CHAPTER TEST: NUMBER SYSTEM
Mathematics | Class IX (2026/NumSys/09/001)
Time: 1.5 Hours **Max. Marks: 40**

GENERAL INSTRUCTIONS

– All questions are compulsory.

– The question paper consists of **five sections: A, B, C, D, and E**.

– Section A contains **8 Multiple Choice Questions (MCQs)** of **1 mark each**.

– Section B contains **4 Very Short Answer questions** of **2 marks each**.

– Section C contains **3 Short Answer questions** of **3 marks each**.

– Section D contains **2 Long Answer questions** of **5 marks each**.

– Section E contains **1 Case Study–based question** of **5 marks**.

– Use of calculators or any electronic devices is **not permitted**, unless stated otherwise.

– All necessary working steps must be clearly shown for full marks.

– The use of appropriate units and correct mathematical symbols is compulsory.

Section A (Multiple Choice Questions)

1. Every rational number is:
   (a) a natural number
   (b) an integer
   (c) a real number
   (d) a whole number

2. Between two rational numbers, there exist:
   (a) no rational number
   (b) exactly one rational number
   (c) infinitely many rational numbers
   (d) only irrational numbers

3. The decimal representation of an irrational number is always:
   (a) terminating
   (b) non-terminating repeating
   (c) non-terminating non-repeating
   (d) terminating repeating

4. Which of the following is an irrational number?

(a) $\sqrt{16}$
(b) $\sqrt{12}/\sqrt{3}$
(c) 0.14
(d) $0.4040040004\ldots$

5. The value of $0.999\ldots$ in the form p/q, where p and q are integers and $q \neq 0$, is:

(a) 9/10
(b) 1
(c) 1/9
(d) 8/9

6. A rational number between $\sqrt{2}$ and $\sqrt{3}$ is:

(a) $(\sqrt{2}+\sqrt{3})/2$
(b) $\sqrt{2} \times \sqrt{3}$
(c) 1.5
(d) 1.8

7. If n is a natural number, then $\sqrt{n}$ is:

(a) always a natural number
(b) always a rational number
(c) always an irrational number
(d) either a natural number or an irrational number

8. The sum of a non-zero rational number and an irrational number is always:

(a) rational
(b) irrational
(c) a whole number
(d) a natural number

Section B (Very Short Answer Questions)

1. Find two rational numbers between 1/4 and 1/3 by using the mean method. (2)
2. Represent $\sqrt{5}$ on the number line using a compass and ruler. (Briefly state the steps of construction). (2)
3. Examine whether $(3+\sqrt{23})-\sqrt{23}$ and $2\pi - 2$ are rational or irrational. (2)
4. Express $0.2\overline{35}$ in the form p/q, where $p, q \in \mathbb{Z}$ and $q \neq 0$. (2)

Section C (Short Answer Questions)

1. Prove that $\sqrt{3}$ is an irrational number. (3)
2. Visualise the representation of 4.673 on the number line using successive magnification. (3)
3. Show that a number whose decimal expansion is $0.1010010001\ldots$ is irrational. Compare this with $0.\overline{10}$ and explain the fundamental difference in their decimal structures. (3)

Section D (Long Answer Questions)

1. Describe the Square Root Spiral method. Using this method, explain how to construct the location of $\sqrt{2}, \sqrt{3}$, and $\sqrt{4}$ on a single diagram. Why is this construction based on the Pythagoras Theorem? (5)

2. If a and b are rational numbers, find the values of a and b in the following equality:

$$\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a + b\sqrt{3}$$

(5)

Section E (Case Study Based Question)

Case Study: The Geometry of Irrigation
In a rural development project in Punjab, a farmer named Harpreet wants to divide his square field into different sections for multi-cropping. To design an efficient drip irrigation system, he uses a coordinate-like mapping on his field. He marks the corner of his field as the origin $(0, 0)$. He needs to place a water pump at a point that represents a distance of $\sqrt{10}$ units from the origin along a straight line to reach the center of a circular pond. He realizes that while whole numbers represent the boundary pillars, the diagonal distances often result in values that cannot be expressed as simple fractions. He consults a local engineer who explains that these "non-terminating, non-recurring" distances are essential for precise geometric layouts. The engineer helps Harpreet understand that these values, along with rational numbers, form the complete set of real numbers used in modern land measurement and GPS technology.

Based on the above information, answer the following questions:

1. To represent $\sqrt{10}$ on the number line, which integer coordinates (x, y) could Harpreet use as base and perpendicular in Pythagoras theorem?
   (a) 1 and 2
   (b) 3 and 1
   (c) 2 and 2
   (d) 5 and 5

2. The distance $\sqrt{10}$ falls between which two consecutive natural numbers?
   (a) 2 and 3
   (b) 3 and 4
   (c) 4 and 5
   (d) 9 and 11

3. The engineer mentioned "non-terminating, non-recurring" decimals. These are:
   (a) Integers
   (b) Rational Numbers
   (c) Irrational Numbers
   (d) Whole Numbers

4. If Harpreet measures a distance of $3.333\ldots$ meters, this distance is:

   (a) Rational
   (b) Irrational
   (c) Not a Real number
   (d) An Integer

5. Which of the following is a real number?

   (a) Only Rational numbers
   (b) Only Irrational numbers
   (c) Both Rational and Irrational numbers
   (d) Neither Rational nor Irrational numbers