APTITUDE NOTES – SECTION 1: QUANTITATIVE APTITUDE

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1. Number System

Key Concepts:

- Every number can be classified as **Natural**, **Whole**, **Integer**, **Rational**, or **Irrational**.
- **Prime Number**: A number divisible only by 1 and itself.
- **Composite Number**: Non-prime, positive integers greater than 1.
- **Even & Odd**: Even → divisible by 2; Odd → not divisible by 2.
- **Divisibility Rules**:
  - 2 → Last digit even
  - 3 → Sum of digits divisible by 3
  - 4 → Last two digits divisible by 4
  - 5 → Ends in 0 or 5
  - 6 → Divisible by both 2 and 3
  - 8 → Last three digits divisible by 8
  - 9 → Sum of digits divisible by 9
  - 11 → (Sum of odd-position digits – Sum of even-position digits) divisible by 11

Examples:

- Check if 918 is divisible by 6 → divisible by 2 and 3 → ☑ Yes.
- Largest 3-digit number divisible by 7 = (999 ÷ 7 = 142.7) → 142 × 7 = 994.

Tips:

- Always reduce fractions to simplest form.
- When dividing large numbers, look for divisibility patterns.

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2. HCF & LCM

Key Concepts:

- **HCF (Highest Common Factor)** = greatest number dividing all.
- **LCM (Least Common Multiple)** = smallest number divisible by all.
- Relation: **HCF × LCM = Product of numbers (for 2 numbers)**.

Example:

Find HCF and LCM of 12, 15.
Prime factors:
$12 = 2^2 \times 3$

15 = 3 × 5
→ HCF = 3, LCM = 2^2 × 3 × 5 = 60.

Tip:

For large numbers, use the **Euclidean method** for HCF.

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3. Ratio & Proportion

Key Concepts:

- **Ratio (a : b)** = a/b
- **Proportion** → a : b = c : d ⇒ ad = bc
- **Continued Proportion:** a : b = b : c
- **Compound Ratio:** (a : b) × (c : d) = ac : bd

Example:

If 3 pens cost ₹24, what will 7 pens cost?
→ 3 : 7 = 24 : x → 3x = 168 → x = 56

Tips:

- Always keep ratios in **same units**.
- Inverse proportion → product constant (e.g. speed ∝ 1/time).

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4. Percentages

Key Concepts:

- Percentage = (Value / Total) × 100
- To convert % → fraction: divide by 100
- Successive % change formula:
- Net % change = A + B + (A×B)/100

Example:

If price increases by 20% and then decreases by 10%,
Net = 20 + (–10) + (20×–10)/100 = 10 – 2 = 8% increase.

Tips:

- % increase/decrease problems can be solved quickly using ratios.

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5. Profit, Loss & Discount

Key Concepts:

- **Cost Price (CP)**, **Selling Price (SP)**, **Marked Price (MP)**.
- **Profit/Loss %** = (Profit or Loss / CP) × 100
- **Discount %** = (MP – SP) / MP × 100

Example:

A shopkeeper buys at ₹200, sells at ₹240 → Profit = ₹40 → Profit% = 40/200 × 100 = 20%.

Tips:

- Use **Successive Discounts formula**:
- Net discount = a + b – (ab)/100

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6. Simple & Compound Interest

Formulas:

- **SI = (P × R × T) / 100**
- **CI = P × [(1 + R/100)^T – 1]**

Example:

₹5000 at 10% for 2 years
→ SI = 5000×10×2 /100 = ₹1000
→ CI = 5000×(1.1²–1) = 5000×0.21 = ₹1050

Tips:

- Difference between CI & SI (for 2 years) = P × (R²/100²).

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7. Time, Speed & Distance

Formulas:

- **Speed = Distance / Time**
- **Distance = Speed × Time**
- **Time = Distance / Speed**
- Conversion: 1 km/hr = 5/18 m/s

Example:

A train covers 120 km in 2 hrs → Speed = 60 km/hr

Tips:

- Opposite direction: relative speed = sum of speeds
- Same direction: relative speed = difference

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8. Time & Work

Key Concepts:

- **Work = Rate × Time**
- If A can do a work in x days → A's 1-day work = 1/x
- Combined work: (A + B)'s 1-day work = 1/x + 1/y

Example:

A can do a job in 10 days, B in 15 → Together = (1/10 + 1/15) = 1/6 → 6 days.

Tips:

- For alternate day problems, find total work as LCM of denominators.

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9. Averages

Formula:

- **Average = (Sum of all terms) / (Number of terms)**

Example:

Find average of 10, 15, 25 → (10+15+25)/3 = 16.67

Tips:

- When equal numbers are added/removed, difference is adjusted by (±x/n).

🔟 Mixtures & Alligations

Formula:

- **Rule of Alligation:**
- Mean – Cheaper : Dearer – Mean = Ratio of quantities

Example:

Mix 2 varieties of rice at ₹20/kg and ₹30/kg to get ₹26/kg mixture.
→ 26–20 : 30–26 = 6 : 4 = 3 : 2

Tip:

Used in questions mixing cost, concentration, or price.

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11. Permutations & Combinations

Formula:

- **Permutations (nPr)** = n! / (n–r)!
- **Combinations (nCr)** = n! / [r! × (n–r)!]

Example:

Number of ways to select 3 from 5 → $^5C_3 = 10$

Tip:

Order matters → use permutation; order doesn't → combination.

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12. Probability

Formula:

P(E) = Favourable outcomes / Total outcomes

Example:

Tossing a coin → P(Head) = 1/2

Tips:

- Mutually exclusive events → P(A or B) = P(A) + P(B)
- Independent events → P(A and B) = P(A) × P(B)

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13. Geometry & Mensuration

Key Formulas:

- Area of triangle = ½ × base × height
- Circle:
  - Area = πr^2
  - Circumference = $2\pi r$
- Rectangle: Area = l × b, Perimeter = 2(l+b)
- Volume of Cylinder = $\pi r^2 h$
- Volume of Sphere = $(4/3)\pi r^3$

Tip:

Always keep units consistent (cm^2, m^3, etc.)

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14. Algebra & Equations

Key Concepts:

- **Linear Equation:** $ax + b = 0 \Rightarrow x = -b/a$
- **Quadratic:** $ax^2 + bx + c = 0 \Rightarrow$
- $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$
- **Sum & Product of roots:**
  - $\alpha + \beta = -b/a$
  - $\alpha\beta = c/a$

Example:

Solve $x^2 - 5x + 6 = 0 \rightarrow (x-2)(x-3)=0 \rightarrow x=2,3$

Tips:

Factorization helps in saving time.