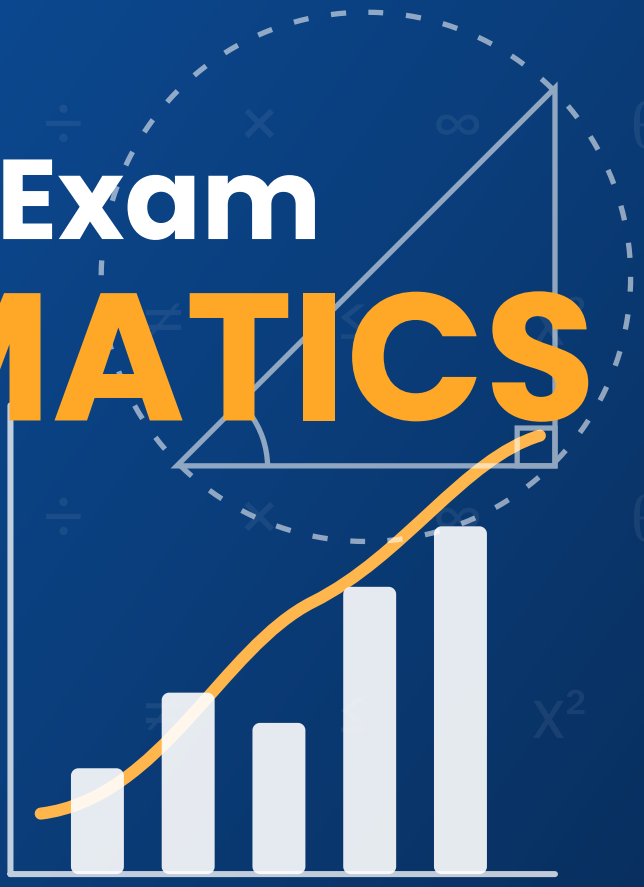
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Theory • Tricks • Shortcuts • Infographics
PYQs • Practice Sets • Mock Tests

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WRITTEN BY
Suman Biswas

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Suman Biswas
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Author: **Suman Biswas**

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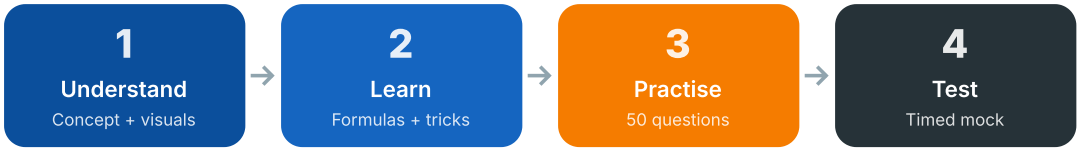
Your roadmap to scoring full marks in quantitative aptitude

This book is built for one goal: to take you from **basic concepts** to **exam speed** on every quantitative topic asked in Indian government exams. You do not need any previous coaching. Read each section in order, solve the examples with a pen, and only then attempt the practice sets.

Exams this book prepares you for

UPSC · WBCS · SSC CGL · SSC CHSL · SSC MTS · SSC GD · RRB NTPC · RRB Group D · RRB ALP · IBPS PO · IBPS Clerk · SBI PO · LIC · Insurance · State PSC · Police · NDA · CDS · CAPF · Airforce · Navy · Coast Guard · CTET · TET · WB Primary

The 4-step learning loop for every section



What each coloured box means

FORMULA BOX
Every formula you must remember, colour-coded in blue.

COMMON MISTAKE
Traps examiners set and errors students make most often.

SHORTCUT TRICK
Faster methods that save 20–40 seconds per question.

EXAM TIP
How the topic is asked and how to attack it in the hall.

MEMORY TRICK
Rhymes, patterns and pictures that make facts stick.

REAL-LIFE EXAMPLE
Where the idea appears in everyday life.

EXAM STRATEGY

Study rule of thumb: one section per 2–3 days. Day 1 — read the theory and examples. Day 2 — solve the practice set without a timer and check every solution, even for questions you got right. Day 3 — take the mock test against the clock and re-learn whatever you missed. Revise using the one-page revision sheet at the end of every section.

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Contents

25 sections that cover the complete quantitative aptitude syllabus — tap any card to jump to it

01 Number System
Types of numbers, divisibility, primes, HCF & LCM, remainders, unit digit, digital root, surds & indices

02 Simplification
BODMAS, approximation, squares & cubes, roots, recurring decimals, fraction conversion

03 Average
Simple, weighted and combined average

04 Percentage
Increase, decrease, successive %, profit/loss/discount %, tax & GST

05 Profit and Loss
CP, SP, MP, discount, successive discount, dishonest dealer

06 Simple & Compound Interest
SI, CI — annual, half-yearly, quarterly, monthly

07 Ratio and Proportion
Direct & inverse variation, partnership basics

08 Partnership
Working & sleeping partner, profit distribution

09 Time and Work
Efficiency, pipes & cisterns, men-women-machines

10 Time, Speed & Distance
Trains, boats & streams, races, circular track, relative speed

11 Mixture and Alligation
Alligation rule, replacement, mixing

12 Age Problems
Present, past & future ages, family relations

13 Algebra
Linear & quadratic equations, polynomials, identities, factorisation

14 Geometry
Lines, angles, triangles, quadrilaterals, circles, polygons

15 Mensuration
2D & 3D figures, surface area, volume

16 Trigonometry
Ratios, identities, heights & distances

17 Coordinate Geometry
Distance formula, midpoint, slope

18 Statistics
Mean, median, mode, range

19 Probability
Basic & conditional probability

20 Permutation & Combination
Counting principle, factorial, arrangements, selections

21 Data Interpretation
Bar, pie, line & mixed graphs, caselets

22 Mathematical Reasoning
Logical mathematics, number puzzles

23 Exam-Pattern Papers
UPSC, SSC, RRB, Bank, WBCS, Police pattern papers

24 Practice Question Bank
Topic-wise & difficulty-wise practice

25 Full Mock Tests
Beginner, intermediate & advanced full-length tests

Book Ending — Revision Toolkit

Final Revision Notes · Complete Formula Book · Most Expected Questions · Speed Maths Tricks · Exam Day Strategy · Last Minute Revision Guide · 7-Day Revision Plan · 30-Day Study Plan · 90-Day Master Plan · Motivational Message · About the Author

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SECTION 01

Number System

01

The foundation of quantitative aptitude. Almost every other chapter — percentage, ratio, time & work, algebra — quietly depends on the ideas in this section.

WHAT YOU WILL LEARN

- Natural, whole, integer, rational & irrational numbers
- Fractions and decimals — types and comparison
- Divisibility rules from 2 to 13
- Prime numbers, co-primes & factorisation
- Number of factors, sum of factors, even & odd factors
- HCF & LCM — methods, fractions, word problems
- Remainders, negative-remainder trick, power cycles
- Unit digit and cyclicity
- Digital root, cyclic numbers & trailing zeros
- Surds and indices — laws and comparison

1 Types of Numbers — 2 Divisibility — 3 Primes & Factors — 4 HCF & LCM — 5 Remainders & Unit Digit — 6 Surds & Indices

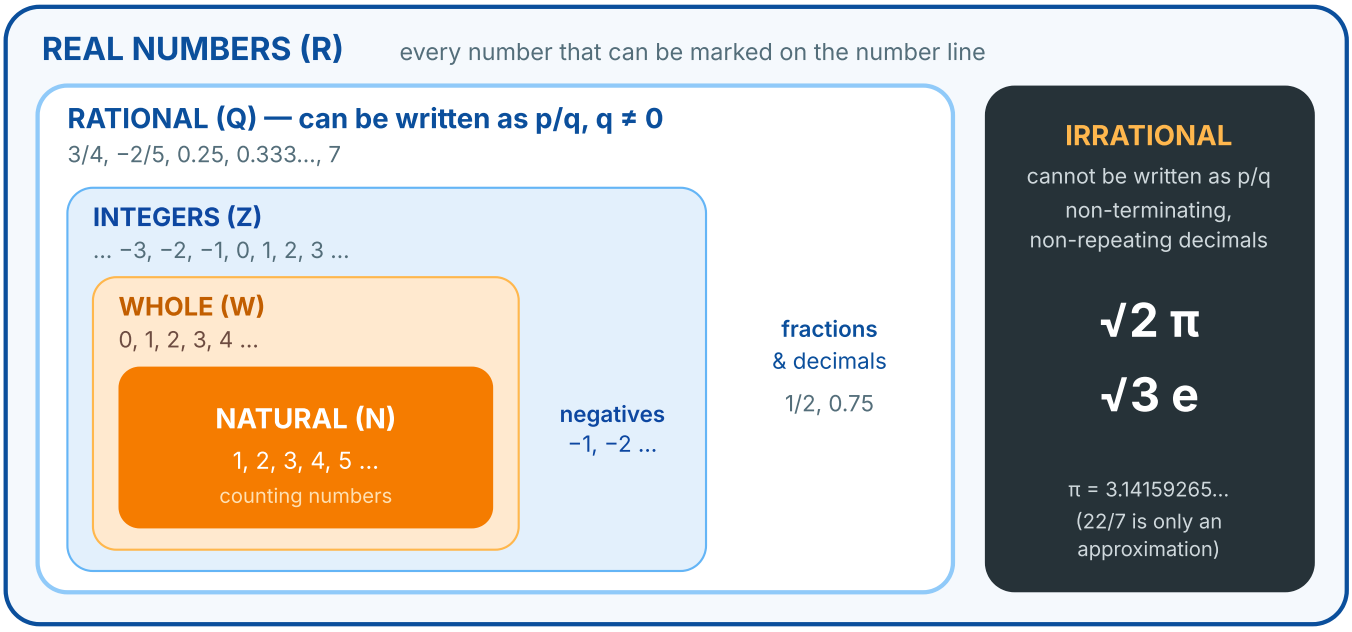
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1.1 Types of Numbers

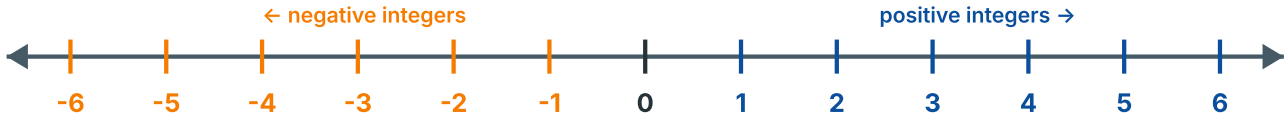
Natural, whole, integers, fractions, decimals, rational and irrational

Introduction. Before you can solve any aptitude question, you must know exactly which kind of number you are dealing with. Exams often hide the whole question inside one word — "natural", "whole" or "integer" — and choosing the wrong family gives the wrong answer.



The number family: N ⊂ W ⊂ Z ⊂ Q ⊂ R. Each box sits completely inside the bigger one.

Type	Symbol	Definition	Examples	Key fact
Natural numbers	N	Counting numbers	1, 2, 3, 4 ...	Smallest = 1. No largest.
Whole numbers	W	Natural numbers + 0	0, 1, 2, 3 ...	Smallest = 0.
Integers	Z	Whole numbers + negatives	... −2, −1, 0, 1, 2 ...	0 is neither + nor −.
Rational	Q	p/q with q ≠ 0 (p, q integers)	3/4, −5, 0.6, 0.333...	Decimal terminates or repeats.
Irrational	—	Cannot be written as p/q	√2, √3, π, e	Decimal never ends, never repeats.
Real	R	Rational + irrational	all of the above	Every point on the number line.



Zero is an integer that is neither positive nor negative.

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Even, odd, prime and composite

EVEN NUMBERS

2n

Divisible by 2: 0, 2, 4, 6 ...

ODD NUMBERS

2n + 1

Leave remainder 1 on ÷ 2: 1, 3, 5 ...

PRIME NUMBERS

exactly 2 factors

1 and itself: 2, 3, 5, 7, 11 ...

COMPOSITE NUMBERS

more than 2 factors

4, 6, 8, 9, 10 ...

CO-PRIME PAIR

HCF = 1

(8, 15), (9, 28) — need not be prime

TWIN PRIMES

differ by 2

(3, 5), (11, 13), (41, 43)

MEMORY TRICK

"1 is lonely." It has only one factor, so it is **neither prime nor composite**. And **2 is the odd one out** — the only even prime.

REAL-LIFE EXAMPLE

Your bank balance can be negative (integer), a shop price is ₹49.50 (decimal / rational), and the diagonal of a 1 m square tile is √2 m (irrational).

COMMON MISTAKE

- Calling 1 a prime number.
- Thinking 0 is a natural number — it is **whole**, not natural.
- Treating 22/7 as exactly π. It is rational; π is irrational.

Fractions and decimals

Kind	Meaning	Example
Proper fraction	Numerator < denominator	$\frac{3}{7}$
Improper fraction	Numerator ≥ denominator	$\frac{9}{4}$
Mixed fraction	Whole + proper fraction	$2\frac{1}{4} = \frac{9}{4}$
Terminating decimal	Ends after some digits	$0.375 = \frac{3}{8}$
Recurring decimal	A block repeats forever	$0.333\ldots = \frac{1}{3}$

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SHORTCUT TRICK

Comparing fractions fast — cross multiply. To compare $\frac{5}{7}$ and $\frac{7}{10}$: 5 × 10 = 50 and 7 × 7 = 49. Since 50 > 49, $\frac{5}{7}$ is bigger. No LCM needed.

A fraction in lowest terms gives a **terminating** decimal only if its denominator has no prime factor other than 2 and 5.

Solved Example — **Easy**

Arrange 2/3, 3/5, 5/8 in ascending order.

1. Convert to decimals: 2/3 = 0.667, 3/5 = 0.600, 5/8 = 0.625.
2. Order: 0.600 < 0.625 < 0.667.

Answer: 3/5 < 5/8 < 2/3

1.2 Divisibility Rules

Check divisibility in seconds — without dividing

Divisibility rules let you test a number by looking only at its digits. They are the most-used tool in this chapter: for finding missing digits, eliminating options, simplifying fractions and checking answers.

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÷	Rule	Example
2	Last digit is 0, 2, 4, 6 or 8	3,458 ✔
3	Sum of digits divisible by 3	4,512 → 12 ✔
4	Last two digits divisible by 4	7,316 → 16 ✔
5	Last digit 0 or 5	8,935 ✔
6	Divisible by both 2 and 3	5,742 → even, sum 18 ✔
7	Double the last digit, subtract from the rest; repeat	343 → 34 − 6 = 28 ✔
8	Last three digits divisible by 8	4,32,568 → 568 = 8 × 71 ✔
9	Sum of digits divisible by 9	8,163 → 18 ✔
10	Last digit 0	4,560 ✔
11	(Sum of odd-place digits) − (sum of even-place digits) = 0 or multiple of 11	7,29,135 → 8 − 19 = −11 ✔
12	Divisible by both 3 and 4	2,544 → sum 15, last two 44 ✔
13	Add 4 × last digit to the rest; repeat	169 → 16 + 36 = 52 = 4 × 13 ✔

MEMORY TRICK

The "last digits" ladder: 2 → look at last **1** digit, 4 → last **2** digits, 8 → last **3** digits, 16 → last 4 digits. The power of 2 tells you how many digits to check.

Composite divisors = split into co-prime parts: 6 = 2 × 3, 12 = 3 × 4, 15 = 3 × 5, 18 = 2 × 9, 24 = 3 × 8, 36 = 4 × 9, 72 = 8 × 9.

Solved Example Easy

Is 7,29,135 divisible by 11?

1. Odd places from the right: 5, 1, 2 → sum 8.
2. Even places: 3, 9, 7 → sum 19.
3. Difference 8 − 19 = −11, a multiple of 11.

Answer: Yes, divisible

Solved Example Easy

Find the digit * if 53*6 is divisible by 9.

1. Digit sum = 5 + 3 + * + 6 = 14 + *.
2. Next multiple of 9 after 14 is 18.
3. * = 18 − 14 = 4.

Answer: * = 4

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