= (55 + 1) \times 13 = 56 \times 13$
$= (2 \times 2 \times 2 \times 7) \times 13$
$= 2^3 \times 7 \times 13$

22. **(C)**

Given that k^2 is divisible by prime number p

$\Rightarrow k^2 = p \times n$

…[where n is some positive integer]

$\Rightarrow k \times k = p \times n$

$\Rightarrow k = p \times \dfrac{n}{k}$

$\Rightarrow k = p \times m$

$\ldots\left[\begin{array}{l}\text{where } m = \dfrac{n}{k} \text{ and m is a positive integer,} \\ \text{as } p \text{ is a prime number } \Rightarrow \text{ k is the factor of n}\end{array}\right]$

$\Rightarrow k$, $7k$ and k^3 are divisible by p.

23. **(D)**

Method I

Note that option (A) and (B) are not divisible by 3 and option (C) is not divisible by 5.

Whether option (D) is divisible by all numbers from 1 to 10.

Method II

$1 = 1$
$2 = 2$
$3 = 3$
$4 = 2^2$
$5 = 5$
$6 = 2 \times 3$
$7 = 7$
$8 = 2^3$
$9 = 3^2$
$10 = 2 \times 5$

$\therefore$ L.C.M. $= 2^3 \times 3^2 \times 5 \times 7 = 2520$

24. **(C)**

$18 = 2 \times 3 \times 3 = 2 \times 3^2$
$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

$\therefore$ Required time = LCM (18, 24) $= 2^3 \times 3^2 = 72$

$\Rightarrow$ Sonia and Ravi will meet again at the starting point after 72 minutes.

25. **(B)**

$12 = 2 \times 2 \times 3 = 2^2 \times 3$
$15 = 3 \times 5$
$18 = 2 \times 3^2$

$\therefore$ Required time = LCM (9, 12, 15)
$= 2^2 \times 3^2 \times 5 = 180$

$\Rightarrow$ The bells toll together after 180 minutes.

26. **(B)**

We first find the smallest number divisible by both 198 and 486, i.e., LCM (198, 486).

$198 = 2 \times 3^2 \times 11$
$486 = 2 \times 3^5$

$\therefore$ LCM (198, 486) $= 2 \times 3^5 \times 11 = 5346$

$\therefore$ Required number $= 5346 - 11 = 5335$

27. **(C)**

$80 = 2 \times 2 \times 2 \times 2 \times 5 = 2^4 \times 5$
$85 = 5 \times 17$
$90 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5$

$\therefore$ Required distance = LCM (80, 85, 90)
$= 2^4 \times 3^2 \times 5 \times 17 = 12240$

$\Rightarrow$ Each person should walk a minimum distance of 12240 cm in complete steps.

28. **(C)**

We first find the smallest number divisible by both 27 and 33, i.e., LCM (27, 33).

$27 = 3^3$
$33 = 3 \times 11$

$\therefore$ L.C.M (27, 33) $= 3^3 \times 11 = 297$

$\therefore$ Required number $= 297 + 18 = 315$

29. **(A)**

We first find the smallest number divisible by 20, 18 and 28, i.e., LCM (20, 18 and 28).

$20 = 2^2 \times 5$
$18 = 2 \times 3^2$
$28 = 2^2 \times 7$

LCM (20, 18 and 28) $= 2^2 \times 3^2 \times 5 \times 7 = 1260$

99999 is the greatest 5 digit number.

Note that $99999 = 1260 \times 79 + 459$

i.e., $1260 \times 79 = 99540$ (5 digit number)

and $1260 \times 80 = 100800$ (6 digit number)

$\therefore$ 99540 is the greatest 5 digits number which is exactly divisible by 20, 18 and 28.

30. **(B)**

We first find the smallest number divisible by 20, 18 and 28, i.e., LCM (20, 18 and 28).

$20 = 2^2 \times 5$
$18 = 2 \times 3^2$
$28 = 2^2 \times 7$

LCM (20, 18 and 28) $= 2^2 \times 3^2 \times 5 \times 7 = 1260$

99999 is the greatest 5 digit number.

Note that $99999 = 1260 \times 79 + 459$

i.e., $1260 \times 79 = 99540$ (5 digit number)

and $1260 \times 80 = 100800$ (6 digit number)

$\therefore$ 100800 is the smallest 6 digits number which is exactly divisible by 20, 18 and 28.

31. (B)

We first find the smallest number divisible by 105, 175 and 70, i.e., LCM (105, 175 and 70).

$105 = 3 \times 5 \times 7$

$175 = 5^2 \times 7$

$70 = 2 \times 5 \times 7$

LCM (105, 175 and 70) $= 2 \times 3 \times 5^2 \times 7 = 1050$

9999 is the greatest 4 digit number.

Note that $9999 = 1050 \times 9 + 549$

i.e., $1050 \times 9 = 9450$ (4 digit number)

and $1050 \times 10 = 10500$ (5 digit number)

$\therefore$ 9450 is the greatest 4 digits number which is exactly divisible by 105, 175 and 70.

$\therefore$ Required number $= 9450 + 12 = 9462$

32. (C)

We first find the smallest number divisible by 105, 175 and 70, i.e., LCM (105, 175 and 70).

$105 = 3 \times 5 \times 7$

$175 = 5^2 \times 7$

$70 = 2 \times 5 \times 7$

LCM (105, 175 and 70) $= 2 \times 3 \times 5^2 \times 7 = 1050$

9999 is the greatest 4 digit number.

Note that $9999 = 1050 \times 9 + 549$

i.e., $1050 \times 9 = 9450$ (4 digit number)

and $1050 \times 10 = 10500$ (5 digit number)

$\therefore$ 10500 is the smallest 5 digits number which is exactly divisible by 105, 175 and 70.

$\therefore$ Required number $= 10500 + 12 = 10512$

33. (A)

$70 - 5 = 65$

$125 - 8 = 117$

Note that: Required number = HCF(65, 117)

$65 = 5 \times 13$

$117 = 3^2 \times 13$

$\therefore$ Required number = HCF(65, 117) = 13

34. (A)

Each stack contains equal number of journals.

$\Rightarrow$ Number of journals in each stack

= HCF (280, 300)

$280 = 2 \times 2 \times 2 \times 5 \times 7 = 2^3 \times 5 \times 7$

$300 = 2 \times 2 \times 5 \times 5 \times 3 = 2^2 \times 5^2 \times 3$

$\Rightarrow$ HCF (280, 300) $= 2^2 \times 5 = 20$

$\Rightarrow$ Number of stacks of science journals $= \frac{280}{20} = 14$

Number of stacks of maths journals $= \frac{300}{20} = 15$

35. (C)

$2002 = 2 \times 7 \times 11 \times 13$

$1040 = 2^4 \times 5 \times 13$

Required number of students

= HCF (2003, 1040)

$= 2 \times 13 = 26$

36. (B)

$630 = 2 \times 3^2 \times 5 \times 7$

$531 = 3^2 \times 59$

Largest possible length of the side of the square tile = HCF (630, 531) $= 3^2 = 9$ m

$\therefore$ Maximum size of a tile $= 9 \times 9$

Size of the floor $= 630 \times 531$

$\therefore$ Required number of tiles $= \frac{630 \times 531}{9 \times 9}$

$= 4130$

37. (C)

HCF$(a, b) = p^2q^3$

$\Rightarrow p^mq^n = p^2q^3$

$\Rightarrow m = 2, n = 3$ and

LCM$(a, b) = p^3p^4$

$\Rightarrow p^rq^s = p^3q^4$

$\Rightarrow r = 3, s = 4$

$\therefore$ $(m + n)(r + s) = (2 + 3)(3 + 4)$

$= 5 \times 7 = 35$

38. (B)

HCF of two numbers is always a factor of their LCM.

18 is not a factor of 380.

$\therefore$ 380 can't be their LCM.

39. (D)

Prime factorisation of 7650 is $2 \times 3^2 \times 5^2 \times 17$

Prime factorisation of 6006 is $2 \times 3 \times 7 \times 11 \times 13$

40. (B)

Product of the two numbers = LCM $\times$ HCF

$\therefore$ $5780 = 17 \times$ LCM

$\therefore$ LCM $= \frac{5780}{17}$

$= 340$

41.

i. $54 = 2 \times 3 \times 3 \times 3 = 2 \times 3^3$

ii. $48 = 2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$

$54 = 2 \times 3 \times 3 \times 3 = 2 \times 3^3$

$\therefore$ Required number of books = LCM (48, 54)

$= 2^4 \times 3^3 = 432$

$\therefore$ Minimum 432 books are to be acquired for the class library.

OR

ii. $48 = 2^4 \times 3$

$54 = 2 \times 3^3$

Maximum number of students that can be attended on each counter = HCF(48, 54)

$= 2 \times 3 = 6$

$\therefore$ Maximum 6 students can be attended on each counter.

iii. **(B)**
$2 \times 3 \times 5 \times 7 \times 11 + 11$
$= (2 \times 3 \times 5 \times 7 \times 1 + 1) \times 11$
$= (210 + 1) \times 11$
$= 211 \times 11$
It is a composite number.

42.
i. $65 = 5 \times 13$
$91 = 7 \times 13$
$117 = 3^2 \times 13$
Maximum number participants that can accommodated in each room
= HCF (65, 91, 117)
= 13

ii. Total number of participants = 65 + 91 + 117
= 273
If maximum number participants that can accommodated in each room are 13, then minimum number of rooms required = $\frac{273}{13} = 21$

OR

ii. LCM (65, 91, 117) = $3^2 \times 5 \times 7 \times 13 = 4095$

iii. **(D)**
HCF (65, 91, 117) = 13
LCM (65, 91, 117) = 4095
$\therefore$ Required product = 53235

1.2 Revisiting Irrational Numbers

1. **(B)**

2. **(C)**
Note that $\sqrt{2}$ is an irrational number.
So, $-\sqrt{2}$ is also an irrational number.
But $\sqrt{2} + \sqrt{2} = 2\sqrt{2}$, an irrational number.
And $\sqrt{2} - \sqrt{2} = 0$, a rational number.

3. **(A)** **4.** **(A)**

5. **(D)** **6.** **(D)**

7. **(B)**
Note that the sum of a rational and an irrational numbers is an irrational number.
As π is an irrational number and $-\frac{22}{7}$ is a rational number, their sum is an irrational number.

8. **(A)**

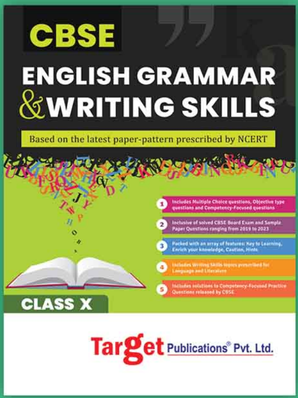
9. **(B)**
Note that: Square root of a number which is not a perfect square is always irrational.
$2205 = 441 \times 5$
$= 3^2 \times 5 \times 7^2$
In order to make 2205 a perfect square we need to divide by 5.
$\frac{2205}{5} = 441$, which is a perfect square.
$\Rightarrow$ The smallest natural number which divides 2205 to make its square root a rational number is 5.

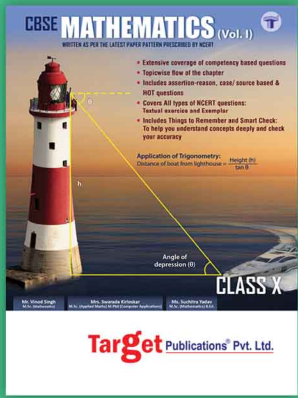
10. **(D)**
We know that $\sqrt{2}$ is an irrational number and the reciprocal of an irrational number is an irrational.
$\therefore$ $\frac{1}{\sqrt{2}}$ is an irrational number.

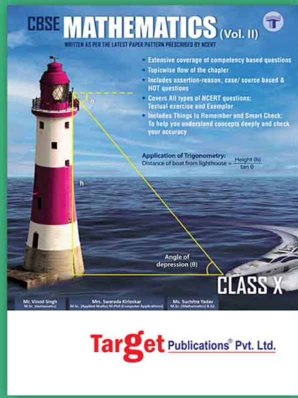
11. **(C)**
Let p be a prime number.
Let us assume that $\sqrt{p}$ is rational.
So, we can find coprime integers a and $b(b \neq 0)$ such that $\sqrt{p} = \frac{a}{b}$
$\Rightarrow \sqrt{p}\, b = a$
$\Rightarrow pb^2 = a^2$ …(i) [Squaring both the sides]
$\Rightarrow a^2$ is divisible by p
$\Rightarrow a$ is divisible by p
So, we can write $a = pc$ for some integer c.
$\Rightarrow a^2 = p^2c^2$ …[Squaring both the sides]
$\Rightarrow pb^2 = p^2c^2$ …[From (i)]
$\Rightarrow b^2 = pc^2$
$\Rightarrow b^2$ is divisible by p
$\Rightarrow b$ is divisible by p
$\Rightarrow p$ divides both a and b.
$\Rightarrow a$ and b have at least p as a common factor.
But this contradicts the fact that a and b are coprime.
This contradiction arises because we have assumed that $\sqrt{p}$ is rational.
$\Rightarrow$ $\sqrt{p}$ is irrational.
i.e., square root of a prime number is irrational.
$\therefore$ $\sqrt{3}$ is an irrational number, as 3 is a prime.

AVAILABLE BOOKS FOR CLASS X :

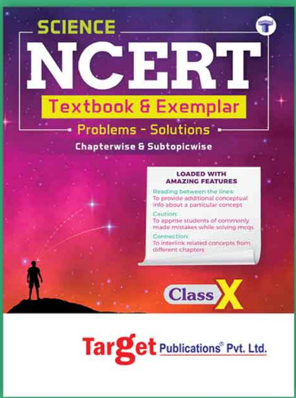
CBSE NOTES

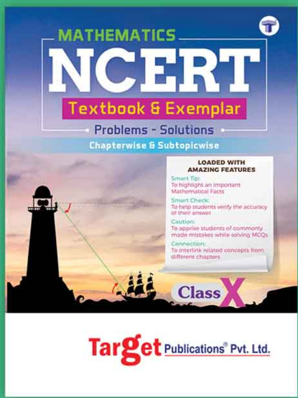




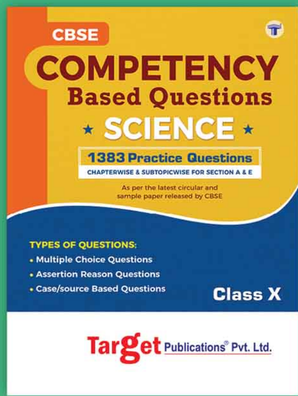


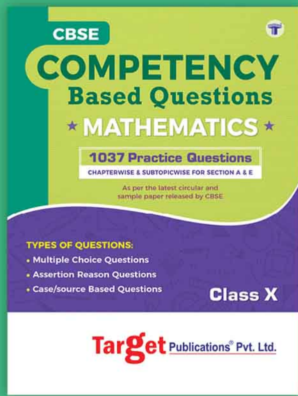
NCERT TEXTBOOK & EXEMPLAR





CBSE COMPETENCY BASED QUESTIONS





Scan the QR code to buy e-book version of Target's Notes on Quill - The Padhai App

Visit Our Website

Target Publications® Pvt. Ltd.
Transforming lives through learning.

Address:
2nd floor, Aroto Industrial Premises CHS,
Above Surya Eye Hospital, 63-A, P. K. Road,
Mulund (W), Mumbai 400 080

Tel: 88799 39712 / 13 / 14 / 15
Website: www.targetpublications.org
Email: mail@targetpublications.org

Explore our range of **STATIONERY**