

Rational and Irrational Numbers

Chapter 1: Number Systems · Topic 1

Key Concept

$\sqrt{2} = 1.41421356\dots$ continues forever without any repeating pattern, proving it is irrational — this was actually proven by the ancient Greeks using a method called proof by contradiction. $\sqrt{2}$ can be geometrically constructed and precisely located on the number line using the Pythagoras theorem, by constructing a right triangle with legs of length 1 and drawing an arc with the hypotenuse ($\sqrt{2}$) onto the number line, demonstrating that irrational numbers, despite their complex decimal form, occupy exact, well-defined positions on the real number line.

Quick Revision Notes

- Rational numbers: expressible as p/q , terminating or repeating decimals.
- Irrational numbers: non-terminating, non-repeating decimals (e.g., $\sqrt{2}$, π).
- Rational + irrational numbers together form the complete set of real numbers.
- $\sqrt{2}$ can be geometrically constructed and placed exactly on the number line using the Pythagoras theorem.

Practice Questions

- 1 Represent $\sqrt{2}$ on the number line using a geometric construction.
- 2 Classify these as rational or irrational: $0.333\dots$, $\sqrt{5}$, $7/2$, π .
- 3 Explain why $\sqrt{2}$ is classified as an irrational number.