04. Aptitude & Reasoning Solved PYQs & Comprehensive Practice Bank

> **Module Focus**: High-Frequency PYQs & Speed Aptitude (Quant, Logical Reasoning, Verbal English)
> **Target Speed**: 30 Questions in 30 Minutes
> **Key Coverage**: Speed Math, Time & Work, Speed-Distance-Time, Boats & Streams, Permutations & Combinations, Probability, Profit & Loss, Alligations, Number Systems, Syllogisms, Circular & Linear Arrangements, Blood Relations, Direction Sense, Error Spotting, Conditionals, Para-Jumbles.

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1. Quantitative Aptitude Solved PYQs

PYQ 1: Pipes & Cisterns with Leakage

Problem: Pipe A can fill a tank in 8 hours and Pipe B can fill it in 12 hours. Due to a leak at the bottom, it takes 2 hours longer to fill the tank when both pipes are open. How long will the leak alone take to empty the full tank?

Detailed Step-by-Step Solution & Proof: 1. **Calculate Ideal Combined Rate (without leak)**: $$\text{Time}_{A+B} = \frac{8 \times 12}{8 + 12} = \frac{96}{20} = 4.8 \text{ hours}$$

1. **Calculate Actual Time (with leak)**: $$\text{Actual Time} = 4.8 + 2 = 6.8 \text{ hours} = \frac{34}{5} \text{ hours}$$

2. **LCM Capacity Method**:

3. Let Total Tank Capacity $= \text{LCM}(8, 12) = 24 \text{ units}$.
4. Rate of Pipe A (r_A) $= \frac{24}{8} = +3 \text{ units/hour}$.
5. Rate of Pipe B (r_B) $= \frac{24}{12} = +2 \text{ units/hour}$.

6. Combined Inflow Rate ($r_A + r_B$) $= 3 + 2 = +5 \text{ units/hour}$.

7. **Determine Net Rate with Leak (L)**: $$\text{Net Rate} = \frac{\text{Capacity}}{\text{Actual Time}} = \frac{24}{34/5} = \frac{120}{34} = \frac{60}{17} \text{ units/hour}$$

8. **Solve for Leak Outflow Rate (L)**: $$\text{Net Rate} = (r_A + r_B) - L$$ $$\frac{60}{17} = 5 - L \implies L = 5 - \frac{60}{17} = \frac{85 - 60}{17} = \frac{25}{17} \text{ units/hour}$$

9. **Time for Leak Alone to Empty Full Tank (24 units)**: $$\text{Time}_{\text{Leak}} = \frac{24}{25/17} = \frac{24 \times 17}{25} = \frac{408}{25} = 16.32 \text{ hours} \quad (16 \text{ hours } 19.2 \text{ minutes})$$

Diagram / Rate Summary:

```
+-----------------------------------------------------------+
| Pipe A Inflow (+3 u/h)  \                                 |
|                          +---> Net Inflow = +60/17 u/h    |
| Pipe B Inflow (+2 u/h)  /      (Fills 24 units in 16.32 h)|
|                                                           |
| Leak Outflow L (-25/17 u/h) ---> Empties 24 u in 16.32 h  |
+-----------------------------------------------------------+
```

Correct Answer: `16.32 hours` (or $16\frac{8}{25}$ hours)

PYQ 2: Boats & Streams - Still Water Speed Derivation

Problem: A boat travels 30 km downstream and returns upstream to the starting point in a total of 8 hours. If the speed of the stream is 2 km/h, find the speed of the boat in still water.

Detailed Step-by-Step Solution & Proof: 1. Let the speed of the boat in still water be $b \text{ km/h}$. - Downstream Speed (U) $= b + 2 \text{ km/h}$ - Upstream Speed (V) $= b - 2 \text{ km/h}$

1. **Formulate Total Time Equation**: $$\text{Time}_{\text{downstream}} + \text{Time}_{\text{upstream}} = T_{\text{total}}$$ $$\frac{30}{b + 2} + \frac{30}{b - 2} = 8$$
2. **Algebraic Simplification**: $$30 \left(\frac{(b - 2) + (b + 2)}{(b + 2)(b - 2)} \right) = 8$$ $$30 \left(\frac{2b}{b^2 - 4} \right) = 8 \implies \frac{60b}{b^2 - 4} = 8$$ $$60b = 8b^2 - 32 \implies 8b^2 - 60b - 32 = 0$$
3. **Solve Quadratic Equation**: Divide entire equation by 4: $$2b^2 - 15b - 8 = 0$$ $$(2b + 1)(b - 8) = 0$$ Roots: $b = -\frac{1}{2}$ or $b = 8$. Since physical speed must be positive: $b = 8 \text{ km/h}$.

Correct Answer: `8 km/h`

PYQ 3: Conditional Probability without Replacement

Problem: Two cards are drawn sequentially without replacement from a standard pack of 52 cards. What is the probability that the first card is a **King** and the second card is an **Ace**?

Detailed Step-by-Step Solution & Proof: 1. **Event E_1 (First card is a King)**: - Total Cards $= 52$, Total Kings $= 4$. $$P(E_1) = \frac{4}{52} = \frac{1}{13}$$

1. **Event $E_2 \mid E_1$ (Second card is an Ace given first was a King)**:
2. Remaining cards in deck $= 51$.
3. Number of Aces remaining $= 4$. $$P(E_2 \mid E_1) = \frac{4}{51}$$
4. **Joint Probability using Multiplication Theorem**: $$P(E_1 \cap E_2) = P(E_1) \times P(E_2 \mid E_1) = \frac{4}{52} \times \frac{4}{51} = \frac{1}{13} \times \frac{4}{51} = \frac{4}{663}$$

Correct Answer: `4 / 663`

PYQ 4: Time & Work - Alternate Days Cycle

Problem: A can complete a work in 12 days, B in 16 days, and C in 24 days. If they work on alternate days in the order of A on Day 1, B on Day 2, C on Day 3, A on Day 4, and so on, in how many days will the work be completed?

Detailed Step-by-Step Solution & Proof: 1. **Define Total Work using LCM**: $$\text{Total Work} = \text{LCM}(12, 16, 24) = 48 \text{ units}$$

1. **Calculate Daily Efficiencies**:
2. Efficiency of A (e_A) $= \frac{48}{12} = 4 \text{ units/day}$
3. Efficiency of B (e_B) $= \frac{48}{16} = 3 \text{ units/day}$
4. Efficiency of C (e_C) $= \frac{48}{24} = 2 \text{ units/day}$
5. **Analyze 1 Complete Cycle (3 Days)**: $$\text{Work in 1 cycle (3 days)} = e_A + e_B + e_C = 4 + 3 + 2 = 9 \text{ units}$$
6. **Determine Completed Cycles**: $$\text{Number of full cycles} = \left\lfloor \frac{48}{9} \right\rfloor = 5 \text{ cycles}$$
7. Work completed in 5 cycles ($5 \times 3 = 15 \text{ days}$) $= 5 \times 9 = 45 \text{ units}$.
8. Remaining Work $= 48 - 45 = 3 \text{ units}$.
9. **Evaluate Partial Day for Remaining Work**:
10. Day 16 is A's turn. A can do 4 units/day.
11. Time required by A for 3 units $= \frac{\text{Remaining Work}}{e_A} = \frac{3}{4} \text{ day}$.
12. **Total Time**: $$\text{Total Days} = 15 + \frac{3}{4} = 15.75 \text{ days} = 15\frac{3}{4} \text{ days}$$

Correct Answer: `15.75 days` (or $15\frac{3}{4}$ days)

PYQ 5: Speed, Distance & Time - Relative Speed & Platform Crossing

Problem: Train X of length 200 m is moving at 72 km/h. Train Y of length 300 m is moving in the opposite direction at 54 km/h.
(a) How long will it take for the two trains to completely cross each other?
(b) How long will Train X take to cross a stationary platform of length 280 m?

Detailed Step-by-Step Solution & Proof: 1. **Convert Speeds to m/s**: - Speed of Train X (v_X) $= 72 \times \frac{5}{18} = 20 \text{ m/s}$ - Speed of Train Y (v_Y) $= 54 \times \frac{5}{18} = 15 \text{ m/s}$

1. **Part (a): Crossing Each Other (Opposite Directions)**:
2. Relative Speed (v_{rel}) $= v_X + v_Y = 20 + 15 = 35 \text{ m/s}$
3. Total Distance (D_1) $= L_X + L_Y = 200 + 300 = 500 \text{ m}$ $$\text{Time}_1 = \frac{D_1}{v_{\text{rel}}} = \frac{500}{35} = \frac{100}{7} \approx 14.29 \text{ seconds}$$

4. **Part (b): Train X Crossing Platform**:
5. Total Distance (D_2) $= L_X + L_{\text{platform}} = 200 + 280 = 480 \text{ m}$ $$\text{Time}_2 = \frac{D_2}{v_X} = \frac{480}{20} = 24 \text{ seconds}$$

Correct Answer: `(a) 14.29 s, (b) 24 s`

PYQ 6: Permutations & Combinations - Vowels Together Constraint

Problem: In how many different ways can the letters of the word **'CORPORATION'** be arranged such that all the vowels always come together?

Detailed Step-by-Step Solution & Proof: 1. **Analyze Letter Frequencies**: - Total letters $= 11$ - Vowels: O, O, A, I, O $\implies$ 5 vowels (Count: O=3, A=1, I=1) - Consonants: C, R, P, R, T, N $\implies$ 6 consonants (Count: R=2, C=1, P=1, T=1, N=1)

1. **Bundle Vowels as One Block ($\mathbf{V}$)**:
2. Items to arrange $= 6 \text{ consonants} + 1 \text{ Vowel-Block} = 7 \text{ items}$.
3. Among consonants, 'R' repeats 2 times. $$\text{Arrangements of 7 items} = \frac{7!}{2!} = \frac{5040}{2} = 2520$$
4. **Internal Arrangements of the Vowel Block ($\mathbf{V}$)**:
5. 5 vowels with 'O' repeating 3 times. $$\text{Internal Arrangements} = \frac{5!}{3!} = \frac{120}{6} = 20$$
6. **Apply Fundamental Principle of Counting**: $$\text{Total Ways} = 2520 \times 20 = 50,400$$

Correct Answer: `50,400`

PYQ 7: Profit, Loss & Successive Discounts

Problem: A retailer marks an item 50% above its Cost Price (CP) and offers two successive discounts of 20% and 10%. If the final Selling Price (SP) is ₹$1,080$, find the Cost Price and the net Profit Percentage.

Detailed Step-by-Step Solution & Proof: 1. Let Cost Price $= 100x$. 2. **Marked Price (MP)**: $$\text{MP} = 100x \times (1 + 0.50) = 150x$$

1. **Apply 1st Discount (20%)**: $$\text{Price}_1 = 150x \times (1 - 0.20) = 150x \times 0.80 = 120x$$
2. **Apply 2nd Discount (10%)**: $$\text{SP} = 120x \times (1 - 0.10) = 120x \times 0.90 = 108x$$
3. **Solve for x given $\text{SP} = ₹1,080$**: $$108x = 1080 \implies x = 10$$ $$\text{Cost Price (CP)} = 100 \times 10 = ₹1,000$$
4. **Calculate Profit and Profit Percentage**: $$\text{Profit} = \text{SP} - \text{CP} = 1080 - 1000 = ₹80$$ $$\text{Profit \%} = \left(\frac{80}{1000} \right) \times 100\% = 8\%$$

Correct Answer: `Cost Price = ₹1,000, Profit % = 8%`

PYQ 8: Mixtures & Alligations - Repeated Dilution Formula

Problem: A container holds 80 liters of pure milk. 8 liters of milk is extracted and replaced with 8 liters of water. This operation is repeated 2 more times (total 3 operations). What is the final quantity of pure milk remaining in the container?

Detailed Step-by-Step Solution & Proof: 1. **Repeated Replacement Formula**: $$Q_{\text{final}} = Q_{\text{initial}} \times \left(1 - \frac{x}{V}\right)^n$$ Where: - $Q_{\text{initial}} = 80 \text{ L}$ (Initial pure volume) - $x = 8 \text{ L}$ (Volume replaced per cycle) - $V = 80 \text{ L}$ (Total container capacity) - $n = 3$ (Number of operations)

1. **Substitute Values**: $$Q_{\text{final}} = 80 \times \left(1 - \frac{8}{80}\right)^3 = 80 \times \left(1 - \frac{1}{10}\right)^3 = 80 \times \left(\frac{9}{10}\right)^3$$
2. **Evaluate**: $$Q_{\text{final}} = 80 \times \frac{729}{1000} = \frac{58320}{1000} = 58.32 \text{ liters}$$

Correct Answer: `58.32 liters`

PYQ 9: Number System - Remainder Theorem & Modular Arithmetic

Problem: What is the remainder when 7^{84} is divided by 342?

Detailed Step-by-Step Solution & Proof: 1. Express 7^{84} in terms of powers close to a multiple of 342. - Note that $7^3 = 343$. 2. Express 343 modulo 342: $$343 \equiv 1 \pmod{342}$$

1. Rewrite 7^{84} using power of 3: $$7^{84} = (7^3)^{28} = (343)^{28}$$
2. Apply Modular Congruence Property ($(a)^n \equiv (b)^n \pmod m$): $$7^{84} \equiv (1)^{28} \pmod{342} \equiv 1 \pmod{342}$$

Correct Answer: `1`

PYQ 10: Simple vs Compound Interest 3-Year Difference

Problem: The difference between Compound Interest (compounded annually) and Simple Interest on a sum of money for 3 years at 10% per annum is ₹155. Find the principal sum.

Detailed Step-by-Step Solution & Proof: 1. **Standard 3-Year Interest Difference Formula**: $$D_3 = P \times \left(\frac{r}{100}\right)^2 \times \left(3 + \frac{r}{100}\right)$$

1. **Substitute Given Values ($D_3 = 155, r = 10$)**: $$155 = P \times \left(\frac{10}{100}\right)^2 \times \left(3 + \frac{10}{100}\right)$$ $$155 = P \times \left(\frac{1}{10}\right)^2 \times \left(\frac{31}{10}\right)$$ $$155 = P \times \frac{1}{100} \times \frac{31}{10} = P \times \frac{31}{1000}$$
2. **Solve for Principal P**: $$P = \frac{155 \times 1000}{31} = 5 \times 1000 = ₹5,000$$

Correct Answer: `₹5,000`

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2. Logical Reasoning Solved PYQs

PYQ 11: Circular Seating Arrangement (Mixed Facing Directions)

Problem: 6 individuals (A, B, C, D, E, F) sit around a circular table. - A and B are facing **outside** the center. - C, D, E, F are facing **inside** the center. - C sits second to the right of A. - B sits opposite to D. - E is an immediate neighbor of both C and B. Who sits to the immediate left of F?

Detailed Step-by-Step Logical Deduction: 1. **Direction Rules**: - Facing IN $\implies$ Right is Counter-Clockwise (CCW), Left is Clockwise (CW). - Facing OUT $\implies$ Right is Clockwise (CW), Left is Counter-Clockwise (CCW).

1. **Step 1: Place A (Facing OUT)**:
2. Assign Position 1 to A (Facing OUT).

3. Right of A (Facing OUT) is Clockwise. Second to right places C at Position 5 (or 2 steps CW).

4. **Step 2: Place E and B**:

5. E is adjacent to both C and B.

6. If C is at Pos 5, E must be at Pos 4, and B at Pos 3.

7. **Step 3: Place D and F**:

8. B (at Pos 3) is opposite $D \implies D$ is at Pos 6.
9. The remaining position (Pos 2) is occupied by F.

Circular Diagram Map:

```
              Pos 1: A (OUT)
             /              \
Pos 6: D (IN)                Pos 2: F (IN)
    |                            |
Pos 5: C (IN)                Pos 3: B (OUT)
             \              /
              Pos 4: E (IN)
```

1. **Step 4: Evaluate Immediate Left of F**:
2. F is at Pos 2 and faces **IN**.
3. For facing IN, **Left** means Clockwise $\implies$ Position 3.
4. Position 3 is occupied by B.

Correct Answer: `B`

PYQ 12: Linear Seating Arrangement (8 Persons Facing North)

Problem: 8 friends P, Q, R, S, T, U, V, W sit in a straight line facing North. 1. R sits 3rd to the left of W. 2. W is not at any extreme end. 3. Only two people sit between W and T. 4. P sits 2nd to the right of T. 5. S sits to the immediate left of U. 6. Q does not sit at an extreme end.

Who sits at the extreme left end of the row?

Detailed Step-by-Step Logical Mapping: 1. Create 8 slots (1 to 8 left to right). 2. Condition 1 & 2: $R \text{ _ _ } W$. Since W is not extreme end, possible slots for (R, W) are $(1, 4), (2, 5), (3, 6), (4, 7)$. 3. Condition 3 & 4: Two people between W and T. P is 2nd to right of T ($T \text{ _ } P$). - If $W=4 \implies T=7 \implies P=9$ (Invalid, out of bounds). - If $W=5 \implies T=2 \implies P=4$. - Test $(R=2, W=5, T=2)$ collision! R and T both at 2 (Invalid). - If $W=6 \implies R=3$. Two between $W(6)$ and $T \implies T=3$ (Collision with R) or $T=9$ (Invalid). - If $W=4, R=1$: Two between $W(4)$ and $T \implies T=7$. P at 2nd right of $T(7) \implies P=8$. - Slots filled so far: 1:R, 4:W, 7:T, 8:P.

1. Condition 5 & 6: S is immediate left of U (SU block). Remaining free contiguous slots are 5 & 6. So $S=5, U=6$.
2. Remaining slots: 2 and 3. Q cannot be at extreme end, so remaining V and Q fill slots 2 and 3. Since Q at 3, V at 2.

Final Linear Layout:

```
Slot:   [ 1 ] [ 2 ] [ 3 ] [ 4 ] [ 5 ] [ 6 ] [ 7 ] [ 8 ]
Person:   R     V     Q     W     S     U     T     P
```

Correct Answer: `R`

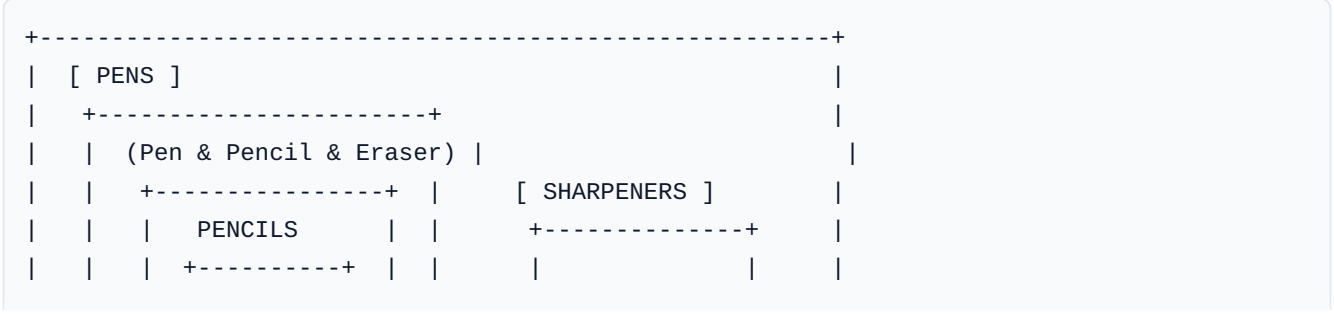
PYQ 13: Syllogism - "Only a Few" & Venn Diagram Logic

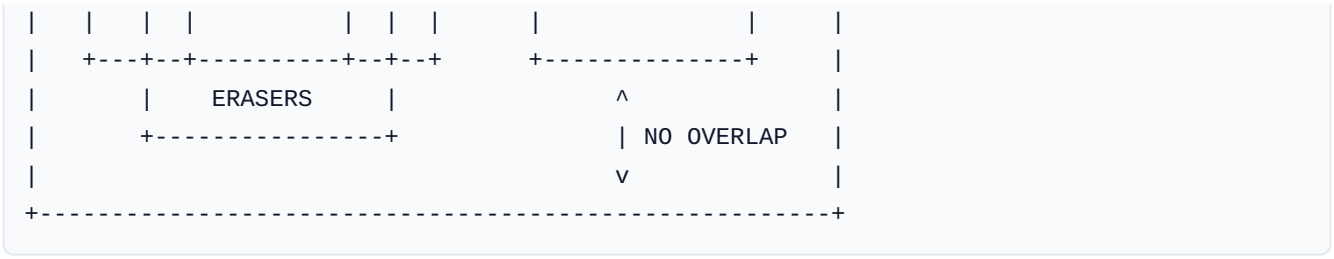
Problem: **Statements**: 1. Only a few Pens are Pencils. 2. All Pencils are Erasers. 3. No Eraser is a Sharpener.

Conclusions: I. Some Pens are Erasers.
II. No Pencil is a Sharpener.
III. All Pens can never be Pencils.

Which of the conclusions logically follow?

Detailed Venn Diagram Logic & Proof: - *"Only a few A are B"* implies two simultaneous conditions: 1. Some A are B (Intersection exists). 2. Some A are NOT B (A cannot be completely inside B).





1. **Check Conclusion I (Some Pens are Erasers)**:
2. Since Some Pens are Pencils and ALL Pencils are Erasers, the Pen-Pencil intersection MUST lie inside Erasers. $\implies$ **Follows**.
3. **Check Conclusion II (No Pencil is a Sharpener)**:
4. All Pencils are inside Erasers, and No Eraser is a Sharpener. $\implies$ Pencils can never overlap with Sharpeners. $\implies$ **Follows**.
5. **Check Conclusion III (All Pens can never be Pencils)**:
6. From Statement 1 ("Only a few Pens are Pencils"), by definition Some Pens are NOT Pencils. Thus, 100% of Pens can never enter Pencils. $\implies$ **Follows**.

Correct Answer: `All I, II, and III follow`

PYQ 14: Syllogism - Possibility and Negative Deduction

Problem: **Statements**: 1. Some Cats are Dogs. 2. All Dogs are Birds. 3. No Bird is a Fish.

Conclusions: I. Some Cats are not Fish.
II. All Birds being Cats is a possibility.

Detailed Step-by-Step Proof: 1. **Conclusion I**: - Cats that are Dogs are also Birds (since All Dogs are Birds). - No Bird is a Fish $\implies$ Those specific Cats which are Dogs can NEVER be Fish. - Therefore, at least those Cats are not Fish $\implies$ **Follows**.

1. **Conclusion II**:
2. The statement "All Dogs are Birds" allows Birds to expand and encompass all Cats without violating any negative boundary with Fish.
3. A single valid Venn diagram exists where the circle of Cats is entirely inside Birds $\implies$ **Follows**.

Correct Answer: `Both I and II follow`

PYQ 15: Coded Blood Relations Tree Deduction

Problem: Symbols: - $A + B \implies A \text{ is the father of } B$ - $A - B \implies A \text{ is the sister of } B$ - $A \times B \implies A \text{ is the mother of } B$ - $A \div B \implies A \text{ is the brother of } B$

Given the expression: $\mathbf{P + Q \times R - S \div T}$
How is P related to T?

Detailed Family Tree Mapping: 1. $P + Q \implies P$ (Male) is Father of Q. 2. $Q \times R \implies Q$ (Female) is Mother of R. 3. $R - S \implies R$ (Female) is Sister of S. 4. $S \div T \implies S$ (Male) is Brother of T.

```
Gen 1:            [ P ] (Male, Grandfather)
                    |
Gen 2:            ( Q ) (Female, Mother)
                    |
Gen 3:   +----------+----------+
         |          |          |
      ( R ) (F)   [ S ] (M)    [ T ] (Gender unstated)
```

1. R, S, T are siblings.
2. Q is the mother of T.
3. P is the father of Q.
4. Therefore, P is the **Maternal Grandfather** of T.

Correct Answer: `Maternal Grandfather`

PYQ 16: Direction Sense & Shortest Distance Vector

Problem: A person starts at point A and walks 10 m North, turns right and walks 15 m to point B, turns right and walks 18 m to point C, then turns left and walks 9 m to point D.
Find the shortest (direct) distance between point A and point D.

Detailed Coordinate System Proof: 1. Assign origin $(0,0)$ to starting Point A. 2. Step 1: North $10 \text{ m} \implies (0, +10)$. 3. Step 2: Turn Right (East) $15 \text{ m} \implies \text{Point B} = (0+15, 10) = (15, 10)$. 4. Step 3: Turn Right (South) $18 \text{ m} \implies \text{Point C} = (15, 10-18) = (15, -8)$. 5. Step 4: Turn Left (East) $9 \text{ m} \implies \text{Point D} = (15+9, -8) = (24, -8)$.

```
   North (+y)
       ^
       |       (0,10) -------------> B (15,10)
       |         |                     |
       |  10m N  |                     | 18m S
  A ---+---------+---------------------+----------> East (+x)
(0,0)  |                               |
       |                         C (15,-8) ---------> D (24,-8)
       |                                      9m E
       v
```

1. **Apply Pythagorean Theorem for Direct Distance AD**: $$\Delta x = 24 - 0 = 24 \text{ m}, \quad \Delta y = -8 - 0 = -8 \text{ m}$$ $$AD = \sqrt{(\Delta x)^2 + (\Delta y)^2} = \sqrt{24^2 + (-8)^2} = \sqrt{576 + 64} = \sqrt{640} = 8\sqrt{10} \approx 25.30 \text{ meters}$$

Correct Answer: `8√10 meters` (approx. 25.30 m)

PYQ 17: Data Sufficiency - Comparative Age Evaluation

Problem: Is person X older than person Y? - **Statement 1**: X was born 3 years before Z, and Z is 2 years younger than Y. - **Statement 2**: The average age of X and Y is strictly greater than Y's age.

Which statement(s) is/are sufficient to answer the question?

Detailed Mathematical Proof: 1. **Evaluate Statement 1 Alone**: - "X born 3 years before Z" $\implies \text{Age}(X) = \text{Age}(Z) + 3$. - "$Z$ is 2 years younger than Y" $\implies \text{Age}(Y) = \text{Age}(Z) + 2$. - Compare $\text{Age}(X)$ and $\text{Age}(Y)$: $$\text{Age}(X) - \text{Age}(Y) = (\text{Age}(Z) + 3) - (\text{Age}(Z) + 2) = +1 \text{ year}$$ - Since $\text{Age}(X) > \text{Age}(Y)$, X is definitively older than Y. - Statement 1 alone is **SUFFICIENT**.

1. **Evaluate Statement 2 Alone**:
2. $\frac{\text{Age}(X) + \text{Age}(Y)}{2} > \text{Age}(Y)$
3. Multiply by 2: $\text{Age}(X) + \text{Age}(Y) > 2 \cdot \text{Age}(Y) \implies \text{Age}(X) > \text{Age}(Y)$.
4. Statement 2 alone is also **SUFFICIENT**.

Correct Answer: `Either Statement 1 alone or Statement 2 alone is sufficient`

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3. Verbal English Error Spotting & Grammar PYQs

PYQ 18: Subject-Verb Agreement with Proximity Rule

Problem: Identify the error in the following sentence:
"Neither the principal nor the teachers was present at the annual sports meet yesterday."

Grammatical Analysis & Proof: - **Rule**: When two subjects are joined by correlative conjunctions such as *neither...nor*, *either...or*, or *not only...but also*, the verb must agree with the subject closest to it (Subject Proximity Rule). - Here, the subjects are "the principal" (singular) and "the teachers" (plural). - The verb follows "the teachers" (plural), requiring the plural past tense auxiliary **were**, not the singular *was*.

Corrected Sentence:
"Neither the principal nor the teachers were present at the annual sports meet yesterday."

PYQ 19: Correlative Conjunctions & Inversion Structure

Problem: Identify the error in the following sentence:
"Scarcely had the train arrived at the platform than all the passengers rushed towards the doors."

Grammatical Analysis & Proof: - **Rule 1 (Pairing)**: The adverbs *Scarcely* and *Hardly* must be paired with **when** or **before** (never *than*). (*No sooner* is paired with *than*). - **Rule 2 (Inversion)**: When *Scarcely* begins a sentence, subject-auxiliary inversion occurs (*Scarcely had* + *Subject* + *Past Participle*), which is correctly implemented here.

Corrected Sentence:
"Scarcely had the train arrived at the platform when all the passengers rushed towards the doors."

PYQ 20: Third Conditional Clause Misconjunction

Problem: Correct the grammatical error in the conditional sentence:
"If he would have worked harder, he would have passed the examination."

Grammatical Analysis & Proof: - **Rule (Third Conditional Structure)**: Unfulfilled past conditional situations require:
`If + Subject + Past Perfect (had + V3), Subject + would have + V3` - The conditional (*if*) clause must NOT contain *would have*.

Corrected Sentence:
"If he had worked harder, he would have passed the examination."

PYQ 21: Dangling / Misplaced Modifier Correction

Problem: Spot the error in the sentence:
"Walking down the street, the trees looked vibrant and beautiful to John."

Grammatical Analysis & Proof: - **Rule**: A participial phrase at the beginning of a sentence ("Walking down the street") must modify the grammatical subject immediately following the comma. - As written, the sentence absurdly implies that *the trees* were walking down the street. - The modifier must explicitly attach to *John*.

Corrected Sentence:
"Walking down the street, John noticed that the trees looked vibrant and beautiful."

PYQ 22: Vocabulary in Context - Double Fillers

Problem: Select the pair of words that best completes the sentence logically and grammatically:
*"Despite the board's initial __ **towards the proposed merger, the CEO's compelling presentation eventually** ____ their lingering doubts."*

Options:
A) enthusiasm ... heightened
B) skepticism ... dispelled
C) indifference ... amplified
D) hostility ... fostered

Contextual & Etymological Proof: - The concession word **"Despite"** signals a contrast between the initial negative state of the board and the outcome achieved by the "compelling presentation". - **Skepticism** (doubt/reluctance) fits the first slot. - **Dispelled** (drove away / eliminated) fits the second slot, matching the removal of "lingering doubts".

Correct Answer: `B) skepticism ... dispelled`

PYQ 23: Para-Jumbles (Logical Paragraph Ordering)

Problem: Arrange the following 4 sentences in the most logical sequence to form a coherent paragraph:
- **A**: This rapid evolution of artificial intelligence has reshaped traditional corporate workflows.
- **B**: Consequently, organizational leaders must prioritize continuous upskilling to maintain competitive advantage.
- **C**: Over the past decade, automated algorithms have transitioned from basic task execution to complex predictive modeling.
- **D**: As a result of this shift, employees face unprecedented demands to adapt to hybrid human-AI environments.

Structural Analysis: 1. **Sentence C** introduces the overarching topic ("Over the past decade...") without pronouns or transition markers $\implies$ Ideal introductory sentence. 2. **Sentence A** builds on sentence C, referencing "This rapid evolution..." (pointing directly to C's transition from task execution to predictive modeling). Mandatory pair: **C $\rightarrow$ A**. 3. **Sentence D** explains the direct consequence on workforce demands ("As a result of this shift..."). 4. **Sentence B** offers the final leadership takeaway ("Consequently, organizational leaders must...").

Correct Order: `C - A - D - B`

PYQ 24: Reading Comprehension & Critical Inference

Passage:
"While automation inevitably eliminates routine manual tasks, empirical evidence suggests that technology shifts workforce demand toward higher-order analytical and interpersonal skills rather than reducing net employment overall."

Question: Which of the following is an underlying assumption of the passage?
A) Technological advancement eliminates all forms of physical labor completely.
B) Human workers are capable of acquiring higher-order analytical and interpersonal skills.
C) Net employment will decline sharply over the next decade.
D) Routine manual tasks require higher-order cognitive processing.

Critical Deduction & Proof: - The passage asserts that demand shifts toward higher-order skills *rather than reducing net employment overall*. - For net employment to remain stable as demand shifts, workers must be able to acquire these higher-order skills. If workers could not learn these skills, overall net employment would inevitably collapse, contradicting the author's premise. - Thus, Option B is a necessary assumption.

Correct Answer: `B) Human workers are capable of acquiring higher-order analytical and interpersonal skills.`

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4. CoCubes Real Placement Solved PYQs Bank (PrepInsta, FACE Prep, IndiaBIX Archives)

> **Module Focus**: Real CoCubes placement exam questions with option choices, speed shortcuts, and detailed solution proofs.
> **Exam Benchmark**: 15–20 Questions per section in 15–20 Minutes (Moderate difficulty, 0 negative marking).

4.1 CoCubes Quantitative Aptitude Solved PYQs

PYQ 25: Time, Speed & Distance - Train Meeting Point

Problem: Two trains start from a station at 10:00 AM and 10:30 AM, traveling in the same direction at 60 km/h and 75 km/h respectively. At what distance from the station will the second train catch up with the first train?
Options:
A) 120 km
B) 150 km
C) 180 km
D) 200 km

Detailed Step-by-Step Solution & Speed Shortcut: 1. **Initial Distance Lead**: Train 1 travels alone for $30 \text{ minutes} = 0.5 \text{ hours}$. $$\text{Lead} = 60 \text{ km/h} \times 0.5 \text{ h} = 30 \text{ km}$$ 2. **Relative Speed**: Both trains move in same direction $\implies v_{\text{rel}} = 75 - 60 = 15 \text{ km/h}$. 3. **Catch-up Time**: $$\text{Time} = \frac{\text{Lead}}{v_{\text{rel}}} = \frac{30}{15} = 2 \text{ hours}$$ 4. **Distance Covered**: $$\text{Distance} = 75 \text{ km/h} \times 2 \text{ h} = 150 \text{ km}$$

Correct Answer: `B) 150 km`

PYQ 26: Time & Work - Man-Days Inverse Proportionality

Problem: 28 children can complete a piece of work in 50 days. How many children are required to finish the exact same work in 35 days?
Options:
A) 36 children
B) 40 children
C) 42 children
D) 45 children

Detailed Step-by-Step Solution & Speed Shortcut: 1. Use inverse proportionality formula $M_1 D_1 = M_2 D_2$: $$28 \times 50 = M_2 \times 35$$ 2. Solve for M_2: $$M_2 = \frac{28 \times 50}{35} = \frac{4 \times 50}{5} = 40 \text{ children}$$

Correct Answer: `B) 40 children`

PYQ 27: Ratio & Proportion - Transitive Ratio Multiplication

Problem: If $a : b = 3 : 4$ and $b : c = 5 : 7$, find the ratio $a : c$.
Options:
A) $15 : 28$
B) $3 : 7$
C) $5 : 4$
D) $12 : 35$

Detailed Step-by-Step Solution & Speed Shortcut: 1. Express as fractions: $\frac{a}{b} = \frac{3}{4}, \frac{b}{c} = \frac{5}{7}$. 2. Multiply ratios to eliminate b: $$\frac{a}{c} = \frac{a}{b} \times \frac{b}{c} = \frac{3}{4} \times \frac{5}{7} = \frac{15}{28}$$

Correct Answer: `A) 15 : 28`

PYQ 28: Algebraic Variable Substitution

Problem: If $a = \frac{2}{3}b$, $b = \frac{2}{3}c$, and $c = \frac{2}{3}d$, what fraction of d is b?
Options:
A) $\frac{2}{3}$
B) $\frac{4}{9}$
C) $\frac{8}{27}$
D) $\frac{1}{3}$

Detailed Step-by-Step Solution & Speed Shortcut: 1. Substitute $c = \frac{2}{3}d$ into $b = \frac{2}{3}c$: $$b = \frac{2}{3} \left(\frac{2}{3}d\right) = \frac{4}{9}d$$

Correct Answer: `B) 4/9`

PYQ 29: Profit & Loss - Successive Discounts

Problem: A trader marks his goods 40% above the cost price and allows two successive discounts of 15% and 10% on the marked price. Find his net profit percentage.
Options:
A) 7.1%
B) 8.0%
C) 10.5%
D) 12.0%

Detailed Step-by-Step Solution & Speed Shortcut: 1. Let Cost Price $(\text{CP}) = 100$. 2. Marked Price $(\text{MP}) = 100 \times 1.40 = 140$. 3. Selling Price (SP) after discounts: $$\text{SP} = 140 \times (1 - 0.15) \times (1 - 0.10) = 140 \times 0.85 \times 0.90 = 140 \times 0.765 = 107.1$$ 4. Net Profit $\% = \text{SP} - \text{CP} = 107.1 - 100 = 7.1\%$.

Correct Answer: `A) 7.1%`

4.2 CoCubes Logical Reasoning Solved PYQs (Syllogisms & Seating)

PYQ 30: Syllogism - The 100-50 Analytical Method

Problem:
Statements: 1. All books are pens. ($\text{Book}^{100} \text{ -- Pen}^{50}$) $[+]$ 2. Some pens are pencils. ($\text{Pen}^{50} \text{ -- Pencil}^{50}$) $[+]$

Conclusions: I. Some books are pencils.
II. Some pens are books.

Options:
A) Only conclusion I follows
B) Only conclusion II follows
C) Either I or II follows
D) Neither I nor II follows

Detailed Logical Proof (100-50 Rule): 1. **Conclusion I**: Middle term **Pen** has values 50 in P1 and 50 in P2 ($50+50=100$, condition fails). No connection between Book and Pencil $\implies$ Does NOT follow. 2. **Conclusion II**: Immediate conversion of P1 ("All Book^{100} are Pen^{50}") $\to$ "Some Pen^{50} are Book^{50}" $\implies$ **Follows**.

Correct Answer: `B) Only conclusion II follows`

PYQ 31: Syllogism - Negative Premise & Particular Conclusion

Problem:
Statements: 1. No cat is a dog. ($\text{Cat}^{100} \text{ -- Dog}^{100}$) $[-]$ 2. All dogs are elephants. ($\text{Dog}^{100} \text{ -- Elephant}^{50}$) $[+]$

Conclusions: I. Some elephants are not cats.
II. No cat is an elephant.

Options:
A) Only conclusion I follows
B) Only conclusion II follows
C) Both I and II follow
D) Neither I nor II follows

Detailed Logical Proof (100-50 Rule): 1. Middle term **Dog** has 100 in P1 and 100 in P2 (Valid). Sign $(-)+(+)=(-)$. 2. Conclusion I: "Some Elephant^{50} are not Cat^{100}" (Type O, negative). Income of Elephant is 50, Expense is 50. Income of Cat is 100, Expense is 100. $\implies$ **Follows**. 3. Conclusion II: "No Cat^{100} is an Elephant^{100}" (Type E). Elephant Expense $100 >$ Income 50. $\implies$ Does NOT follow.

Correct Answer: `A) Only conclusion I follows`

PYQ 32: Circular Seating Arrangement (6 Persons Facing Center)

Problem:
6 friends (A, B, C, D, E, F) sit around a circular table facing the center. - A sits 2nd to the left of C. - B sits immediate right of C. - D sits 2nd to the right of B. - E sits between A and D.

Who sits opposite to C?
Options:
A) D
B) E
C) F
D) A

Detailed Placement Logic & Map: 1. Clockwise = Left, Counter-Clockwise = Right (Facing Center). 2. Anchor C at Slot 1. - 2nd left of $C \implies A$ at Slot 3. - Immediate right of $C \implies B$ at Slot 6. 3. 2nd right of $B \implies D$ at Slot 5. 4. E between A (Slot 3) and D (Slot 5) $\implies E$ at Slot 4. 5. Remaining F at Slot 2. 6. Opposite of Slot 1 (C) is Slot 4 (E).

Correct Answer: `B) E`

PYQ 33: Linear Seating Arrangement (5 Persons Facing North)

Problem:
5 students (P, Q, R, S, T) sit in a row facing North. - S sits between T and Q. - Q sits to the immediate left of R. - P sits at the extreme left end.

Who sits at the extreme right end of the row?
Options:
A) Q
B) R
C) S
D) T

Detailed Placement Logic: 1. Slots 1 to 5 (Left to Right). 2. Slot 1 = P (Extreme left). 3. Immediate left of R is $Q \implies QR$ block. 4. S between T and $Q \implies T - S - Q$. 5. Arrangement: $P(1) - T(2) - S(3) - Q(4) - R(5)$. 6. Extreme right end (Slot 5) = **R**.

Correct Answer: `B) R`

4.3 CoCubes Verbal English Solved PYQs (Error Spotting)

PYQ 34: Error Spotting - Subject-Verb Proximity Rule

Problem: Identify the part containing the grammatical error:
"Neither the manager (A) / nor his subordinates (B) / was present at (C) / the emergency meeting. (D)"
Options:
A) Part A

B) Part B
C) Part C
D) Part D

Grammatical Analysis & Proof: - Under *neither...nor*, the verb must agree with the subject closest to it ("his subordinates" - plural). - "was present" (singular) must be corrected to "were present" (plural). - Error is in Part C.

Correct Answer: `C) Part C`

PYQ 35: Error Spotting - Correlative Conjunction Pairing

Problem: Identify the part containing the grammatical error:
"No sooner had the alarm rung (A) / than the security guard (B) / locked all the entrance gates (C) / immediately. (D)"
Options:
A) Part A
B) Part B
C) Part C
D) No Error

Grammatical Analysis & Proof: - *No sooner* is correctly paired with *than*. - Subject-auxiliary inversion (*No sooner had + subject + V3*) is correctly applied. - The sentence is grammatically sound.

Correct Answer: `D) No Error`

PYQ 36: Error Spotting - Misplaced Participial Modifier

Problem: Spot the error in the sentence:
"While driving to work, (A) / a dog ran across the road (B) / and nearly caused (C) / a major accident. (D)"
Options:
A) Part A
B) Part B
C) Part C
D) Part D

Grammatical Analysis & Proof: - The opening modifier "While driving to work" must modify the subject of the main clause. - As written, "a dog" becomes the subject driving to work, creating a misplaced modifier error. - Correct phrasing: *"While I was driving to work..."* or *"While driving to work, the driver saw a dog..."* - Error is in Part A.

Correct Answer: `A) Part A`