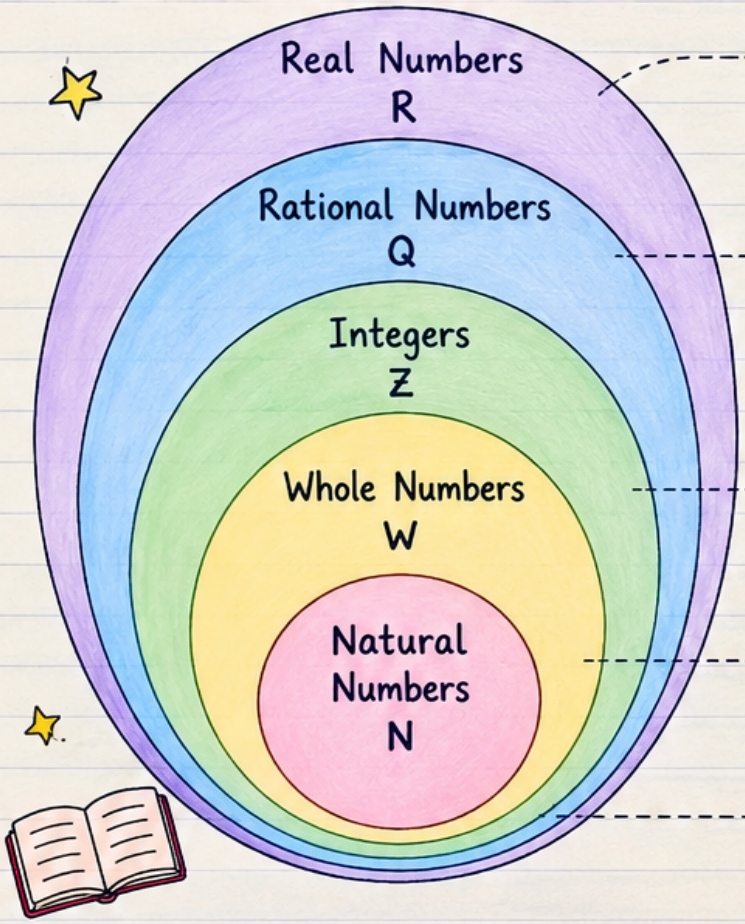
Pragyan

TYPES OF NUMBERS

Class 9 - The Number System Made Easy!

1. HIERARCHY OF NUMBER SETS



Real Numbers (R)

- All numbers on the number line.
- Includes rational and irrational numbers.
- Examples: -3, $-\sqrt{2}$, 0, $\frac{1}{2}$, $\sqrt{5}$, π

Rational Numbers (Q)

- Numbers that can be written as a fraction $\frac{p}{q}$ $\left(\frac{p}{q}\right)$ $(q \neq 0)$.
- Examples: $\frac{1}{2}$, $-\frac{3}{4}$, 0.25, -7, 5 $(=\frac{5}{1})$

Integers (Z)

- Positive numbers, negative numbers and zero.
- Examples: $-3, -2, -1, 0, 1, 2, 3, \ldots$

Whole Numbers (W)

- Natural numbers and zero.
- Examples: $0, 1, 2, 3, 4, 5, \ldots$

Natural Numbers (N)

- Counting numbers (start from 1).
- Examples: $1, 2, 3, 4, 5, \ldots$

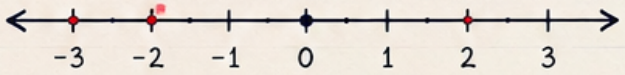
2. IRRATIONAL NUMBERS

- Numbers that cannot be written as a fraction $\frac{p}{q}$.
- They have non-terminating and non-repeating decimals.
- Examples: $\sqrt{2}$, $\sqrt{3}$, π, e, $0.1010010001\ldots$

Note: Every rational number is a real number, but every real number is not rational (some are irrational).

3. NUMBER LINE

- All real numbers can be represented on a number line.
- Rational and irrational numbers are both included.



4. KEY POINTS

- $N \subset W \subset Z \subset Q \subset R$
- All natural numbers are whole numbers.
- All whole numbers are integers.
- All integers are rational numbers.
- All rational numbers are real numbers.
- Irrational numbers are also real numbers. (but not rational).

5. EXAMPLES

Identify the type:

(a) -5	Integer, Rational, Real
(b) 0	Whole, Integer, Rational, Real
(c) $\frac{7}{3}$	Rational, Real
(d) $\sqrt{7}$	Irrational, Real
(e) 12	Natural, Whole, Integer, Rational, Real

True or False?

(a) Every integer is a rational number. ✓

(b) Every real number is rational. ✗

(c) 0 is a natural number. ✗

(d) $\sqrt{2}$ is a rational number. ✗

(e) All whole numbers are natural numbers. ✗