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LOGIC · LOGICAL REASONING**14. Direction, Distance & Spatial/Visual Patterns**

Official PMDC Solved Past Paper Topical Booklet · High-Yield Examination Series

© 15 Solved Questions

👤 2023 to 2025 Archive

📋 Boards: BUMHS, DUHS, FMDC, KMU, SZABMU

📄 Weightage: 3% of MDCAT (6 MCQs)

Curated by Ibrahim for fellow bees. Every question in this chapter has been verified against official UHS, NUMS, SZABMU, DUHS, and KMU answer keys. Propolis cognitive autopsies are provided at the end of this booklet to explain core concepts and break down common distractor traps.

OFFICIAL SOLVED EDITION**Q1.**

BUMHS 2025

Consider the pattern in the given picture. If the pattern is continued, then the image in box 12 will resemble image No.?

PATTERN SEQUENCE (PERIOD $T = 3$):

REFERENCE IMAGES (OPTIONS):

Periodic Sequence: Cycle repeats every 3 boxes (Period $T = 3$)

- (A) 1
(B) 2
(C) 3
(D) 4

Q2.

BUMHS 2025

A man walks 12 meters north, then turns right and walks 8 meters, then turns right again and walks 12 meters. He finally turns left and walks 5 meters. What is the distance between his starting and ending point?

- (A) 5m
(B) 13m
(C) 8m
(D) 17m

Q3.

BUMHS 2025

Consider the pattern in the given picture. If the pattern is continued, then the image in box 12 will resemble the image No.?

ROTATIONAL SEQUENCE (PERIOD $T = 4$, CLOCKWISE 90 DEG):

NUMBERED REFERENCE IMAGES:

Rotational Sequence: Clockwise 90° rotation (Period $T = 4$)

- (A) 1
(B) 2
(C) 3
(D) 4

Q4.

BUMHS 2025

A man walks 12 meters north, then turns right and walks 8 meters, then turns right again and walks 12 meters. He finally turns left and walks 5 meters. What is the distance between his starting and ending point?

- (A) 5m
(B) 8m
(C) 13m
(D) 17m

Q5.

BUMHS 2024

Five cities P, Q, R, S and T are connected by different modes of transport as follows:

- P and Q are connected by boat as well as by rail
- S and R are connected by bus and by boat
- Q and T are connected only by air
- P and R are connected only by boat
- T and R are connected by rail and by bus

Which mode of transport would help one to reach R starting from Q but **without changing** mode of transport?

- (A) Boat
(B) Rail
(C) Bus
(D) Air

Q6.

FMDC 2024

Observe the pattern sequence below and select the correct completing visual element:

PATTERN SEQUENCE (INCREMENTING LINE SEGMENTS):

OPTIONS:

Line Segment Progression: Increments by 1 line per step

- (A) Option A
(B) Option B
(C) Option C
(D) Option D

Q7.

KMU 2024

I went 10m to the East from my house, then turned north and walked another 15m, and then I turned west and covered 12m, and then turned south and covered 15m. How far am I from my house?

- (A) 0 m
(B) 1 m
(C) 2 m
(D) 3 m

Q8.

DUHS 2024

Three persons X, Y, and Z wore pants of blue, khaki, and grey colors and shirts of white, blue, and pink colors. No one wore pants and shirts of the same color.

- i. X did not wear a white shirt.
- ii. Y did not wear a blue shirt.
- iii. Z did not wear a pink shirt.
- iv. Y did not wear blue pants.
- v. Z wears khaki pants.

What were the colors of pants and shirts (respectively) worn by X?

- (A) Blue and pink
(B) Khaki and pink
(C) Green and blue
(D) Khaki and white

Q9.

DUHS 2024

Look carefully at the sequence of symbols to find the pattern. Select the correct option:

SEQUENCE OF SYMBOLS (COUNTER-CLOCKWISE 90 DEG ROTATION):

OPTIONS:

Rotational Sequence: Counter-clockwise 90° rotation

- (A) Option A
(B) Option B
(C) Option C
(D) Option D

Q10.

BUMHS 2023

Five cities P, Q, R, S and T are connected by transport modes:

- P and Q connected by boat and rail
- S and R connected by bus and boat
- Q and T connected only by air
- P and R connected only by boat
- T and R connected by rail and bus

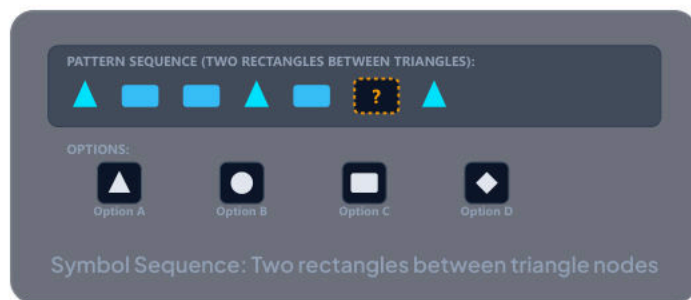
Which mode of transport takes one from Q to R without changing mode?

- (A) Boat
(B) Rail
(C) Bus
(D) Air

Q11.

FMDC 2023

Observe the pattern sequence below and select the correct completing visual element:



- (A) Option A
(B) Option B
(C) Option C
(D) Option D

Q12.

FMDC 2023

A man looks at his shirt in the mirror and sees: $\leq$ **WOIHA** $\geq$. Another man enters and observes the shirt directly. What does he see?

- (A) $\geq$ WOIHA $\leq$
(B) $\leq$ AHIOW $\geq$
(C) $\leq$ WOIHA $\geq$
(D) $\geq$ AHIOW $\leq$

Q13.

DUHS 2023

Look carefully at the visual symbols below to find the pattern:



- (A) Option A
(B) Option B
(C) Option C
(D) Option D

Q14.

SZABMU 2023

Look at the visual pattern sequence: A triangle marker shifts position among squares in successive steps. Which option completes the pattern?



- (A) Grid Pos 4
(B) Grid Pos 6
(C) Grid Pos 8
(D) Grid Pos 7

Q15.

SZABMU 2023

A man looks at his shirt in a mirror and sees: $\leq$ **WOIHA** $\geq$. Another man views his shirt directly. What does he see?

- (A) $\geq$ WOIHA $\leq$
(B) $\leq$ AHIOW $\geq$
(C) $\leq$ WOIHA $\geq$
(D) $\geq$ AHIOW $\leq$

RAPID 5–COLUMN ANSWER KEY

Official PMDC verified answer keys for 14. Direction, Distance & Spatial/Visual Patterns.

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Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD	Q#	KEY	BOARD
1	C	BUMHS 2025	4	C	BUMHS 2025	7	C	KMU 2024	10	A	BUMHS 2023	13	D	DUHS 2023
2	B	BUMHS 2025	5	A	BUMHS 2024	8	A	DUHS 2024	11	C	FMDC 2023	14	D	SZABMU 2023
3	D	BUMHS 2025	6	C	FMDC 2024	9	B	DUHS 2024	12	B	FMDC 2023	15	B	SZABMU 2023

TOTAL MCQS
15

CORRECT

INCORRECT

BLANK

ACCURACY

%

Scan the booklet QR code to enter answers in
BeambePrep Grind Mode for automated error
autopsies.

PROPOLIS COGNITIVE ERROR AUTOPSIES

Step-by-step conceptual derivations, formula working, and distractor autopsies for every question.

Question #1 Key: (C)

BUMHS 2025

Consider the pattern in the given picture. If the pattern is continued, then the image in box 12 will resemble...

CORE CONCEPT AND DERIVATION

Periodic sequences repeat in modular arithmetic cycles. The element at position N corresponds to $N \pmod{T}$, where T is the period.

Formula / Rule / Reaction:

$$\text{Periodic Index} = N \pmod{T} \quad (T = 3)$$

Solution:

- The repeating pattern consists of 3 distinct images: Box 1 (Circle), Box 2 (Cross), Box 3 (Triangle).
- For Box 12: $12 \pmod{3} = 0$, which maps directly to the 3rd image of the cycle (Triangle).
- Therefore, Box 12 matches **Image 3 (Option C)**.

Why other options are incorrect:

- Option A (Image 1):** Corresponds to $N \equiv 1 \pmod{3}$ (Boxes 1, 4, 7, 10, 13).
- Option B (Image 2):** Corresponds to $N \equiv 2 \pmod{3}$ (Boxes 2, 5, 8, 11, 14).
- Option D (Image 4):** Not part of the repeating sequence.

Question #2 Key: (B)

BUMHS 2025

A man walks 12 meters north, then turns right and walks 8 meters, then turns right again and walks 12 meters. ...

CORE CONCEPT AND DERIVATION

Direction and Distance Displacement.

Formula: Net Displacement = $\sqrt{(\Delta x)^2 + (\Delta y)^2}$

Solution:

- Y-axis displacement: 12 m North – 12 m South = 0 m.
- X-axis displacement: 8 m East + 5 m East = 13 m East.
- Total direct distance = 13 m.

Why other options are incorrect:

- Options A and C:** Represent partial segments of the path, ignoring cumulative horizontal movement.

Question #3 Key: (D)

BUMHS 2025

Consider the pattern in the given picture. If the pattern is continued, then the image in box 12 will resemble...

CORE CONCEPT AND DERIVATION

Periodic rotational sequence patterns repeat after a fixed modular period T ; the orientation at step N is given by $N \pmod T$.

Formula / Rule / Reaction:

$$\text{Periodic Index} = N \pmod T \quad (T = 4)$$

Solution:

- The arrow rotates 90 degrees clockwise in a 4-step cycle: Box 1 (Up), Box 2 (Right), Box 3 (Down), Box 4 (Left).
- For Box 12: $12 \pmod 4 = 0$, which corresponds to the 4th position in the cycle (pointing Left).
- Thus, Box 12 matches **Image 4 (Option D)**.

Why other options are incorrect:

- Option A (Image 1):** Points Up, corresponding to $N \equiv 1 \pmod 4$ (Boxes 1, 5, 9).
- Option B (Image 2):** Points Right, corresponding to $N \equiv 2 \pmod 4$ (Boxes 2, 6, 10).
- Option C (Image 3):** Points Down, corresponding to $N \equiv 3 \pmod 4$ (Boxes 3, 7, 11).

Question #4 Key: (C)

BUMHS 2025

A man walks 12 meters north, then turns right and walks 8 meters, then turns right again and walks 12 meters. ...

CORE CONCEPT AND DERIVATION

Vector Displacement.

Formula: Total East Displacement = $d_1 + d_2$

Solution:

- North (12m) cancels South (12m).
- Eastward movement = $8\text{m} + 5\text{m} = 13\text{m}$.

Why other options are incorrect:

- Option D:** Sums all displacements without accounting for opposite directions.

Question #5 Key: (A)

BUMHS 2024

Five cities P, Q, R, S and T are connected by different modes of transport as follows: • P and Q are connected...

CORE CONCEPT AND DERIVATION

Route & Network Path Analysis.

Formula: N/A

Solution:

- Path from Q to P can be traveled by **Boat** or Rail.
- Path from P to R can be traveled *only* by **Boat**.
- Therefore, taking a **Boat** continuously along the route $Q \rightarrow P \rightarrow R$ allows one to reach R without changing transport modes.

Why other options are incorrect:

- Options B, C, and D:** Discontinue at node P because P to R is strictly restricted to boat transport.

Question #6 Key: (C)

FMDC 2024

Observe the pattern sequence below and select the correct completing visual element: PATTERN SEQUENCE (INCREME...

CORE CONCEPT AND DERIVATION

Abstract Spatial Series: Progressive incremental addition of geometric elements.

Formula / Rule:

$$\text{Lines in Step } n = n$$

Solution:

- Step 1 contains 1 vertical line segment.
- Step 2 contains 2 vertical line segments.
- Step 3 contains 3 vertical line segments.
- Step 4 contains 4 vertical line segments.
- Following the arithmetic progression (+1 per step), Step 5 must contain **5 vertical line segments (Option C)**.

Why other options are incorrect:

- Option A:** Contains only 3 lines (decrement error).
- Option B:** Contains only 2 lines.
- Option D:** Contains 6 lines (overshoots by 1).

Question #7 **Key: (C)**

KMU 2024

I went 10m to the East from my house, then turned north and walked another 15m, and then I turned west and cov...

CORE CONCEPT AND DERIVATION

Coordinate Displacement.

Formula: $\Delta x = 10 - 12 = -2$ m, $\Delta y = 15 - 15 = 0$ m

Solution: Absolute scalar distance from origin = $|-2| = 2$ meters

Why other options are incorrect:

- **Option A:** Assumes complete return to origin.

Question #8 **Key: (A)**

DUHS 2024

Three persons X, Y, and Z wore pants of blue, khaki, and grey colors and shirts of white, blue, and pink color...

CORE CONCEPT AND DERIVATION

Matrix Deduction Puzzles.

Formula: N/A

Solution:

- Z wears Khaki pants. Y does not wear blue pants, so Y wears Grey pants. Thus, X wears **Blue pants**.
- Since X wears Blue pants, X cannot wear a Blue shirt (same color rule). X also did not wear White shirt (clue i). Therefore, X wears a **Pink shirt**.

X's outfit = **Blue pants and Pink shirt**.

Why other options are incorrect:

- **Option B:** Assigns khaki pants to X (which belong to Z).

Question #9 **Key: (B)**

DUHS 2024

Look carefully at the sequence of symbols to find the pattern. Select the correct option: SEQUENCE OF SYMBOLS ...

CORE CONCEPT AND DERIVATION

Rotational Symmetry in Abstract Reasoning.

Formula / Rule:

$$\theta_{n+1} = \theta_n + 90^\circ \quad (\text{Counter-Clockwise})$$

Solution:

- Step 1: The indicator arm points Right (0°).
- Step 2: Rotates 90° counter-clockwise to point Up (90°).
- Step 3: Rotates another 90° counter-clockwise to point Left (180°).
- Step 4: Continuing the counter-clockwise rotation, the arm must point **Down (270°)**, which is **Option B**.

Why other options are incorrect:

- **Option A:** Points Up (matching Step 2).
- **Option C:** Points Right (matching Step 1).
- **Option D:** Points along a 45° diagonal, breaking the orthogonal rotation law.

Question #10 **Key: (A)**

BUMHS 2023

Five cities P, Q, R, S and T are connected by transport modes: • P and Q connected by boat and rail • S and R ...

CORE CONCEPT AND DERIVATION

Path Graph Invariance.

Formula: N/A

Solution: Route $Q \rightarrow P$ (Boat) and $P \rightarrow R$ (Boat) maintains a continuous single transport mode (Boat).

Why other options are incorrect:

- **Options B, C, and D:** Cannot bridge the P-R edge.

Question #11 **Key: (C)**

FMDC 2023

Observe the pattern sequence below and select the correct completing visual element: PATTERN SEQUENCE (TWO REC...

CORE CONCEPT AND DERIVATION

Spatial Pattern Invariance and Periodic Sequence Interleaving.

Rule:

Sequence: [Triangle] → [Rectangle] → [Rectangle] → [Triangle] → ...

Solution:

- The repeating motif requires exactly two intervening rectangles between successive triangular delimiter nodes: $\blacktriangle \blacksquare \blacksquare \blacktriangle \blacksquare [?] \blacktriangle$.
- After the triangle at position 4, position 5 is a rectangle. Therefore, position 6 must also be a **Rectangle (Option C)** to complete the pair before the next triangle.

Why other options are incorrect:

- Option A (Triangle):** Would place two consecutive triangles, breaking the sequence rule.
- Option B (Circle) & Option D (Diamond):** Geometric shapes foreign to this two-symbol alternating sequence.

Question #12 **Key: (B)**

FMDC 2023

A man looks at his shirt in the mirror and sees: $\leq \text{WOIHA} \geq$. Another man enters and observes the shirt directl...

CORE CONCEPT AND DERIVATION

Lateral Inversion Inversion.

Formula: Reversal of mirrored string.

Solution: Reversing $\leq \text{WOIHA} \geq$ gives $\leq \text{AHIOW} \geq$.

Why other options are incorrect:

- Option D:** Inverts the bracket directions twice unnecessarily.

Question #13 **Key: (D)**

DUHS 2023

Look carefully at the visual symbols below to find the pattern: VISUAL SYMBOL PROGRESSION (PROGRESSIVE ARC CLO...

CORE CONCEPT AND DERIVATION

Curvilinear Progression: Cumulative angular arc closure toward a closed topological figure.

Formula / Rule:

Cumulative Arc Angle: $180^\circ \rightarrow 270^\circ \rightarrow 315^\circ \rightarrow 360^\circ$

Solution:

- Step 1 shows a top semicircular arc (180°).
- Step 2 extends the curve along the bottom-left quadrant (270° total).
- Step 3 extends the arc further into the bottom-right quadrant ($\sim 315^\circ$).
- Step 4 completes the full continuous perimeter, forming a **complete closed circular ring (Option D)**.

Why other options are incorrect:

- Option A:** Incomplete vertical crescent arc.
- Option B:** Broken/dashed arc structure not matching the solid line progression.
- Option C:** Reverts back to an unclosed single top semicircle.

Question #14 **Key: (D)**

SZABMU 2023

Look at the visual pattern sequence: A triangle marker shifts position among squares in successive steps. Whic...

CORE CONCEPT AND DERIVATION

Positional Movement Rules along a discrete coordinate grid.

Formula / Rule:

$$\text{Position}_n = \text{Position}_1 + (n - 1) \times 2$$

Solution:

- Step 1: Marker is located at Grid Position 1.
- Step 2: Marker shifts +2 spaces to Grid Position 3.
- Step 3: Marker shifts +2 spaces to Grid Position 5.
- Step 4: Following the continuous +2 step rule, the marker must shift to $5 + 2 = \text{Grid Position 7 (Option D)}$.

Why other options are incorrect:

- **Option A (Pos 4) & Option B (Pos 6):** Represent even coordinate positions, violating the odd-numbered stepping arithmetic.
- **Option C (Pos 8):** Jumps +3 spaces from Step 3, breaking the constant distance rule.

Question #15 **Key: (B)**

SZABMU 2023

A man looks at his shirt in a mirror and sees: $\leq \text{WOIHA} \geq$. Another man views his shirt directly. What does he ...

CORE CONCEPT AND DERIVATION

Lateral Inversion in Plane Mirrors.

Rule / Principle:

A plane mirror reflects a 2D image across the vertical axis ($x \rightarrow -x$). This produces two simultaneous transformations when transitioning between a mirror view and a direct view:

1. **Positional Reversal:** The spatial sequence of characters is reversed from left-to-right (the rightmost element in the mirror is the leftmost element on the actual physical shirt).
2. **Glyph Inversion:** Each individual character is reflected horizontally about its own vertical axis.

Step-by-Step Solution:

The mirror image viewed from left to right is: $\leq \text{W O I H A} \geq$

- **Leftmost symbol in direct view:** Originates from the rightmost symbol in the mirror ($\geq$). Horizontally reflecting $\geq$ flips its rightward-pointing vertex to the left, yielding $\leq$.
- **Letter sequence:** The letters in the mirror reading left-to-right are **W - O - I - H - A**. In direct view, their positional order reverses to **A - H - I - O - W**. Because each of the English letters **A, H, I, O, W** possesses vertical line symmetry ($\text{reflect}(L) = L$), their individual glyph forms remain unchanged.
- **Rightmost symbol in direct view:** Originates from the leftmost symbol in the mirror ($\leq$). Horizontally reflecting $\leq$ flips its leftward-pointing vertex to the right, yielding $\geq$.

Assembling the elements in direct view from left to right yields: $\leq \text{AHIOW} \geq$ (Option B).

Why other options are incorrect:

- **Option D ($\geq \text{AHIOW} \leq$):** Classic lateral inversion trap. Flipped the orientation of the symbols in place without swapping their lateral positions (or swapped positions without flipping glyph orientation). If the direct shirt were $\geq \text{AHIOW} \leq$, its mirror reflection would be $\leq \text{WOIHA} \geq$, not $\leq \text{WOIHA} \geq$.
- **Option A ($\geq \text{WOIHA} \leq$) & Option C ($\leq \text{WOIHA} \geq$):** Fail to reverse the lateral sequence of the letters from left to right.