Case Study 2:

Priya is curious about irrational numbers and wants to understand why certain numbers like $\sqrt{2}$ and π cannot be written in the form $\frac{p}{q}$. She starts testing their decimal expansions and realizes they never terminate or repeat. She uses this knowledge in her math club activities to challenge her friends with identifying irrational numbers from a list.

MCQ Questions:

1. Which of the following is an irrational number?

   (a) $\frac{4}{7}$

   (b) $0.121212\ldots$

   (c) $\sqrt{3}$

   (d) 1.25

   Answer: (c)
   Solution: $\sqrt{3}$ is not a perfect square and has a non-terminating, non-repeating decimal.

2. What is the nature of the decimal expansion of $\frac{22}{7}$?

   (a) Terminating

   (b) Non-terminating, repeating

   (c) Non-terminating, non-repeating

   (d) Whole number

   Answer: (b)
   Solution: $\frac{22}{7} = 3.142857142857\ldots$, repeating block "142857"

3. Which statement is true?

   (a) All rational numbers are integers

   (b) All irrational numbers are real numbers

   (c) All real numbers are irrational

   (d) All integers are irrational

   Answer: (b)
   Solution: Real numbers include both rational and irrational numbers.

4. Identify the number with a terminating decimal expansion.

   (a) $\frac{5}{16}$

   (b) $\frac{7}{9}$

(c) $\frac{11}{6}$

(d) $\frac{10}{3}$

Answer: (a)
Solution: Denominator is 2^4, so decimal terminates.

5. Which of these is not a rational number?

(a) $0.666\ldots$

(b) $\sqrt{5}$

(c) $\frac{7}{8}$

(d) -3

Answer: (b)
Solution: $\sqrt{5}$ is irrational as it cannot be expressed as $\frac{p}{q}$.