

QUANTITATIVE APTITUDE

Important Formulas Revision E-book

FINAL PREP EDITION

By LearnFrenzy

BANK • SSC • RAILWAY • INSURANCE • CAT • GRE • UPSC

INTRODUCTION

Quantitative Aptitude is a pivotal component of nearly every competitive examination in India, ranging from Banking (IBPS, SBI), Staff Selection Commission (SSC), Railways, and Insurance to high-level management entrances like CAT and GMAT.

This E-book is designed as a quick-revision tool to help you recall essential formulas, shortcuts, and mathematical rules right before your exam. Each section is curated for maximum retention and clarity.

Preparation Guide

- Memorize Table of Squares up to 30.
- Memorize Table of Cubes up to 20.
- Learn Fraction-to-Percentage conversions (1-20).
- Always practice with a timer.

Stay connected with us for daily practice quizzes.

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1. SIMPLIFICATION

The foundation of Aptitude is the speed and accuracy of calculation.

BODMAS Rule

Depicts the correct sequence of operations:

B - Brackets (Order: $()$, $\{\}$, $[\]$)
O - Of
D - Division
M - Multiplication
A - Addition
S - Subtraction

Modulus & Vinculum

Modulus of a Real Number:

$$|a| = a \text{ (if } a > 0) \text{ else } -a$$

Example: $|-5| = 5$

Vinculum (Bar):

Expression marked with a bar ($\overline{\quad}$) is solved before the standard BODMAS sequence.

Pro-Tip: Solve 10 simplification questions daily to reduce calculation errors.

2. PROFIT AND LOSS

Loss or gain is always reckoned on the Cost Price (C.P.).

Basic Formulas

Gain	$(S.P.) - (C.P.)$
Loss	$(C.P.) - (S.P.)$
Gain %	$(\text{Gain} \times 100) / C.P.$
Loss %	$(\text{Loss} \times 100) / C.P.$

To find S.P. & C.P.

$$S.P. = [(100 + \text{Gain}\%) / 100] \times C.P.$$

$$S.P. = [(100 - \text{Loss}\%) / 100] \times C.P.$$

$$C.P. = [100 / (100 + \text{Gain}\%)] \times S.P.$$

Special Scenarios

- **Common Gain & Loss:** Sells two items, one at x% gain and other at x% loss. Gain/loss is always a loss:

$$\text{Loss \%} = (x / 10)^2$$

- **False Weights:** Gain % = $[\text{Error} / (\text{True Value} - \text{Error})] \times 100\%$

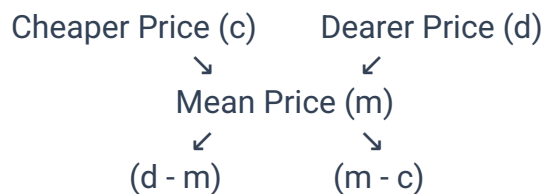
3. MIXTURES & ALLIGATIONS

The Rule of Alligation enables us to find the ratio in which two ingredients must be mixed to reach a desired price.

Rule of Alligation:

$$\frac{(\text{Qty of Cheaper})}{(\text{Qty of Dearer})} = \frac{(\text{C.P. Dearer} - \text{Mean Price})}{(\text{Mean Price} - \text{C.P. Cheaper})}$$

Alligation Diagram



$$\text{Ratio} = (d - m) : (m - c)$$

Liquid Replacement Formula

If a container has x units of liquid and y units are replaced by water repeatedly n times:

$$\text{Final Quantity} = x [1 - (y/x)]^n$$

4. INTEREST CALCULATION

Simple Interest (S.I.)

$$\text{S.I.} = (P \times R \times T) / 100$$

Where P = Principal, R = Rate%, T = Time in years.

Compound Interest (C.I.)

$$\text{Amount (A)} = P [1 + (R/100)]^n$$

Compounded	Formula for Amount (A)
Annually	$P [1 + R/100]^n$
Half-Yearly	$P [1 + (R/2)/100]^{2n}$
Quarterly	$P [1 + (R/4)/100]^{4n}$
Varying R1,R2,R3	$P [1 + R1/100][1 + R2/100][1 + R3/100]$

Present Worth (P.W.): Rs. x due n years hence:

$$\text{P.W.} = x / [1 + (R/100)]^n$$

5. SURDS & INDICES

Laws of Indices

- $a^m \times a^n = a^{(m+n)}$
- $a^m / a^n = a^{(m-n)}$
- $(a^m)^n = a^{(mn)}$
- $(ab)^n = a^n b^n$
- $(a/b)^n = a^n / b^n$
- $a^0 = 1$

Laws of Surds

Let **a** be rational and **n** be positive integer:

$$\begin{aligned}\sqrt{(ab)} &= \sqrt{a} \times \sqrt{b} \\ (n\sqrt{a})^n &= a\end{aligned}$$

$$\begin{aligned}\sqrt{(a/b)} &= \sqrt{a} / \sqrt{b} \\ m\sqrt{(n\sqrt{a})} &= (mn)\sqrt{a}\end{aligned}$$

Example: $(\sqrt{a})^2 = a$

6. TIME, WORK & DISTANCE

Work & Time

- If A can do a piece of work in **n** days, then A's 1 day's work = **$1/n$** .
- **Efficiency:** If A is thrice as good as workman B, Ratio of work A:B = 3:1. Ratio of time A:B = 1:3.

Time & Distance

$$\text{Speed} = \text{Dist}/\text{Time}$$

$$\text{Time} = \text{Dist}/\text{Speed}$$

$$\text{Dist} = \text{Speed} \times \text{Time}$$

Conversions & Average

$$x \text{ km/hr to m/s} \quad x * (5/18)$$

$$x \text{ m/s to km/hr} \quad x * (18/5)$$

$$\text{Average Speed} \quad (2xy) / (x+y) - [\text{Equal distances at speeds } x \text{ and } y]$$

7. RATIO & PROPORTION

Ratio (a:b)

a = antecedent, b = consequent.

Multiplying or dividing both terms by same non-zero number does not change ratio.

Proportion (a:b :: c:d)

Product of Means = Product of Extremes

$$(b \times c) = (a \times d)$$

Key Terms

- **Fourth Proportional:** $x = (b \times c)/a$
- **Third Proportional:** $x = b^2/a$
- **Mean Proportional:** $\sqrt{ab}$
- **Componendo & Dividendo:** If $a/b = c/d$, then $(a+b)/(a-b) = (c+d)/(c-d)$

8. PERMUTATION & COMBINATION

Factorial Notation

$$n! = n(n-1)(n-2) \dots 3.2.1$$

Example: $0! = 1$; $4! = 24$

Permutation (nPr)

Arrangements where order matters.

$$nPr = n! / (n-r)!$$

Combination (nCr)

Selections where order doesn't matter.

$$nCr = n! / [r!(n-r)!]$$

Properties:

- $nCn = 1$
- $nC0 = 1$
- $nCr = nC(n-r)$

9. PROBABILITY

The measure of uncertainty of an event.

$$P(E) = n(E) / n(S)$$

$n(E)$ = favorable outcomes, $n(S)$ = total possible outcomes.

Principles

- $0 \leq P(E) \leq 1$
- $P(S) = 1$ (Sure event)
- $P(\Phi) = 0$ (Impossible event)
- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A') = 1 - P(A)$

Card Deck: 52 cards (26 Red, 26 Black). 4 Suits (Spades, Clubs, Hearts, Diamonds). 12 Face cards (Kings, Queens, Jacks).

10. MENSURATION

3D Shapes

Shape	Volume	Surface Area
Cuboid	$l \times b \times h$	$2(lb + bh + lh)$
Cube	a^3	$6a^2$
Cylinder	$\pi r^2 h$	$2\pi rh$ (Curved)
Cone	$\frac{1}{3} \pi r^2 h$	πrl (Curved)
Sphere	$\frac{4}{3} \pi r^3$	$4\pi r^2$
Hemisphere	$\frac{2}{3} \pi r^3$	$2\pi r^2$ (Curved)

Diagonal Formulas:

- Cuboid: $\sqrt{l^2 + b^2 + h^2}$
- Cube: $a\sqrt{3}$

11. ALGEBRAIC IDENTITIES

Constant use of these identities helps in Simplification and Quadratic Equations.

$$(a + b)^2 = a^2 + b^2 + 2ab$$

$$(a - b)^2 = a^2 + b^2 - 2ab$$

$$(a^2 - b^2) = (a + b)(a - b)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$$

$$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$$

$$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$$

Special Condition

If $(a + b + c) = 0$, then:

$$a^3 + b^3 + c^3 = 3abc$$

12. PARTNERSHIP

When two or more persons run a business jointly.

Ratio of Divisions of Gains

Case I: Same Time Period

Ratio of Profit = Ratio of Investment

Case II: Different Time Periods

$$\text{Profit Ratio} = (P1 \times T1) : (P2 \times T2)$$

Partner Types

- **Working Partner:** Manages the business.
- **Sleeping Partner:** Only invests the money.

CONGRATULATIONS!

You are now ready for a quick overview of Quant Aptitude.

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