

CAT QUANTITATIVE APTITUDE

| PERCENTAGES |

COMPLETE STUDENT GUIDE

EXAM

CAT (Common Admission Test)

SECTION

Quantitative Aptitude

TOPIC WEIGHTAGE

3-5 direct questions per paper (~9-15 marks); underlies ~40-50% of Arithmetic & DI questions

GUIDE LENGTH

8 Sections — Formulas + Solved Examples + Practice

BEST USED AS

Reference during study + quick revision before exam

1 INTRODUCTION & PURPOSE

Percentages rarely appear in CAT as a standalone, clearly labelled question — instead they are disguised inside Profit & Loss, Simple/Compound Interest, Ratios, Averages, Mixtures, Time & Work, and almost every Data Interpretation set. A student who can convert fractions to percentages instantly and think in multipliers gains a calculation-speed advantage that compounds across the entire QA section.

CAT Year	Percentage Questions	Marks	Difficulty
CAT 2021	3	9	Easy-Moderate
CAT 2022	4	12	Moderate
CAT 2023	3	9	Easy-Moderate
CAT 2024	3-5	9-15	Moderate
CAT 2025 (Expected)	4	12	Moderate

HOW TO USE THIS GUIDE

- Read **Section 2 & 3** first to lock in core concepts and formulas.
- Study **Section 4** topic-by-topic for applications and solved examples.
- Internalize **Section 5** to recognize and dodge CAT-style traps.
- Drill **Section 6** to build raw calculation speed.
- Review **Section 7** once you start attempting mocks.
- Use **Section 8** as your final 10-minute revision sheet before the exam.

2 CORE CONCEPTS

Term	Full Form / Meaning	Definition & Example
Percentage	Per Hundred	A proportion expressed out of 100. $25\% = \frac{25}{100} = 0.25$
Base	Reference Value	The quantity a percentage is calculated of. Identifying it correctly is the single most important step.
Multiplier	Growth/Decay Factor	The single number a value is multiplied by to apply a percentage change in one step, e.g. a 20% increase $\Rightarrow \times 1.2$
Successive Change	Compounded Change	Two or more percentage changes applied one after another on a <i>changing</i> base.
Reverse Percentage	Backward Calculation	Finding the original value when only the final (changed) value and the percentage change are known.
Percentage Points	Absolute Difference	The simple arithmetic difference between two percentage figures, <i>not</i> a percentage change.

Base Value \rightarrow Percentage Change ($\pm x\%$) \rightarrow Final Value

Final Value $\rightarrow \div (1 \pm x/100) \rightarrow$ Base Value (Reverse)

KEY INSIGHT

In every percentage problem, the **base can shift** between steps — especially in successive changes or reverse problems. The single biggest source of error is silently assuming the base stayed the same when it didn't. Always ask: "100% of what, right now?"

3 FORMULA SHEET

3A Basic Formulas

Scenario	Formula
Percentage of a quantity	$\text{Percentage} = \frac{\text{Part}}{\text{Whole}} \times 100$
Value after increase	$\text{New} = \text{Original} \times \left(1 + \frac{x}{100}\right)$
Value after decrease	$\text{New} = \text{Original} \times \left(1 - \frac{x}{100}\right)$
Finding original value	$\text{Original} = \frac{\text{Final} \times 100}{100 \pm x}$

3B Advanced / Sub-Topic Formulas

Scenario	Formula
Successive increase (a% then b%)	$\text{Net \%} = a + b + \frac{ab}{100}$
Increase followed by decrease	$\text{Net \%} = a - b - \frac{ab}{100}$
Percentage difference	$\text{Difference \%} = \frac{\text{Difference}}{\text{Average}} \times 100$
Compound growth over n periods	$\text{Future} = P \left(1 + \frac{r}{100}\right)^n$
Depreciation over n periods	$\text{Future} = P \left(1 - \frac{r}{100}\right)^n$

3C Special / Boundary Cases

Scenario	Formula
Reverse (after x% increase)	$\text{Original} = \frac{\text{New}}{1 + x/100}$
Reverse (after x% decrease)	$\text{Original} = \frac{\text{New}}{1 - x/100}$
Points change → % change	$\text{Actual \%} = \frac{\text{Point Change}}{\text{Original \%}} \times 100$
If A is x% more than B	$B \text{ is } \frac{x}{100 + x} \times 100\% \text{ less than A}$

DERIVE-ON-THE-SPOT TRICKS

- Forgot the successive-change formula? Simulate it: take base = 100, apply a%, then b% on the new number, and read off the net change.
- Any increase/decrease is just multiplication — never memorize separate rules, only flip the sign inside $(1 \pm x/100)$.
- Reverse percentage golden rule: what you multiplied to go forward, you must divide by to go backward.
- "x% more than" and "x% less than" are not symmetric — derive the reverse relation fresh using $\frac{x}{100 + x}$ or $\frac{x}{100 - x}$.

4 TOPIC-WISE CONCEPT SUMMARIES & SOLVED EXAMPLES

4A Percentage Increase & Decrease

- Convert every percentage change into a single multiplier before calculating.
- Multiplication is faster and safer than computing the change separately and then adding/subtracting.
- Always anchor your multiplier to the *original* value, not the final value, unless explicitly reversing.

CAT TIP

If a question gives the *final* value and a percentage change, your instinct should be to divide by the multiplier — not multiply. This is the most common silent trap.

SOLVED EXAMPLE 4A

Q: The price of a product increased by 20% to become ₹600. What was the original price?

→ Let original price = P

$$\rightarrow P \times 1.2 = 600$$

$$\rightarrow P = \frac{600}{1.2}$$

$$\rightarrow P = 500$$

Answer: ₹500

4B Successive Percentage Change

- Two or more successive percentage changes can **never** be added directly — the base changes after the first application.
- Use $a + b + \frac{ab}{100}$ for two successive increases, adjusting signs for decreases.
- For three or more changes, chain multipliers (e.g. $\times 1.2 \times 0.9 \times 1.1$) rather than extending the algebraic formula.

CAT TIP

The moment you see "increased by... and then...", switch to multiplication mode — addition always gives a wrong answer here.

SOLVED EXAMPLE 4B

Q: A number is increased by 20% and then decreased by 10%. Find the net percentage change.

→ Using Net % = $a - b - \frac{ab}{100}$, with $a = 20$, $b = 10$

$$\rightarrow \text{Net \%} = 20 - 10 - \frac{20 \times 10}{100}$$

$$\rightarrow \text{Net \%} = 10 - 2$$

$$\rightarrow \text{Net \%} = 8$$

Answer: 8% net increase

4C Reverse Percentages

- These questions give the *final* value after a change and ask for the *original* — always divide, never multiply.
- Set up the equation explicitly: $\text{Original} \times \text{Multiplier} = \text{Final}$.
- For compound reverse problems, reverse each step individually, in the opposite order.

CAT TIP

Reverse percentage questions feel harder only because students instinctively multiply — pause and identify which value is given as "final."

SOLVED EXAMPLE 4C

Q: After a 20% salary hike, an employee's salary becomes ₹48,000. Find the original salary.

→ Let original salary = S

$$\rightarrow S \times 1.2 = 48000$$

$$\rightarrow S = \frac{48000}{1.2}$$

$$\rightarrow S = 40000$$

Answer: ₹40,000

4D Percentage Difference

- Percentage difference is calculated relative to the **average** of two values, not the original.
- Distinct from "percentage increase," which uses the original value as base — confusing the two is a classic trap.
- Useful in DI questions comparing two data points with no clear "before/after."

CAT TIP

If the question doesn't specify an "original" value, it's almost certainly asking for percentage *difference* (divide by average), not percentage *increase* (divide by original).

SOLVED EXAMPLE 4D

Q: Find the percentage difference between 60 and 80.

$$\rightarrow \text{Difference} = 80 - 60 = 20$$

$$\rightarrow \text{Average} = \frac{60 + 80}{2} = 70$$

$$\rightarrow \text{Difference \%} = \frac{20}{70} \times 100$$

$$\rightarrow \text{Difference \%} \approx 28.57\%$$

Answer: $\approx 28.57\%$

4E Population Growth & Depreciation

- Population growth and asset depreciation follow the same compound structure as Compound Interest.
- Never use linear growth for multi-period problems unless explicitly told the rate is "simple."
- For depreciation, the rate is subtracted inside the bracket each period.

CAT TIP

If growth/depreciation occurs "every year" for more than one period, default to the compound formula — the linear assumption is the most common error here.

SOLVED EXAMPLE 4E

Q: A town's population is 10,000 and grows at 10% per annum. Find the population after 2 years.

$$\rightarrow \text{Future} = P \left(1 + \frac{r}{100}\right)^n$$

$$\rightarrow \text{Future} = 10000 \times (1.1)^2$$

$$\rightarrow \text{Future} = 10000 \times 1.21$$

$$\rightarrow \text{Future} = 12100$$

Answer: 12,100

4F Income, Expenditure & Savings

- Income and expenditure change independently — never compare their percentage changes directly to infer savings change.
- Always compute the **actual revised values** of income and expenditure separately, then subtract.
- Common CAT structure: income/expenditure given as a ratio, each changing by a different percentage — recompute both from

scratch.

CAT TIP

If income rises by $x\%$ and expenditure by $y\%$, the change in savings is **not** simply $x\% - y\%$ — recalculate savings from actual figures.

SOLVED EXAMPLE 4F

Q: Income ₹50,000, expenditure ₹40,000. Income rises 10%, expenditure rises 5%. Find % change in savings.

→ Original savings = $50000 - 40000 = 10000$

→ New income = $50000 \times 1.1 = 55000$

→ New expenditure = $40000 \times 1.05 = 42000$

→ New savings = $55000 - 42000 = 13000$

→ % Change = $\frac{13000 - 10000}{10000} \times 100 = 30\%$

Answer: 30% increase in savings

4G Applications in Profit & Loss

- Profit %, Loss %, and Discount % use Cost Price, Marked Price, or Selling Price as base respectively — identify which before applying any formula.
- Successive discounts behave like successive percentage decreases — use the compounded formula, never simple addition.
- Marked Price problems often disguise a reverse percentage question.

CAT TIP

Always re-confirm whether the percentage given is on Cost Price (default) or Selling Price — CAT occasionally tests this distinction directly.

SOLVED EXAMPLE 4G

Q: An item is marked 25% above cost price, then a 10% discount is given. Find overall profit %.

→ Let Cost Price = 100

→ Marked Price = $100 \times 1.25 = 125$

→ Selling Price = $125 \times 0.9 = 112.5$

→ Profit = $112.5 - 100 = 12.5$

Answer: 12.5% profit

4H Percentages in Data Interpretation

- DI sets frequently require quick percentage estimation across tables, pie charts, and line graphs — exact calculation is often unnecessary.
- Market share, growth rate, and contribution questions are percentage-of-base problems in disguise.
- Rounding intelligently before comparing options saves time without sacrificing accuracy in MCQs.

CAT TIP

Estimate the answer's range using rounded percentages first, then eliminate options — compute precisely only if two options are too close.

SOLVED EXAMPLE 4H

Q: A pie chart shows Company A's market share as 18% of a ₹50,000 crore market. Find its revenue.

$$\rightarrow \text{Revenue} = 50000 \times \frac{18}{100}$$

$$\rightarrow \text{Revenue} = 50000 \times 0.18$$

$$\rightarrow \text{Revenue} = 9000$$

Answer: ₹9,000 crore

5 CAT TRAP IDENTIFIER

Trap	Wrong Approach	Right Approach
Wrong base	Treating the final value as the base	Identify which value is "100%" first
Successive change	Adding the two percentages directly	Use $a + b + \frac{ab}{100}$ or chain multipliers
Increase then decrease	Assuming the changes cancel out	Multiply the respective factors
Reverse percentage	Multiplying by the percentage	Divide by $(1 \pm x/100)$
Difference vs. increase	Dividing by the original value	Divide by the average
Points vs. percentage	Treating a point change as a % change	Convert via $\frac{\text{Point Change}}{\text{Original \%}} \times 100$
Population / depreciation	Applying linear growth/decay	Apply compound growth: $P(1 \pm r/100)^n$
Income / expenditure	Subtracting percentages directly	Recompute actual revised values first

PRE-ATTEMPT MENTAL CHECKLIST

- What exactly is the **base** (100%) in this question?
- Am I given the **original** value or the **final** value?
- Is this a **single** change or a **successive** change?
- Does the change happen on a fixed base or a shifting base each time?
- Is this asking for percentage *difference* (average) or percentage *change* (original)?
- Can I **estimate** the answer range before computing exactly?

6 SPEED TECHNIQUES & SHORTCUTS

Fraction	Percentage	Fraction	Percentage
1/2	50%	1/8	12.5%
1/3	33.33%	3/8	37.5%
2/3	66.67%	5/8	62.5%
1/4	25%	7/8	87.5%
3/4	75%	1/5	20%
2/5	40%	3/5	60%
4/5	80%	1/10	10%

Percentage	Multiplier	Percentage	Multiplier
110%	×1.1	80%	×0.8
120%	×1.2	75%	×0.75
125%	×1.25	70%	×0.7
150%	×1.5	50%	×0.5
90%	×0.9	40%	×0.4

Use Direct Formula when:

Only a single percentage change is involved

The question explicitly asks for "percentage difference"

Exact computation is required (no options to eliminate)

Use Multiplier Chain when:

Three or more successive changes are involved

The sequence is "increased...then decreased...then increased again"

Quick estimation/elimination of MCQ options is sufficient

ELIMINATING WRONG MCQ OPTIONS BY APPROXIMATION

- Round percentages to the nearest clean fraction ($24\% \approx 1/4$) to eliminate distant options.
- For successive changes, approximate the $\frac{ab}{100}$ correction term first — simple addition is close enough for single-digit a, b .
- In DI, compare bar heights or pie slice sizes visually before calculating exact percentages.
- Check whether your computed answer's order of magnitude matches the options — catches misplaced decimals.

7 COMMON MISTAKES TO AVOID

Mistake 1 · Adding Successive Percentages Directly

WRONG Assuming a 20% increase followed by a 10% increase gives a flat 30% net increase.

CORRECT Apply $\text{Net \%} = a + b + \frac{ab}{100} = 20 + 10 + \frac{200}{100} = 32\%$

Mistake 2 · Choosing the Wrong Base

WRONG Calculating "what % more is A than B" using A as the denominator.

CORRECT Divide by the value compared against: $\frac{A - B}{B} \times 100$, not $\frac{A - B}{A} \times 100$

Mistake 3 · Confusing Percentage Points with Percentages

WRONG Treating a rise from 40% to 50% as a "10% increase."

CORRECT The rise is 10 percentage points; the actual increase is $\frac{50 - 40}{40} \times 100 = 25\%$

Mistake 4 · Approximating Too Early

WRONG Rounding intermediate values before completing the calculation, compounding errors.

CORRECT Set up the full equation first, approximate only the final step: $\frac{600}{1.2} = 500$ computed exactly

Mistake 5 · Ignoring Reverse Percentage Structure

WRONG Multiplying the final value by the percentage when asked to find the original value.

CORRECT Divide the final value: $\text{Original} = \frac{\text{Final}}{1 \pm x/100}$

8 QUICK REVISION CARD

KEY FORMULAS

$$\text{Percentage} = \frac{\text{Part}}{\text{Whole}} \times 100$$

$$\text{Increase} \rightarrow \times \left(1 + \frac{x}{100}\right) \quad \text{Decrease} \rightarrow \times \left(1 - \frac{x}{100}\right)$$

$$\text{Successive Increase} = a + b + \frac{ab}{100} \quad \text{Increase then Decrease} = a - b - \frac{ab}{100}$$

$$\text{Population} = P \left(1 + \frac{r}{100}\right)^n \quad \text{Difference \%} = \frac{\text{Difference}}{\text{Average}} \times 100$$

VALUES TO REMEMBER

$1/2 = 50\%$, $1/3 = 33.33\%$, $2/3 = 66.67\%$, $1/4 = 25\%$, $3/4 = 75\%$, $1/5 = 20\%$, $2/5 = 40\%$, $3/5 = 60\%$, $4/5 = 80\%$, $1/8 = 12.5\%$, $3/8 = 37.5\%$, $5/8 = 62.5\%$, $7/8 = 87.5\%$

5 TOPIC TRAPS

- Successive % changes are never added — always multiply.
- Reverse problems require division, not multiplication.
- Percentage difference uses the average, not the original, as base.
- Percentage points \neq percentage change.
- Population/depreciation problems are compound, never linear.

PRE-SOLVE CHECKLIST

Base? Original or final? Single or successive? Fixed or shifting base? Difference or increase? Can I estimate first?

SHORTCUT TARGETS

Direct questions: under 45-60 sec | Successive/Reverse/DI: under 75-90 sec | Accuracy goal: 90%+