**I. General Strategy for Quantitative Aptitude**

1. **Master the Basics:** Don't skip fundamental concepts. Strong basics make advanced problems easier.
2. **Learn Formulas & Identities:** Memorize crucial formulas for all topics. Don't just know them, understand *when* and *how* to apply them.
3. **Practice Consistently:** Quant is all about practice. Solve a variety of problems daily.
4. **Time Management:**
   * **Per Question:** Don't get stuck on one problem. If it's taking too long, move on and revisit later.
   * **Overall Section:** Allocate time wisely. Some questions are quick wins; some are time-consuming.
5. **Read Carefully:** Misreading a question is a common cause of error. Pay attention to keywords, units, and what exactly is being asked.
6. **Avoid Silly Mistakes:** Calculation errors, unit conversions, small logical oversights are costly. Double-check your work if time permits.
7. **Identify Question Types:** Recognize recurring problem structures (e.g., "mixture replacement," "profit/loss on SP"). This helps you quickly recall the relevant approach.
8. **Regular Revision:** Periodically revise formulas and tricky concepts.

**II. Essential Concepts, Shortcuts & Things to Remember**

* **Divisibility Rules (MUST KNOW for speed!):**
  + **By 2:** Ends in 0, 2, 4, 6, 8.
  + **By 3:** Sum of digits is divisible by 3.
  + **By 4:** Last two digits are divisible by 4, or are "00".
  + **By 5:** Ends in 0 or 5.
  + **By 6:** Divisible by both 2 and 3.
  + **By 8:** Last three digits are divisible by 8, or are "000".
  + **By 9:** Sum of digits is divisible by 9.
  + **By 10:** Ends in 0.
  + **By 11 (Crucial for Q3):** The **alternating sum of digits** (sum of digits at odd places - sum of digits at even places) is either 0 or a multiple of 11.
    - *Example for Q3: 7684x91 is divisible by 11.*
      * (1 - 9 + x - 4 + 8 - 6 + 7) = (1 - 9 + x - 4 + 8 - 6 + 7) = 1 + x - 3 = x + 1.
      * For this to be 0 or a multiple of 11, x+1 must be 0 or 11.
      * If x+1 = 0, x = -1 (not possible for a digit).
      * If x+1 = 11, x = 10 (not possible for a single digit).
      * Let's try from left to right: (7 - 6 + 8 - 4 + x - 9 + 1) = 1 + 4 + x - 9 + 1 = x - 3.
      * For x - 3 to be 0 or a multiple of 11, x - 3 = 0 => x = 3.
      * (The standard rule is usually (Sum of digits at odd places from right) - (Sum of digits at even places from right)).
      * Right to Left: (1+x+8+7) - (9+4+6) = (16+x) - 19 = x - 3.
      * For x-3 to be 0 or a multiple of 11, x-3 = 0, so x=3.
      * *Feedback matches, x=3.*
* **Squares & Cubes:** Memorize squares up to 30, cubes up to 20. Helps in Q1, Q2, and number series.
* **BODMAS/PEMDAS:** Order of operations is critical for simplification.
* **Decimal/Fraction Conversion:** Be quick with conversions.
* **Percentage-Fraction Equivalents:** Memorize common conversions (e.g., 25% = 1/4, 33.33% = 1/3, 20% = 1/5). Saves time.
* **X% of Y = Y% of X:** (e.g., 50% of 20 = 20% of 50).
* **Profit/Loss Formulas:**
  + P% = (Profit/CP) \* 100 ; L% = (Loss/CP) \* 100
  + SP = CP \* (100 + P%)/100 ; SP = CP \* (100 - L%)/100
  + *Tip for Q8:* If SP and Loss% are given, find CP first: CP = SP \* 100 / (100 - L%). Then find new SP for desired Profit%: New SP = CP \* (100 + P%)/100.
* **Successive Percentage Change:** Use multipliers: (1 + P1/100)(1 + P2/100).
* **Relationship between CP, SP, MP, Discount:** MP - Discount = SP. Discount% = (Discount/MP)\*100.
* **Average = Sum / Count**
* **Weighted Average (Crucial for Q7):** For groups with different averages: Average = (Sum1 + Sum2) / (Count1 + Count2) or (A1*N1 + A2*N2) / (N1 + N2).
* **Replacement Trick (Q6):** If an item is replaced and the average changes: New item's value = Old item's value + (Change in average \* Number of items).
  + *Q6 Example:* Avg increases by 5 kg for 3 boxes. New box = 89 + (5 \* 3) = 89 + 15 = 104 kg.
* **Age Problems:** Often boil down to forming linear equations based on average or ratio information. Be careful with "X years ago/hence".
* **Alligation Rule (for Q24, Q29):** Used to find the ratio in which two ingredients with different costs/values must be mixed to get a mixture of a desired cost/value.

Generated code

Cost of Cheaper (C) Cost of Dearer (D)

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Mean Cost (M)

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(D - M) (M - C)

Ratio of Cheaper to Dearer = (D - M) : (M - C)

* + *Important for Q29:* If selling price is given with profit, convert it to cost price first to use the alligation rule. Cost Price = Selling Price / (1 + Profit%).
* **Mixture Replacement (Q25, Q26, Q28):**
  + **Formula for repeated replacement:**  
    Final Quantity of Pure Substance = Initial Quantity \* (1 - Quantity Removed / Initial Quantity)^n  
    Where 'n' is the number of times the process is repeated.
  + *Q28 Example:* Initial milk = 60L. Removed = 6L. Repeated 2 more times (total 3 times).  
    Final milk = 60 \* (1 - 6/60)^3 = 60 \* (1 - 1/10)^3 = 60 \* (9/10)^3 = 60 \* 729/1000 = 43740/1000 = 43.74L.
* **Basic Formula:** Distance = Speed × Time (D=ST)
* **Units Conversion:** Be mindful of km/hr to m/s (multiply by 5/18) and vice-versa (multiply by 18/5). Convert minutes to hours or vice-versa as needed (Q15).
* **Relative Speed:** When moving in same direction (S1 - S2), opposite direction (S1 + S2).
* **Efficiency Concept:** Work = Efficiency × Time. If A does a work in 'x' days, A's 1-day work = 1/x.
* **MDH Formula (Crucial for Q16, Q17):**  
  M1 D1 H1 / W1 = M2 D2 H2 / W2  
  Where M = Men, D = Days, H = Hours, W = Work.
  + *Q17 Example:* Initial: 32 workers, 72 days. After 54 days, 2/5 work done. Remaining work = 3/5.  
    Remaining days for original plan = 72 - 54 = 18 days.  
    Target finish time = 72 - 2 = 70 days. Work must be done in 70-54 = 16 days.  
    So, 32 men did 2/5 work in 54 days.  
    How many (32+x) men do 3/5 work in 16 days?  
    (32 \* 54) / (2/5) = ((32+x) \* 16) / (3/5)  
    32 \* 54 \* 5/2 = (32+x) \* 16 \* 5/3  
    16 \* 54 \* 5 = (32+x) \* 16 \* 5/3  
    54 = (32+x)/3  
    162 = 32+x  
    x = 130. (Matches feedback)
* **Inverse Proportion (Q39):** Men \* Days = Constant. (M1D1 = M2D2).
* **Simple Interest:** SI = (P \* R \* T) / 100
* **Compound Interest:** A = P (1 + R/100)^T ; CI = A - P
* **Interest on Interest (Crucial for Q19):** The interest earned in year 'n' is the interest on (Principal + CI accumulated till year n-1).
  + If CI for year 6 is 960 and for year 7 is 1152, then (1152 - 960) = 192 is the interest earned on 960 from year 6 to year 7.
  + Rate = (192/960) \* 100 = 20%.
  + So, interest for year 5 (X) + 20% of X = 960. X \* 1.2 = 960. X = 960/1.2 = 800. (Matches feedback)
* **Permutations (Arrangement):** nPr = n! / (n-r)!
* **Combinations (Selection):** nCr = n! / (r! \* (n-r)!)
* **Anagrams with Repeated Letters (Q20):** If a word has 'n' letters, with 'r1' identical of one type, 'r2' identical of another, etc. then permutations = n! / (r1! \* r2! \* ...).
  + *Q20 MONSOON:* 7 letters. M(1), O(2), N(2), S(1).
  + Arrangements = 7! / (2! \* 2!) = 5040 / (2 \* 2) = 5040 / 4 = 1260.
  + \*Wait, the feedback is 420. Let's recheck the word. MONSOON. M-1, O-2, N-2, S-1. Okay, 7!/(2!2!) is correct. Maybe the options are wrong or the feedback refers to a different problem? Let's check common answers. 7! = 5040. If only one letter repeated (e.g. O twice), 7!/2! = 2520. If 3 same, 7!/3! = 840. If 4 same, 7!/4! = 210. Ah, if it was 7!/(3!1!1!1!1!) or 7!/(2!2!1!1!1!) as calculated above. Let's assume the question text is the final authority and re-evaluate. 7!/(2!*2!) = 5040/4 = 1260. The provided correct answer is 420 which is 7! / (4! \* 1! \* 1! \* 1!) assuming 4 repeating characters. This implies 4 'O's or 4 'N's but MONSOON has 2 'O's and 2 'N's. So either the word is different or the answer is based on some other interpretation/typo.*
  + **Self-Correction/Key takeaway:** Double-check your understanding of the question or given answers. For MONSOON (M-1, O-2, N-2, S-1), the correct formula application is 7! / (2! \* 2!) = 1260. If the answer is 420, there might be a typo in the word or the provided answer. If we assume it meant a 7-letter word with 4 identical letters (e.g., AAAAA BC), then 7!/4! = 5040/24 = 210. Or 7!/(3!3!) = 5040/36 = 140. None directly give 420.
  + **Update:** *Let's re-examine options and "correct answer is: 420". Ah, option "4." is 420. But the math for MONSOON is 1260. This is a discrepancy. When faced with such, assume your calculation is correct based on the text. If forced to choose an option, sometimes the closest one is implied. However, mathematically, 1260 is correct for MONSOON.* For learning, *always apply the correct formula*.
* **Probability (Q21):**
  + P(Event) = (Number of Favorable Outcomes) / (Total Number of Possible Outcomes).
  + *Q21 Dice:* Total outcomes = 6\*6 = 36. Sum > 10 means sum is 11 or 12.
    - Sum 11: (5,6), (6,5) = 2 outcomes.
    - Sum 12: (6,6) = 1 outcome.
    - Total favorable = 2 + 1 = 3.
    - Probability = 3/36 = 1/12. (Matches feedback)
* **Number Series (Q22, Q30):** Look for patterns:
  + **Differences:** Constant difference, increasing/decreasing difference, differences forming another series (AP, GP, squares, cubes).
  + **Ratios:** Constant ratio (GP), increasing/decreasing ratio.
  + **Squares/Cubes:** Numbers are (N^2 +/- K), (N^3 +/- K).
  + **Alternating Series:** Two patterns interleaved.
  + **Fibonacci-like:** Sum of previous two/three terms.
  + **Multiplication/Division with addition/subtraction:** (x N +/- K).
  + *Q22: 1, 2, 5, 12, 27, 58, 121, ?*
    - 1 \* 2 + 0 = 2
    - 2 \* 2 + 1 = 5
    - 5 \* 2 + 2 = 12
    - 12 \* 2 + 3 = 27
    - 27 \* 2 + 4 = 58
    - 58 \* 2 + 5 = 121
    - 121 \* 2 + 6 = 242 + 6 = 248. (Matches feedback)
* **Alphabet Series (Q23):**
  + Assign numerical values (A=1, B=2... Z=26).
  + Look for skips (e.g., +2, +3, -1).
  + *Q23 ADG, GJM, \_\_\_\_, SVY*
    - A(1) + 6 = G(7)
    - D(4) + 6 = J(10)
    - G(7) + 6 = M(13)
    - So the pattern is +6 for each letter.
    - Next will be GJM + 6:
      * G(7) + 6 = M(13)
      * J(10) + 6 = P(16)
      * M(13) + 6 = S(19)
    - So, MPS. Let's check if MPS + 6 = SVY.
      * M(13) + 6 = S(19) (Correct)
      * P(16) + 6 = V(22) (Correct)
      * S(19) + 6 = Y(25) (Correct)
    - Answer: MPS. (Matches feedback)
* **Seating Arrangements (Q12, Q13):**
  + **Draw Diagrams:** Always draw the setup (linear line or circle).
  + **Identify Fixed Positions:** Start with definite statements (e.g., "Harshita is at the extreme right").
  + **Use Relative Information:** "X is to the left of Y." "X is between Y and Z."
  + **Handle Negatives:** "Q is NOT between P and M."
  + **Trial and Error (if needed):** If stuck, try placing a person and see if it contradicts other statements.
* **Coding-Decoding (Q27):**
  + **Identify Type:** Letter shifting, substitution, alphanumeric.
  + **Letter Shifting:** Check positional values (A=1, B=2...) and see if there's a constant shift (+/- N) or a pattern (+1, -2, +3...).
  + *Q27 BEAMING -> BFCMHOJ ; CLEAR -> MDESB*
    - Let's analyze BEAMING to BFCMHOJ:
      * B(+0) -> B
      * E(+1) -> F
      * A(+2) -> C
      * M(+0) -> M (This seems off based on a consistent shift)
      * Let's try a different approach. Maybe it's not a simple shift.
      * B->B, E->F, A->C, M->M, I->H (backwards), N->O, G->J. This is complex.
      * Let's recheck the given feedback 'SUAMJ'.
      * Let's analyze CLEAR -> MDESB:
        + C->M (+10)
        + L->D (-8)
        + E->E (+0)
        + A->S (+18)
        + R->B (+10, wrapping around or -16)
      * This doesn't look like a simple, consistent pattern for the whole word.
      * **Could it be position-based?** Let's re-examine the correct answer: SUAMJ.
      * If TRAIL becomes SUAMJ.
        + T -> S (-1)
        + R -> U (+3)
        + A -> A (+0)
        + I -> M (+4)
        + L -> J (-2)
      * This is not simple. Let's assume there's a rule connecting the original word and the coded word *per character*. The example BEAMING -> BFCMHOJ needs to be consistently applied to TRAIL.
      * Let's look at BEAMING again, letter by letter B E A M I N G and B F C M H O J:
        + B -> B (0)
        + E -> F (+1)
        + A -> C (+2)
        + M -> M (0)
        + I -> H (-1)
        + N -> O (+1)
        + G -> J (+3)
      * This looks like a mix of shifts, perhaps related to position or vowel/consonant. This is a difficult coding pattern to discern quickly. If a simple pattern isn't obvious, sometimes it's about unique mapping or a more complex rule.
      * Given the answer SUAMJ, let's try to reverse engineer the rule from the first word.
      * Let's check for an 'nth letter' rule or something common:
        + For BEAMING (7 letters): (B, E, A, M, I, N, G)
        + BFCMHOJ
        + Maybe (1st char + 0), (2nd char + 1), (3rd char + 2), (4th char + 0), (5th char - 1), (6th char + 1), (7th char + 3). This is very specific.
      * Let's re-evaluate CLEAR -> MDESB
        + C -> M (+10)
        + L -> D (-8)
        + E -> E (0)
        + A -> S (+18)
        + R -> B (+10 or -16)
      * This suggests either the rule is highly complex and specific, or it's a simple, non-alphabetic substitution that's not obvious.
      * **Let's assume there might be a typo in the question's example coding. If the answer SUAMJ for TRAIL is correct, we'd need to find a simpler pattern.** Often these are direct shifts. Without a clear pattern from the examples, this specific question is problematic. For general learning, stick to simple shifts, skip letter patterns, or positional value patterns.
* **Caselets (Q31-34):**
  + **Extract Information:** List down all given facts clearly.
  + **Assign Variables:** Use variables for unknowns.
  + **Form Equations:** Translate facts into mathematical equations.
  + **Solve Systematically:** Solve the equations step-by-step.
  + *Q31-34 Example Breakdown:*
    - Total employees = 150
    - HR = 20 (Given)
    - Dev = 2 \* HR = 2 \* 20 = 40 (Q31 answer)
    - Sales = HR + 10 = 20 + 10 = 30 (Q32 answer)
    - Finance = Marketing - 5
    - Sum = Dev + Marketing + HR + Sales + Finance = 150
    - 40 + Marketing + 20 + 30 + (Marketing - 5) = 150
    - 90 + 2\*Marketing - 5 = 150
    - 85 + 2\*Marketing = 150
    - 2\*Marketing = 65
    - Marketing = 32.5. This isn't a whole number for employees, suggesting a possible typo in the source problem or my quick calculation. Let's recheck.
    - Let's re-read the Marketing and Finance relation: "Finance department has 5 fewer employees than Marketing."
    - Let Marketing = M. Then Finance = M - 5.
    - Total = Dev(40) + Marketing(M) + HR(20) + Sales(30) + Finance(M-5) = 150
    - 40 + M + 20 + 30 + M - 5 = 150
    - 85 + 2M = 150
    - 2M = 150 - 85 = 65
    - M = 32.5. This implies the numbers given in the caselet are not perfectly designed to yield integer results for all departments.
    - However, let's look at the options for Q33 (Finance) and Q34 (Which department has 33 employees?).
    - If Marketing = 32.5, then Finance = 27.5.
    - The feedback for Q33 is 27. This suggests Marketing might be 32, making Finance 27, or Marketing 33, making Finance 28. But then the total sum wouldn't be 150.
    - Let's assume the feedback (27 for Finance, 33 for Marketing) is correct and work backward.
    - If Finance = 27 (Q33 answer), then Marketing = 27 + 5 = 32.
    - If Marketing = 33 (Q34 answer), then Finance = 33 - 5 = 28.
    - There is a clear contradiction in the provided "correct answers" for Q33 and Q34 if the sum must be 150.
    - Let's take the "correct answer" for Q33 = 27 for Finance.
      * HR = 20
      * Dev = 40
      * Sales = 30
      * Finance = 27
      * Marketing = 27 + 5 = 32
      * Total = 20 + 40 + 30 + 27 + 32 = 149. This is not 150.
    - Let's take the "correct answer" for Q34 = Marketing has 33 employees.
      * HR = 20
      * Dev = 40
      * Sales = 30
      * Marketing = 33
      * Finance = 33 - 5 = 28
      * Total = 20 + 40 + 30 + 33 + 28 = 151. This is not 150.
    - **Key Takeaway for Caselets:** These puzzles rely on exact information. If the provided "correct answers" contradict the initial data (like total employees), it indicates an issue with the question itself or the provided solutions. In a real exam, you would flag this or make the best assumption based on the prompt. For learning, practice setting up the equations and solving.

**III. Mental Math & Estimation**

* **Tables:** Memorize multiplication tables up to 20.
* **Square Roots & Cube Roots:** Quick recognition for common numbers.
* **Percentage Multipliers:** Instantly know that 20% increase is x1.2, 20% decrease is x0.8.
* **Approximation:** For multiple-choice questions, sometimes you can estimate the answer without exact calculations, especially when options are far apart.
* **Fractions for percentages:** 1/2=50%, 1/3=33.33%, 1/4=25%, 1/5=20%, 1/6=16.67%, 1/7=14.28%, 1/8=12.5%, 1/9=11.11%, 1/10=10%, 1/11=9.09%, 1/12=8.33%.

**IV. Practice Strategy**

1. **Solve Topic-Wise:** Go through each topic, learn concepts, solve examples, then practice problems.
2. **Mix & Match:** Once comfortable with individual topics, start solving mixed bags of questions.
3. **Mock Tests:** Regularly take full-length mock tests to simulate exam conditions. This helps with time management, identifying weak areas, and building stamina.
4. **Analyze Mistakes:** Don't just check answers. Understand *why* you made a mistake (conceptual error, calculation error, silly mistake, time management). Maintain an error log.