CHAPTER TEST: NUMBER SYSTEM
Mathematics | Class IX (2026/NumSys/09/003)

Solution

Section A (Multiple Choice Questions)

1. Which of the following is an irrational number?

   (a) $\sqrt{\frac{4}{9}}$
   (b) $\frac{\sqrt{12}}{\sqrt{3}}$
   (c) $\sqrt{7}$
   (d) 0.81

   Solution: $\sqrt{7}$ is an irrational number. $\boxed{C}$

2. A rational number between $-2/3$ and $1/4$ is:

   (a) $-5/12$
   (b) $5/12$
   (c) $-3/4$
   (d) $1/2$

   Solution: $-5/12$ is a rational number between $-2/3$ and $1/4$. $\boxed{A}$

3. The product of any two irrational numbers is:

   (a) Always irrational
   (b) Always rational
   (c) Always an integer
   (d) Sometimes rational, sometimes irrational

   Solution: The product of two irrational numbers can be rational or irrational. $\boxed{D}$

4. The decimal expansion of the number $\sqrt{3}$ is:

   (a) A finite decimal
   (b) 1.732
   (c) Non-terminating recurring
   (d) Non-terminating non-recurring

   Solution: The decimal expansion of $\sqrt{3}$ is non-terminating non-recurring. $\boxed{D}$

5. $0.3\overline{2}$ in the form of p/q is:

   (a) 32/99
   (b) 29/90
   (c) 32/100
   (d) 29/99

Solution: Let $x = 0.3\overline{2}$. Then,

$$10x = 3.\overline{2}$$

$$100x = 32.\overline{2}$$

Subtracting,

$$90x = 29 \implies x = \frac{29}{90}$$

$\boxed{B}$

6. Which of the following is not a real number?

   (a) $\sqrt{5}$
   (b) $-\sqrt{2}$
   (c) $\sqrt{-4}$
   (d) 0

   Solution: $\sqrt{-4}$ is not a real number. $\boxed{C}$

7. Between two distinct rational numbers:

   (a) There is no rational number
   (b) There is exactly one rational number
   (c) There are infinitely many rational numbers
   (d) There are only irrational numbers

   Solution: There are infinitely many rational numbers between two distinct rational numbers. $\boxed{C}$

8. If $1/7 = 0.\overline{142857}$, then the value of $2/7$ is:

   (a) $0.\overline{285714}$
   (b) 0.285714
   (c) 0.1428572
   (d) $0.\overline{245817}$

   Solution: $2/7 = 2 \times 0.\overline{142857} = 0.\overline{285714}$. $\boxed{A}$

Section B (Very Short Answer Questions)

1. Find the standard form of the rational number $\frac{105}{-168}$.

   Solution:

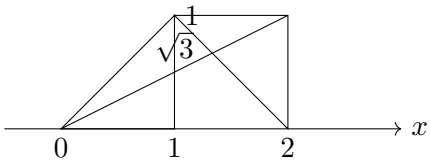
$$\frac{105}{-168} = \frac{105 \div 21}{-168 \div 21} = \frac{5}{-8} = -\frac{5}{8}$$

2. Represent $\sqrt{3}$ on the number line.

   Solution:

   (a) Draw a number line and mark 0, 1, and 2.
   (b) At point 1, draw a perpendicular line of length 1 unit.
   (c) Join the origin to the endpoint of the perpendicular. The hypotenuse is $\sqrt{2}$.

(d) At the endpoint of $\sqrt{2}$, draw a perpendicular of length 1 unit. The new hypotenuse is $\sqrt{3}$.



3. State with reason whether $\sqrt{1.44}$ is rational or irrational.

Solution:

$$\sqrt{1.44} = \sqrt{\frac{144}{100}} = \frac{12}{10} = \frac{6}{5}$$

Since $\frac{6}{5}$ is a ratio of two integers, $\sqrt{1.44}$ is rational.

4. Express $2.1\overline{47}$ in the form p/q, where p and q are integers and $q \neq 0$.

Solution: Let $x = 2.1\overline{47}$. Then,

$$10x = 21.\overline{47}$$

$$1000x = 2147.\overline{47}$$

Subtracting,

$$990x = 2126 \implies x = \frac{2126}{990} = \frac{1063}{495}$$

Section C (Short Answer Questions)

1. Prove that $\sqrt{2}$ is an irrational number using the method of contradiction.

Solution: Assume $\sqrt{2}$ is rational. Then, $\sqrt{2} = \frac{p}{q}$, where p and q are co-prime integers.

$$2q^2 = p^2 \implies p^2 \text{ is divisible by } 2 \implies p \text{ is divisible by } 2$$

Let $p = 2k$. Then,

$$2q^2 = 4k^2 \implies q^2 = 2k^2 \implies q \text{ is divisible by } 2$$

This contradicts the assumption that p and q are co-prime. Hence, $\sqrt{2}$ is irrational.

2. Find three different irrational numbers between the rational numbers 5/7 and 9/11.

Solution:

$$\frac{5}{7} \approx 0.714 \quad \text{and} \quad \frac{9}{11} \approx 0.818$$

Three irrational numbers between 0.714 and 0.818 are:

$$0.72072007200072..., \quad 0.75075007500075..., \quad 0.8080080008...$$

3. Using successive magnification, show the position of $5.3\overline{7}$ up to 4 decimal places on the number line.

Solution: The number $5.3\overline{7}$ is approximately 5.3777. To locate it on the number line:

(a) Locate 5 and 6 on the number line.

(b) Magnify the interval $[5, 6]$ to locate 5.3.

(c) Magnify the interval $[5.3, 5.4]$ to locate 5.37.

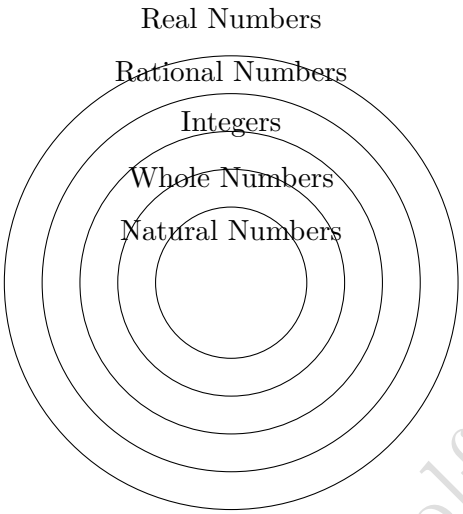
(d) Magnify the interval $[5.37, 5.38]$ to locate 5.377.

Section D (Long Answer Questions)

1. (i) Define Real Numbers. Explain the relationship between the sets of Natural numbers, Whole numbers, Integers, and Rational numbers using a Venn diagram description.

   Solution:

   - **Real Numbers**: The set of all rational and irrational numbers.
   - **Natural Numbers**: The set of positive integers, i.e., $1, 2, 3, \ldots$
   - **Whole Numbers**: The set of natural numbers including zero, i.e., $0, 1, 2, 3, \ldots$
   - **Integers**: The set of whole numbers and their negatives, i.e., $\ldots, -2, -1, 0, 1, 2, \ldots$
   - **Rational Numbers**: The set of numbers that can be expressed as a ratio of two integers, i.e., $\frac{p}{q}$ where $q \neq 0$.



   (ii) Is every whole number a natural number? Justify your answer with an example.

   Solution: No, every whole number is not a natural number. For example, 0 is a whole number but not a natural number.

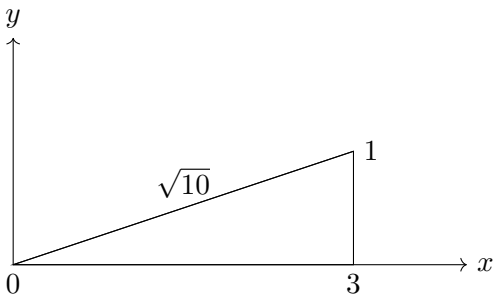
2. In a math lab activity, students are asked to construct a "Square Root Spiral."

   (a) Describe the steps to locate $\sqrt{10}$ on a number line using the spiral method or direct Pythagoras application.

   Solution:

   i. Start at the origin $(0, 0)$.

   ii. Draw a right triangle with legs 1 and 3. The hypotenuse is $\sqrt{10}$.



   (b) Explain why the diagonal of a unit square represents an irrational length.

   Solution: The diagonal of a unit square is $\sqrt{1^2 + 1^2} = \sqrt{2}$, which is an irrational number.

Section E (Case Study Based Question)

1. Which number would Ananya consider "unpredictable" for her security protocol?

   (a) 22/7
   (b) 3.1414
   (c) $\sqrt{17}$
   (d) $0.\overline{54}$

   Solution: $\sqrt{17}$ is an irrational number and would be considered "unpredictable". $\boxed{C}$

2. The value $0.\overline{54}$ expressed as a fraction in simplest form is:

   (a) 54/100
   (b) 6/11
   (c) 27/50
   (d) 54/90

   Solution: Let $x = 0.\overline{54}$. Then,

$$100x = 54.\overline{54}$$
$$99x = 54 \implies x = \frac{54}{99} = \frac{6}{11}$$

   $\boxed{B}$

3. The decimal expansion of 22/7 is:

   (a) Terminating
   (b) Non-terminating non-recurring
   (c) Non-terminating recurring
   (d) Same as π

   Solution: The decimal expansion of 22/7 is non-terminating recurring. $\boxed{C}$

4. Ananya's use of π digits is based on the fact that π is:

   (a) A rational number
   (b) An irrational number
   (c) An integer
   (d) A terminating decimal

   Solution: π is an irrational number. $\boxed{B}$

5. If Ananya encounters the number $\sqrt{6.25}$, she should classify it as:

   (a) A predictable rational number
   (b) An unpredictable irrational number
   (c) A non-terminating repeating number
   (d) An integer

   Solution:

$$\sqrt{6.25} = \sqrt{\frac{25}{4}} = \frac{5}{2} = 2.5$$

   $\sqrt{6.25}$ is a predictable rational number. $\boxed{A}$