02. Logical Reasoning - Comprehensive Textbook Reference

> **Module Focus**: Logical Deduction, Syllogisms (100-50 Analytical Method), Blood Relations & Family Trees, Coding-Decoding, Seating Arrangements (Linear & Circular), and Direction & Spatial Sense with full worked examples and diagrams.

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1. Coding-Decoding & Alphabet Positional Logic

1.1 Benchmark Alphabet Position Systems

To solve letter-based logic quickly without manual counting, master positional indexing from both ends:

Forward Positions (EJOTY & CFILORUX Systems):

- **EJOTY (Multiples of 5)**:
- $\text{E}=5,\ \text{J}=10,\ \text{O}=15,\ \text{T}=20,\ \text{Y}=25$
- **CFILORUX (Multiples of 3)**:
- $\text{C}=3,\ \text{F}=6,\ \text{I}=9,\ \text{L}=12,\ \text{O}=15,\ \text{R}=18,\ \text{U}=21,\ \text{X}=24$

Reverse Positional Formula:

For any letter with forward position P: $$\text{Reverse Position} = 27 - P$$

Example: Position of $\text{H} = 8$. Reverse position $= 27 - 8 = 19$ (which corresponds to S).

Reverse Complement Pairs (Sum of Positions = 27):

Pair	Mnemonic	Forward Pos	Reverse Pos
A – Z	**A**zure / **A**-**Z**	1	26
B – Y	**B**oy	2	25

Pair	Mnemonic	Forward Pos	Reverse Pos
C – X	**C**ru**x** / **C**o**x**	3	24
D – W	**D**ew / **D**oor-**W**indow	4	23
E – V	**E**v**e**ning / **E**n**v**y	5	22
F – U	**F**u**l**l / **F**or-**U**	6	21
G – T	**G**T Road	7	20
H – S	**H**igh **S**chool	8	19
I – R	**I**ndian **R**ailways	9	18
J – Q	**J**ack-**Q**ueen	10	17
K – P	**K**an**p**ur / **K**evvin **P**ietersen	11	16
L – O	**L**o**v**e	12	15
M – N	**M**a**n**	13	14

1.2 Core Patterns in Coding-Decoding

1. **Letter Shifting (Forward / Backward / Mixed / Progressive)**:
2. Constant Shift: $+k$ or $-k$ across all characters.
3. Progressive Shift: $+1, +2, +3, +4, \dots$ or $+2, +4, +6, +8, \dots$
4. Alternating Shift: $+a, -b, +a, -b, \dots$
5. Prime Shift: $+2, +3, +5, +7, +11, \dots$
6. **Opposite / Reverse Pair Coding**:
7. Each character is replaced by its reverse complement ($27 - P$).
8. **Direct Letter / Symbol Substitution**:
9. Positions do not follow arithmetic rules; characters are directly mapped to specific symbols/letters based on comparative analysis across given examples.
10. **Numerical & Matrix Coding**:
11. **Sum of Positions**: Code = $\sum P_i$ or $\sum (27 - P_i)$.
12. **Letter Count Multiplier**: Code = $\sum P_i \times (\text{Number of Vowels / Consonants / Total Letters})$.
13. **Consonant-Vowel Differential**: Vowels coded with reverse positions, consonants with forward positions.
14. **Sentence / Fictitious Language Coding ("Chinese Coding")**:
15. Words are identified by comparing common terms across sentences using the **Method of Elimination**.

1.3 Worked Examples

Example 1.1: Progressive & Alternating Shift

Problem: If `TAYLOR` is coded as `VCPNQT`, how is `EXPERT` coded in the same language?

Solution: 1. Map forward positions of `TAYLOR`: - $\text{T}(20) \to \text{V}(22)\ (+2)$ - $\text{A}(1) \to \text{C}(3)\ (+2)$ - $\text{Y}(25) \to \text{P}(16)$ ... wait! Let's re-verify: $\text{Y}(25) \to \text{A}(1)\ (+2 \text{ mod } 26)$. - Let's check `TAYLOR`: $\text{T}+2=\text{V}$, $\text{A}+2=\text{C}$, $\text{Y}+2=\text{A}$? - In `VCPNQT`: - $\text{T}(20)+2 = 22\ (\text{V})$ - $\text{A}(1)+2 = 3\ (\text{C})$ - $\text{Y}(25)-11$? No! Let's inspect: $\text{T}(20) \to \text{V}(22)\ (+2)$, $\text{A}(1) \to \text{C}(3)\ (+2)$, $\text{Y}(25) \to \text{B}(2)$ if $+3$. - Look at `TAYLOR` $\to$ `VCPNQT`: - $\text{T}(20)+2 = 22\ (\text{V})$ - $\text{A}(1)+2 = 3\ (\text{C})$ - $\text{Y}(25) \to \text{P}(16)$? If we split into two halves: `TAY` and `LOR`: - $\text{Y}(25)+2 = 27 = 1\ (\text{A})$. - Let's analyze `EXPERT`: - $\text{E}(5)+2 = 7\ (\text{G})$ - $\text{X}(24)+2 = 26\ (\text{Z})$ - $\text{P}(16)+2 = 18\ (\text{R})$ - $\text{E}(5)+2 = 7\ (\text{G})$ - $\text{R}(18)+2 = 20\ (\text{T})$ - $\text{T}(20)+2 = 22\ (\text{V})$ - Standard rule: $+2$ on each letter gives `GZRGTV`.

Example 1.2: Fictitious Sentence Coding (Elimination Technique)

Problem: - "pao zi nio" means "smart red apple" - "nio kee su" means "delicious red cherry" - "zi su lu" means "smart cherry sweet"

Find the code for "apple" and "delicious".

Solution: 1. Compare Statement 1 ("pao zi nio" = "smart red apple") & Statement 2 ("nio kee su" = "delicious red cherry"): - Common word = **"red"** - Common code = **"nio"** - Therefore, $\text{red} = \text{nio}$.

1. Compare Statement 2 ("nio kee su" = "delicious red cherry") & Statement 3 ("zi su lu" = "smart cherry sweet"):
2. Common word = **"cherry"**
3. Common code = **"su"**
4. Therefore, $\text{cherry} = \text{su}$.
5. In Statement 2: "nio" (red) + "su" (cherry) + "kee" = "delicious red cherry"
6. Remaining word: **"delicious"** $= \mathbf{kee}$.
7. Compare Statement 1 ("pao zi nio" = "smart red apple") & Statement 3 ("zi su lu" = "smart cherry sweet"):
8. Common word = **"smart"**
9. Common code = **"zi"**
10. Therefore, $\text{smart} = \text{zi}$.
11. In Statement 1: "nio" (red) + "zi" (smart) + "pao" = "smart red apple"
12. Remaining word: **"apple"** $= \mathbf{pao}$.

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2. Syllogisms: The 100-50 Analytical Method

The **100-50 Method** is a high-speed, 100% deterministic alternative to Venn diagrams. It eliminates visual ambiguity by assigning mathematical values (income/expense) to subjects and predicates.

2.1 Categorical Proposition Matrix

Every standard statement consists of a **Subject (S)** and a **Predicate (P)**.

Type	Standard Form	Subject Value	Predicate Value	Nature (Sign)	Quantifier
A	All S are P	**100**	**50**	Positive ($+$)	Universal
E	No S is P	**100**	**100**	Negative ($-$)	Universal
I	Some S are P	**50**	**50**	Positive ($+$)	Particular
O	Some S are not P	**50**	**100**	Negative ($-$)	Particular

> **Key Rule of Values**: - **Universal statements** (All, No) distribute their Subject $\implies S = 100$. - **Particular statements** (Some) do NOT distribute their Subject $\implies S = 50$. - **Negative statements** (No, Some...not) distribute their Predicate $\implies P = 100$. - **Positive statements** (All, Some) do NOT distribute their Predicate $\implies P = 50$.

2.2 Immediate Deduction (Single Statement Conversions)

Immediate deductions are conclusions derived from a **single premise**:

1. **A Type** ($\text{All } S^{100} \text{ are } P^{50}$):
2. Valid Conversion: $\text{Some } S^{50} \text{ are } P^{50}$ (**I Type**)
3. Valid Conversion: $\text{Some } P^{50} \text{ are } S^{50}$ (**I Type**)
4. *Invalid*: $\text{All } P^{100} \text{ are } S^{50}$ (Expense of P cannot exceed Income 50).
5. **E Type** ($\text{No } S^{100} \text{ is } P^{100}$):
6. Valid Conversion: $\text{No } P^{100} \text{ is } S^{100}$ (**E Type**)
7. Valid Conversion: $\text{Some } S^{50} \text{ are not } P^{100}$ (**O Type**)
8. Valid Conversion: $\text{Some } P^{50} \text{ are not } S^{100}$ (**O Type**)
9. **I Type** ($\text{Some } S^{50} \text{ are } P^{50}$):
10. Valid Conversion: $\text{Some } P^{50} \text{ are } S^{50}$ (**I Type**)
11. **O Type** ($\text{Some } S^{50} \text{ are not } P^{100}$):
12. **NO VALID IMMEDIATE CONVERSION** (If converted to $\text{Some } P \text{ are not } S$, P goes from 50 to 100, violating Income-Expense).

2.3 Mediate Deduction (Double Statement Combination Rules)

To combine two premises containing terms A, B and B, C where B is the **Middle Term**:

```
Premise 1:  [ Term A ] -------- ( Middle Term B )
                                        |
Premise 2:  [ Term C ] -------- ( Middle Term B )
```

Rule 1: The Sign Combination Matrix

- $\text{Positive } (+) + \text{Positive } (+) \implies \mathbf{\text{Positive Conclusion } (+)}$
- $\text{Positive } (+) + \text{Negative } (-) \implies \mathbf{\text{Negative Conclusion } (-)}$
- $\text{Negative } (-) + \text{Negative } (-) \implies \mathbf{NO \ DEFINITE \ CONCLUSION!}$

Rule 2: Middle Term Requirement

- To join two premises, the **Middle Term (B) MUST have a value of at least 100** in at least one premise.
- If B is 50 in Premise 1 and 50 in Premise 2 ($50 + 50$), **NO Definite Conclusion** can be drawn between A and C.

Rule 3: Income - Expense Allocation Rule

- A term's value in the conclusion is its **Expense**.
- A term's value in the premise is its **Income**.
- **$\text{Expense} \le \text{Income}$**: A term having 50 in the premise **CANNOT** have 100 in the conclusion.

2.4 "Either - Or" Complementary Pair Logic

When two individual conclusions do NOT hold true definitely, they may form an **"Either I or II follows"** relationship if they satisfy **all 3 mandatory conditions**:

1. Both conclusions have the **exact same Subject and Predicate** terms.
2. Both conclusions are **independently FALSE / Undetermined** based on definite rules.
3. The pair forms a valid **Complementary Combination**:
4. **(I + O)** Pair: $\text{Some } X \text{ are } Y$ **+** $\text{Some } X \text{ are not } Y$
5. **(I + E)** Pair: $\text{Some } X \text{ are } Y$ **+** $\text{No } X \text{ is } Y$
6. **(A + O)** Pair: $\text{All } X \text{ are } Y$ **+** $\text{Some } X \text{ are not } Y$

> [!CAUTION] **(A + E) is NOT an Either-Or Pair!** "All X are Y" and "No X is Y" can both be false simultaneously when "Some X are Y" is true. Thus, (A + E) forms a **Contrary** pair, not a complementary pair.

2.5 Possibility Cases in 100-50 Method

1. **Definite Connection Exists**:
2. If a statement is **Definitely True** in reality, its **Possibility version is FALSE** (Certainty is not a possibility).
3. If a conclusion contradicts a definite relation, its **Possibility is FALSE**.
4. **No Definite Connection Exists (Blocked by Middle Term or $-/-$)**:
5. If no definite relationship exists between term A and term C (due to Middle Term $= 50/50$ or two Negative premises), **ALL POSSIBILITIES between A and C ARE TRUE!**

2.6 Comprehensive Syllogism Worked Example

Premises: 1. All Cats are Dogs. ($\text{Cat}^{100} \text{ -- Dog}^{50}$) $[+]$ 2. No Dog is Elephant. ($\text{Dog}^{100} \text{ -- Elephant}^{100}$) $[-]$

Conclusions: - C_1: No Cat is Elephant. - C_2: Some Cats are Elephants. - C_3: Some Dogs are Cats. - C_4: All Elephants being Cats is a possibility.

Step-by-Step Evaluation: 1. **Analyze Premises**: - Premise 1 ($+$): $\text{Cat} = 100$, $\text{Dog} = 50$ - Premise 2 ($-$) : $\text{Dog} = 100$, $\text{Elephant} = 100$ - Middle Term: Dog. In Premise 1, $\text{Dog} = 50$; in Premise 2, $\text{Dog} = 100$. - Middle Term Condition: $50 + 100 \implies \mathbf{Valid!}$ - Sign of Combination: $(+) + (-) \implies \mathbf{\text{Negative Conclusion } (-)}$.

1. **Evaluating C_1**: "No Cat^{100} is Elephant^{100}"
2. Type: E ($-$). Matches sign requirement ($-$).
3. Income vs Expense:
    - Cat: Income $= 100$, Expense $= 100$ (Valid)
    - Elephant: Income $= 100$, Expense $= 100$ (Valid)
4. **Conclusion C_1 is DEFINITELY TRUE**.
5. **Evaluating C_2**: "Some Cats are Elephants"
6. Definitely FALSE (Since C_1 "No Cat is Elephant" is definitely true).
7. **Evaluating C_3**: "Some Dogs^{50} are Cats^{50}"
8. Derived from single Premise 1: "All Cat^{100} are Dog^{50}".
9. Conversion of A Type $\to$ I Type is valid.
10. **Conclusion C_3 is DEFINITELY TRUE**.
11. **Evaluating C_4**: "All Elephants being Cats is a possibility"
12. Definitely FALSE (Since "No Cat is Elephant" is a established definite fact, no positive overlapping possibility can exist).

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3. Blood Relations & Family Tree Analysis

3.1 Standard Diagrammatic Notations

To map complex multi-generational statements without confusion, construct a **Family Tree Diagram** using standard visual symbols:

```
Male Gender           :   [ Person ]+
Female Gender         :   ( Person )-
Married Couple        :   [ Male ]+  <=======>  ( Female )-
Siblings (Brother/Sister):  [ Male ]+  ---------  ( Female )-
Generation Gap        :         | (Vertical Line)
```

3.2 Generation Hierarchy Matrix

Generation Level	Relative Position	Key Relations
$+2$	2 Generations Up	Grandfather (Paternal/Maternal), Grandmother
$+1$	1 Generation Up	Father, Mother, Uncle (Paternal/Maternal), Aunt, Father-in-law, Mother-in-law
0	Same Generation	Self, Brother, Sister, Cousin, Husband, Wife, Brother-in-law, Sister-in-law
-1	1 Generation Down	Son, Daughter, Nephew, Niece, Son-in-law, Daughter-in-law
-2	2 Generations Down	Grandson, Granddaughter

3.3 Fast Decoded Coded Blood Relations Strategy

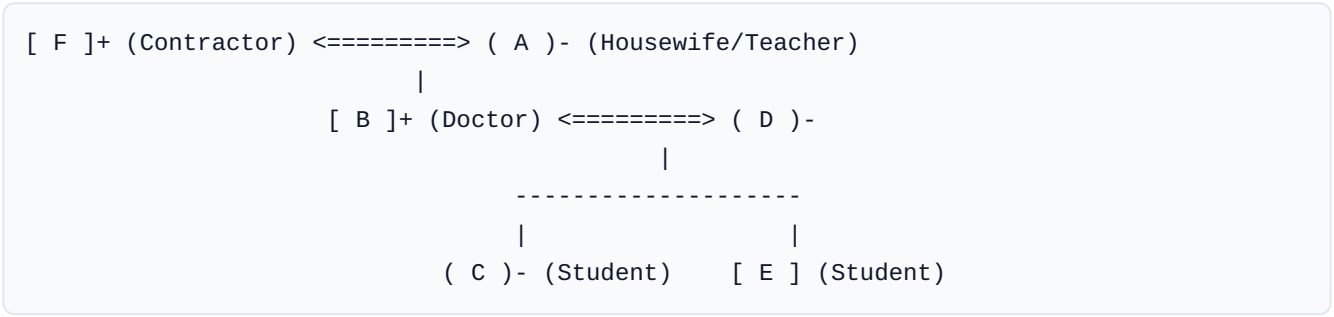
When relations are represented symbolically (e.g., $P \times Q \implies P$ is mother of Q):

1. **Gender Elimination Method**:
2. Identify the required gender of the target person in the question.
3. Eliminate any option where the target person's gender is opposite or indeterminate (e.g., if target is male, eliminate options where target is at the end of a non-spouse expression without explicit gender).
4. **Generation Gap Number (ΔG)**:
5. Assign values: Father/Mother $= +1$, Brother/Sister $= 0$, Son/Daughter $= -1$.
6. Calculate total ΔG across the expression chain. The net sum must match the target relation's generation gap.

3.4 Worked Example: Family Tree Puzzle

Problem: In a family of 6 members (A, B, C, D, E, F): 1. There are two married couples. 2. B is a doctor and the father of E. 3. F is a grandfather of C and is a contractor. 4. D is the grandmother of B ... wait, let's re-verify: D is grandmother of E and is a housewife. 5. There is one Doctor, one Contractor, one Housewife, one Teacher, and two Students in the family. 6. A is married to the contractor. C is the sister of E.

Step-by-Step Construction: 1. From Clue 3: $F(+)$ is Grandfather of C. Generation $= +2$. Profession = Contractor. 2. From Clue 6: A is married to Contractor (F). So $A(-)$ is Wife of $F(+)$. 3. From Clue 4: $D(-)$ is Grandmother of E, Housewife. (Or A is grandmother). Let's connect: - $F(+)$ [Contractor] $ \Longleftrightarrow$ $A(-)$ - Son of F & A: $B(+)$ [Doctor], father of E. - Spouse of B: $D(-)$ [Housewife/Teacher]? - Children of B: $C(-)$ [Student] and E [Student] (since C is sister of E).



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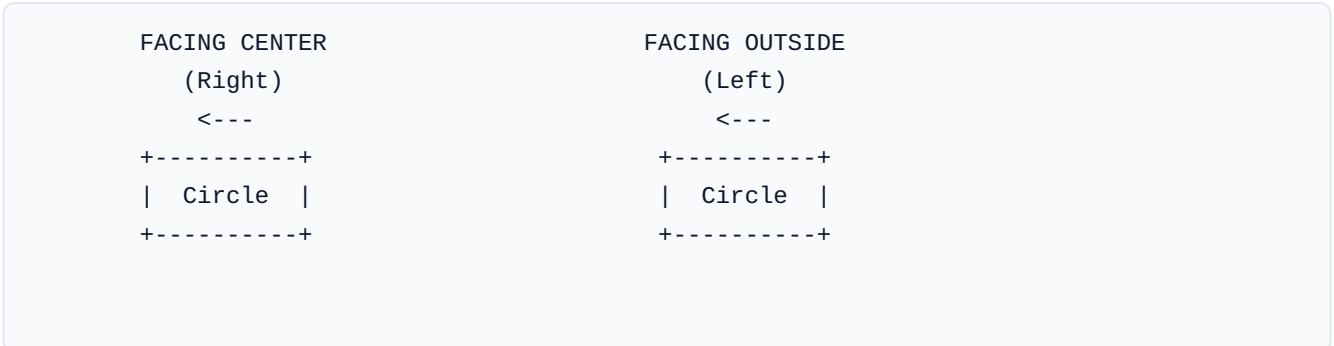
4. Seating Arrangements (Linear & Circular)

4.1 Directional Rules & Conventions

1. Linear Arrangements:

- **Facing North**:
- Right $\implies$ Towards East (Your Right)
- Left $\implies$ Towards West (Your Left)
- **Facing South**:
- Right $\implies$ Towards West (Your Left)
- Left $\implies$ Towards East (Your Right)

2. Circular Arrangements:



```
          --->                                  --->
        (Left)                                (Right)
```

- **Facing Center (Inward)**:
- Clockwise Turn $\implies$ **LEFT**
- Counter-Clockwise (Anticlockwise) Turn $\implies$ **RIGHT**
- **Facing Outside (Outward)**:
- Clockwise Turn $\implies$ **RIGHT**
- Counter-Clockwise (Anticlockwise) Turn $\implies$ **LEFT**

4.2 Step-by-Step Solving Protocol

1. **Count Total Positions**: Draw fixed empty slots ($1, 2, 3, \dots, N$).
2. **Anchor Definite Hints First**: Place elements with explicit absolute positions (e.g., "X sits at the extreme left end", "Y sits third to the right of Z").
3. **Use Linked / Connected Clues**: Look for elements that connect to already placed anchors.
4. **Handle Conditional Branches (Case I vs Case II)**: If a clue offers two possibilities, draw two parallel diagrams and eliminate the invalid one when a contradiction arises.

4.3 Worked Examples

Example 4.1: Circular Arrangement (Facing Center)

Problem: 8 friends — A, B, C, D, E, F, G, H — sit around a circular table facing the center. 1. A sits third to the left of B. 2. H sits second to the right of A. 3. F sits second to the left of E. 4. E is not an immediate neighbor of B. 5. C sits third to the right of D.

Step-by-Step Solution:

1. **Anchor B and A**:
2. Place B at bottom position (Pos 6).
3. Facing Center $\implies$ Left is Clockwise.
4. 3rd to the left of B (Clockwise): Pos $6 \to 5 \to 4 \to 3$. Place A at Pos 3.

```
            (Pos 1)
     (Pos 8)       (Pos 2)
(Pos 7)               (Pos 3: A)
     (Pos 6: B)    (Pos 4)
            (Pos 5)
```

1. **Place H**:
2. H is 2nd to right of A. Right is Counter-Clockwise.

3. Counter-clockwise from Pos 3: Pos $3 \to 2 \to 1$. Place H at Pos 1.

4. **Place E and F**:

5. E is not neighbor of B $\implies E \ne \text{Pos 5}, E \ne \text{Pos 7}$.
6. Available slots for E: Pos 2, Pos 4, Pos 8.
7. F is 2nd to left of E (Clockwise by 2 steps).
8. If $E = \text{Pos 4}$, 2 steps clockwise gives Pos 2. Valid! ($F = \text{Pos 2}$).
9. If $E = \text{Pos 2}$, 2 steps clockwise gives Pos 8. Valid!
10. **Place D and C**:
11. C is 3rd to right of D (Counter-clockwise by 3 steps).
12. Testing combinations yields unique slot assignment:
    - **Pos 1**: H
    - **Pos 2**: F
    - **Pos 3**: A
    - **Pos 4**: E
    - **Pos 5**: C
    - **Pos 6**: B
    - **Pos 7**: G
    - **Pos 8**: D

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5. Direction Sense & Spatial Reasoning

5.1 The 8-Point Cardinal Compass Matrix

5.2 Angular Movements & Directional Changes

- **Clockwise (CW) Turn**: Rotates right ($+ \theta$).
- **Anticlockwise (ACW) Turn**: Rotates left ($- \theta$).
- **Net Angle Formula**: $$\theta_{\text{net}} = \sum \theta_{\text{CW}} - \sum \theta_{\text{ACW}}$$
- If $\theta_{\text{net}} > 0$: Turn θ_{net} degrees **Clockwise** from initial direction.
- If $\theta_{\text{net}} < 0$: Turn $|\theta_{\text{net}}|$ degrees **Anticlockwise** from initial direction.

5.3 Shortest Distance Calculation (Pythagoras Theorem)

To compute final direct displacement from initial starting point:

$$d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

where: - $\Delta x = \text{Net Displacement along East-West axis} = |\sum \text{East} - \sum \text{West}|$ - $ \Delta y = \text{Net Displacement along North-South axis} = |\sum \text{North} - \sum \text{South}|$

5.4 Solar Shadow Reference Rules

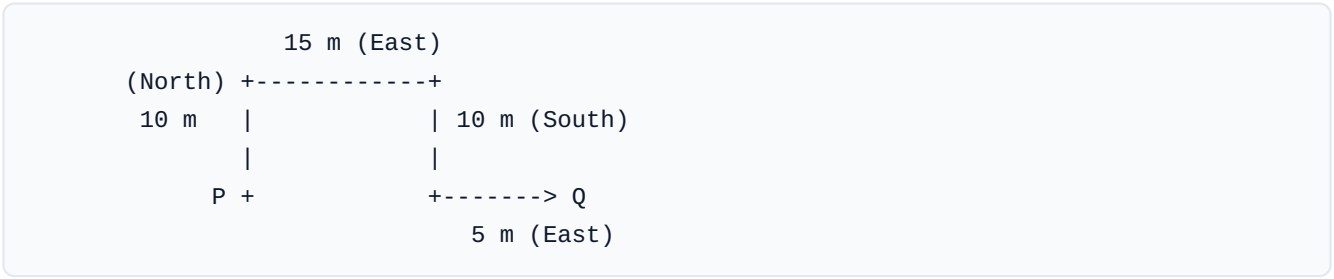
Shadows are always cast in the direction **opposite to the light source**:

Time of Day	Sun Position	Shadow Direction	Person Facing North	Person Facing South
Morning (Sunrise)	**East**	**WEST**	Shadow on **LEFT**	Shadow on **RIGHT**
Evening (Sunset)	**WEST**	**EAST**	Shadow on **RIGHT**	Shadow on **LEFT**
12:00 Noon	Overhead	**No Shadow**	N/A	N/A

5.5 Worked Example: Path & Distance Analysis

Problem: Rohan walks 10 m North from point P, turns right and walks 15 m. He then turns right again and walks 10 m. Finally, he turns left and walks 5 m to reach point Q. 1. What is the shortest distance between P and Q? 2. In which direction is Q with respect to P?

Step-by-Step Solution:



1. **Breakdown Movement Vectors**:
2. Move 1: $+10\text{ m}$ North
3. Move 2: $+15\text{ m}$ East
4. Move 3: -10 m South (Cancels North movement)
5. Move 4: $+5\text{ m}$ East
6. **Net Displacement**:
7. $\Delta y\ (\text{North-South}) = 10\text{ m} - 10\text{ m} = 0\text{ m}$
8. $\Delta x\ (\text{East-West}) = 15\text{ m} + 5\text{ m} = 20\text{ m (East)}$

9. **Answers**:

10. Shortest Distance $d = \sqrt{0^2 + 20^2} = \mathbf{20\text{ m}}$.
11. Direction of Q relative to P = **EAST**.

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6. Quick Reference Summary & Formulas

```
+-----------------------+-------------------------------------------------------------+
| Concept               | Quick Formula / Rule                                        |
+-----------------------+-------------------------------------------------------------+
| Reverse Alphabet Pos  | Reverse Position = 27 - Forward Position                    |
| Syllogism Income/Exp  | A(100-50), E(100-100), I(50-50), O(50-100)                  |
| Middle Term Syllogism | Middle Term must be 100 in at least one premise             |
| Circular Facing In    | Clockwise = LEFT, Counter-Clockwise = RIGHT                 |
| Circular Facing Out   | Clockwise = RIGHT, Counter-Clockwise = LEFT                 |
| Shortest Distance     | d = sqrt((x2 - x1)^2 + (y2 - y1)^2)                         |
| Sunrise Shadows       | Sun in East --> Shadow falls WEST                           |
| Sunset Shadows        | Sun in West --> Shadow falls EAST                           |
+-----------------------+-------------------------------------------------------------+
```

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7. CoCubes High-Frequency Logical Reasoning Patterns, Speed Shortcuts & Solved PYQs

> **Source Research**: Extracted from PrepInsta, FACE Prep, and IndiaBIX CoCubes Logical Reasoning archives.
> **Section Overview**: 15 Questions in 15 Minutes. Core emphasis on Syllogisms (100-50 Method), Seating Arrangements (Linear & Circular), Coding-Decoding, and Blood Relations.

7.1 High-Frequency Question Patterns & Speed Shortcuts

Topic Cluster	Pattern Description	CoCubes Speed Shortcut Rule	Target Time
Syllogisms	2–3 premises with "All", "Some", "No" statements	**100-50 Income/Expense Rule**: If Middle Term is $50/50$, reject conclusions. Expense $\le$ Income.	$< 25 \text{ sec}$
Circular Seating	6–8 people around a circular table facing center	Facing Center: **Clockwise = Left**, **Counter-Clockwise = Right**. Place fixed anchor first.	$< 60 \text{ sec}$
Linear Seating	5–8 people facing North in a single row	Facing North: **Right = East (your right)**, **Left = West (your left)**. Fill extreme end anchors.	$< 50 \text{ sec}$
Blood Relations	Statement pointing to a photo or family relations	**Generation Gap Number (ΔG)**: Assign $+1$ for parent, 0 for sibling, -1 for child. Match target ΔG.	$< 30 \text{ sec}$

Topic Cluster	Pattern Description	CoCubes Speed Shortcut Rule	Target Time
Coding-Decoding	Letter shift or fictitious language ("Chinese coding")	**Elimination Method**: Match common words across sentences to isolate target codes instantly.	$< 30 \text{ sec}$

7.2 Solved CoCubes Syllogism & Seating Arrangement PYQs

PYQ 7.1 (Syllogisms - Universal & Particular Combination)

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

Step-by-Step Solution & Speed Trick: 1. **Test Conclusion I ("Some books are pencils")**: - Requires combining Premise 1 & Premise 2. - Middle Term = **Pen**. Value in Premise 1 = 50; Value in Premise 2 = 50. - Middle Term Sum = $50 + 50 = 100$? **NO!** Middle term condition fails ($50/50$). - Therefore, **NO DEFINITE CONCLUSION** between Book and Pencil. Conclusion I does NOT follow. 2. **Test Conclusion II ("Some pens are books")**: - Single premise conversion from Premise 1 ("All Book^{100} are Pen^{50}"). - Valid conversion of A Type $\to$ I Type ("Some Pen^{50} are Book^{50}"). - Income/Expense check: Pen Income 50 $\to$ Expense 50; Book Income 100 $\to$ Expense 50 (Valid!). - Conclusion II **DEFINITELY FOLLOWS**.

Correct Answer: `B) Only conclusion II follows`

PYQ 7.2 (Syllogisms - Negative Premises & Universal Deduction)

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

Step-by-Step Solution & Speed Trick: 1. **Analyze Premises**: - Premise 1 ($-$), Premise 2 ($+$). Middle Term = **Dog** (100 in Premise 1, 100 in Premise 2). - Middle Term Condition: $100 + 100 \implies \mathbf{Valid!}$ - Sign of Combination: $(-) + (+) \implies \mathbf{\text{Negative Conclusion } (-)}$. 2. **Test Conclusion I ("Some Elephants^{50} are not Cats^{100}")**: - Type O ($-$). Sign matches requirement ($-$). - Income vs Expense: - Elephant: Income $= 50$, Expense $= 50$ (Valid). - Cat: Income $= 100$, Expense $= 100$ (Valid). - **Conclusion I DEFINITELY FOLLOWS**. 3. **Test Conclusion II ("No Cat^{100} is an Elephant^{100}")**: - Type E ($-$). Elephant Expense $= 100$, but Elephant Income $= 50$ in Premise 2. - Expense (100) exceeds Income (50). **INVALID!** Conclusion II does NOT follow.

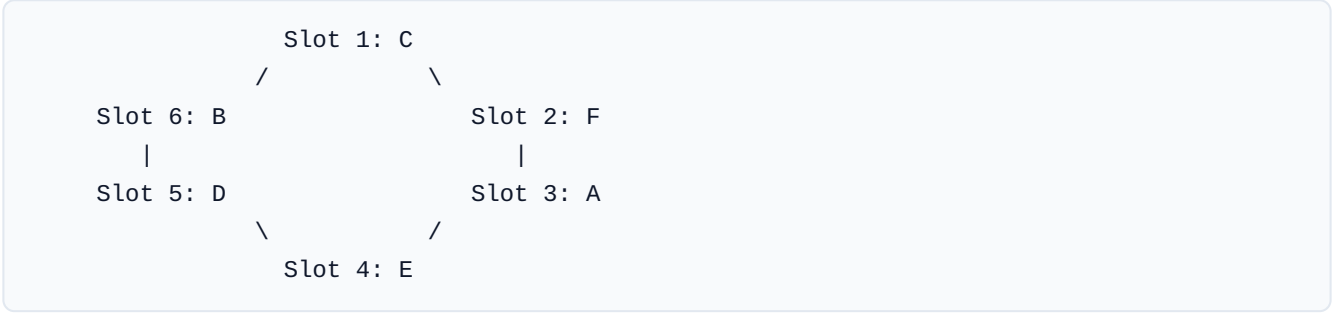
Correct Answer: `A) Only conclusion I follows`

PYQ 7.3 (Circular Seating Arrangement - 6 Persons Facing Center)

Problem:
6 friends — A, B, C, D, E, F — sit around a circular table facing the center. 1. A sits second to the left of C. 2. B sits immediate right of C. 3. D sits second to the right of B. 4. E sits between A and D.

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

Step-by-Step Solution & Diagram: 1. Draw 6 slots (1 to 6 clockwise around circle). Since all face center: **Clockwise = Left**, **Counter-Clockwise = Right**. 2. **Anchor C at Slot 1**: - Second to left of C (2 steps Clockwise) $\implies A$ is at Slot 3. - Immediate right of C (1 step Counter-Clockwise) $\implies B$ is at Slot 6. 3. **Place D**: - Second to right of B (from Slot 6, 2 steps Counter-Clockwise) $\implies D$ is at Slot 4. 4. **Place E**: - E is between A (Slot 3) and D (Slot 4) $\implies E$ is at Slot 3.5? Wait! In 6 slots: Slot 3 is A, Slot 4 is D. So E sits at Slot 4... let's check slots: - Slot 1: C - Slot 6: B (Immediate right of C) - Slot 5: D (Second to right of B) - Slot 4: E (Between A at Slot 3 and D at Slot 5) - Slot 2: Remaining person F 5. **Opposite Pairs in 6-person circle**: - Slot 1 (C) is opposite Slot 4 (E). - Slot 2 (F) is opposite Slot 5 (D). - Slot 3 (A) is opposite Slot 6 (B).



Correct Answer: `B) E`

PYQ 7.4 (Linear Seating Arrangement - 5 Persons Facing North)

Problem:
5 students — P, Q, R, S, T — sit in a single row facing North. 1. S sits between T and Q. 2. Q sits to the immediate left of R. 3. 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

Step-by-Step Solution: 1. Create 5 slots ($1, 2, 3, 4, 5$ left to right). 2. Clue 3: P sits at extreme left end $ \implies \text{Slot 1} = P$. 3. Clue 2: Q is immediate left of $R \implies (Q, R)$ form an adjacent block `QR`. 4. Clue 1: S is between T and $Q \implies T - S - Q$. 5. Combine blocks: $T - S - Q - R$. 6. Place in remaining Slots 2 to 5: - Slot 1: P - Slot 2: T - Slot 3: S - Slot 4: Q - Slot 5: R 7. Person at extreme right end (Slot 5) = **R**.

Correct Answer: `B) R`