



TANATA General Aptitude & Mental Ability

Sample Paper – 10

Duration: 38 Minutes

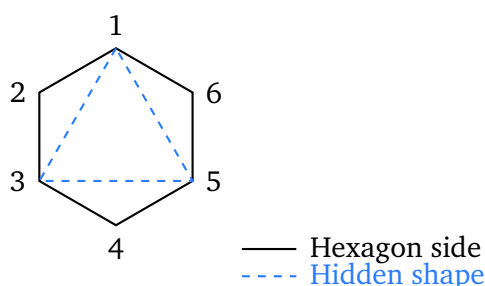
Questions: 25

Max Marks: 50

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the General Aptitude & Mental Ability portion of **TANATA** entrance.
- Each correct answer carries **+2 marks**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **General Aptitude section of TANATA — Mental Ability (visual, numerical, verbal), Architectural Awareness (Indian & International), Mathematical Reasoning, and Sets & Relations.**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

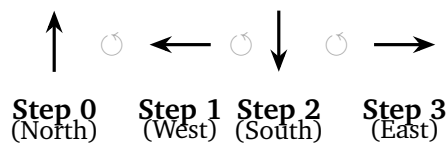
Q.1. A regular hexagon is drawn with its six vertices numbered 1 to 6 in order. Which of the following simple shapes is **hidden** within it — traceable using only the hexagon's own vertices, connected by straight lines?



- (A) Square
- (B) Equilateral triangle
- (C) Circle
- (D) Octagon

Answer: (B)

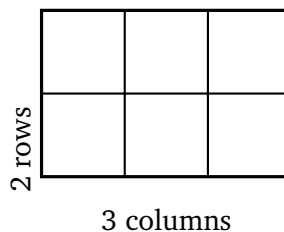
Q.2. An arrow initially points **North**. It is rotated **90° counterclockwise (CCW)** at each step. After **3** such rotations, in which direction does the arrow point?



- (A) North
- (B) West
- (C) East
- (D) South

Answer: (C)

Q.3. How many rectangles (including squares) are there in total in a 2×3 grid of unit squares (2 rows, 3 columns)?



- (A) 12
- (B) 15

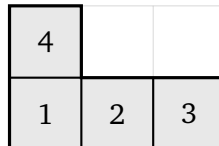


(C) 16

(D) 18

Answer: (D)

Q.4. The figure below shows an irregular staircase shape drawn on a unit grid. Count the number of **complete unit squares** inside the shape.



(A) 4

(B) 5

(C) 6

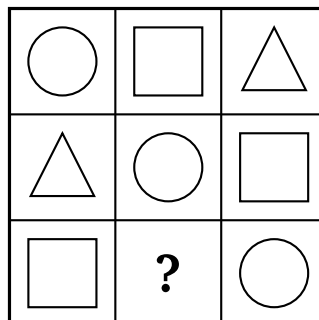
(D) 3

Answer: (A)

Q.5. In a 3×3 grid pattern, each row contains exactly one circle, one square, and one triangle. The arrangement so far is:

Row 1: Circle, Square, Triangle **Row 2:** Triangle, Circle, Square **Row 3:** Square, ?, Circle

What shape belongs in the ? position?



(A) Circle



- (B) Triangle
- (C) Square
- (D) Pentagon

Answer: (B)

Q.6. Pipe A can fill a tank in 6 hours. Pipe B can empty the full tank in 10 hours. If both pipes are opened simultaneously when the tank is **empty**, how many hours will it take to fill the tank completely?

- (A) 6 hours
- (B) 10 hours
- (C) 15 hours
- (D) 12 hours

Answer: (C)

Q.7. If $A = 1$, $B = 2$, $C = 3$, ..., $Z = 26$, what is the **sum** of the positional values of all letters in the word “**CAT**”?

- (A) 26
- (B) 22
- (C) 34
- (D) 24

Answer: (D)

Q.8. If **15 July 2024** is a **Monday**, what day of the week is **15 August 2024**?

- (A) Thursday
- (B) Wednesday
- (C) Friday
- (D) Tuesday



Answer: (A)

Q.9. If $2 : 3 = 6 : x$, find the value of x .

- (A) 6
- (B) 9
- (C) 12
- (D) 18

Answer: (B)

Q.10. Start : End :: Beginning : _____

- (A) Start
- (B) Middle
- (C) Conclusion
- (D) Pause

Answer: (C)

Q.11. Which of the following does **NOT** belong to the category of *cultural or knowledge institutions*?

- (A) Library
- (B) Museum
- (C) Art Gallery
- (D) Airport

Answer: (D)

Q.12. Bird : Nest :: Fox : _____

- (A) Den
- (B) Hive



(C) Burrow

(D) Lodge

Answer: (A)

Q.13. Glass : Fragile :: Diamond : _____

(A) Transparent

(B) Hard

(C) Expensive

(D) Precious

Answer: (B)

Q.14. Mehrangarh Fort in Jodhpur — one of India's largest and most imposing forts — was founded in 1459 by which ruler?

(A) Akbar (Mughal Emperor)

(B) Rana Pratap Singh (Mewar)

(C) Rao Jodha (Rathore Rajput clan)

(D) Prithviraj Chauhan

Answer: (C)

Q.15. The Mysore Palace (Amba Vilas Palace) — official residence of the royal family of Mysore and today a famous museum and tourist landmark — belongs to which dynasty?

(A) Hoysala dynasty

(B) Chola dynasty

(C) Maratha dynasty

(D) Wadiyar dynasty

Answer: (D)



- Q.16.** Rani ki Vav in Patan, Gujarat — a UNESCO World Heritage Site — is an outstanding example of which type of historical Indian structure?
- (A) Stepwell
 - (B) Granary
 - (C) Fortification
 - (D) Observatory

Answer: (A)

- Q.17.** Gol Gumbaz in Bijapur (Vijayapura), Karnataka — the mausoleum of Sultan Muhammad Adil Shah — is famous for which architectural curiosity?
- (A) Largest minaret in India
 - (B) Whispering gallery due to the dome's acoustic geometry
 - (C) Longest corridor in India
 - (D) Underground water-harvesting system

Answer: (B)

- Q.18.** The National Museum of Qatar in Doha, opened in 2019, is designed to evoke the natural formation of a *desert rose* crystal — with 539 interlocking disc-shaped elements of varying sizes. Who designed it?
- (A) Zaha Hadid
 - (B) Frank Gehry
 - (C) Jean Nouvel
 - (D) Norman Foster

Answer: (C)

- Q.19.** The MAXXI — National Museum of 21st Century Arts in Rome, opened in 2010, with its flowing concrete walls, curved circulation paths, and naturally lit galleries — was designed by:



- (A) Renzo Piano
- (B) Rafael Moneo
- (C) Jean Nouvel
- (D) Zaha Hadid

Answer: (D)

Q.20. The 8 House project in Copenhagen (completed 2010), designed by Bjarke Ingels Group (BIG), is architecturally notable for:

- (A) Its figure-8 plan with a continuous cycling and walking path that winds from ground level to the rooftop
- (B) Its fully glazed curtain-wall façade
- (C) Its underground suspended gardens
- (D) Its rotating floors that track the sun

Answer: (A)

Q.21. The negation of the statement “If p , then q ” (i.e., the negation of $p \rightarrow q$) is:

- (A) $\sim p \rightarrow \sim q$
- (B) $p \wedge \sim q$
- (C) $\sim p \vee q$
- (D) $\sim p \wedge \sim q$

Answer: (B)

Q.22. Which of the following is a **tautology** (always true, regardless of the truth value of p)?

- (A) $p \wedge \sim p$
- (B) $p \rightarrow q$
- (C) $p \vee \sim p$



(D) $p \wedge q$

Answer: (C)

Q.23. Consider the argument:

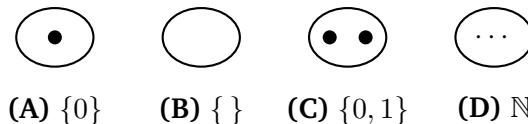
“All architects are creative. Rahul is creative. $\therefore$ Rahul is an architect.”

This argument is:

- (A) Valid — it is an instance of modus ponens
- (B) Valid — it is a valid categorical syllogism
- (C) Valid — it is an instance of modus tollens
- (D) Invalid — fallacy of the undistributed middle

Answer: (D)

Q.24. Which of the following is a **singleton set** (a set containing exactly one element)?



- (A) $\{0\}$
- (B) $\{\}$ (empty set)
- (C) $\{0, 1\}$
- (D) $\mathbb{N}$ (all natural numbers)

Answer: (A)

Q.25. A relation R on a set A is called **reflexive** if:

- (A) $(a, b) \in R \Rightarrow (b, a) \in R$ for all $a, b \in A$
- (B) $(a, b) \in R$ and $(b, c) \in R \Rightarrow (a, c) \in R$ for all $a, b, c \in A$
- (C) $(a, a) \in R$ for every $a \in A$



(D) $(a, b) \in R$ and $(b, a) \in R$ for some $a, b \in A$

Answer: (C)



Solutions

Solution

Concept & Chapter: Embedded Figure — Visual Reasoning. Alternate vertices (1, 3, 5) of a regular hexagon are 120° apart; connecting them traces an equilateral triangle hidden inside. Answer: **(B)**.

Visual — Hidden Figure in a Regular Hexagon.

In a regular hexagon the six vertices are equally spaced at 60° intervals around the centre. Alternate vertices (1, 3, 5) are separated from each other by exactly 120° . Connecting these three vertices with straight line segments produces three chords of equal length at equal angles — an **equilateral triangle** embedded inside the hexagon.

The dashed triangle in the figure uses only the hexagon's own vertices (no new points are required) and can be traced along straight lines, confirming it is genuinely “hidden” within the figure.

- Q.1.**
- Square (A): requires four 90° corners; a regular hexagon's alternating vertices subtend 120° , not 90° .
 - Circle (C): cannot be traced with straight line segments between a finite set of vertices.
 - Octagon (D): would need 8 vertices; the hexagon has only 6.

∴ Answer **(B)**.

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Solution

Concept & Chapter: Figure Series (Arrow Rotation) — Visual Reasoning. Each 90° CCW rotation advances the arrow one step in the cycle $N \rightarrow W \rightarrow S \rightarrow E$; after 3 steps from North it points East. Answer: **(C)**.

Visual — Arrow Direction after Repeated CCW Rotations.

Each 90° counterclockwise (CCW) rotation advances the compass direction by one step in the cycle: $N \rightarrow W \rightarrow S \rightarrow E \rightarrow N \rightarrow \dots$

	Rotation	Direction
	Start (Step 0)	North ($\uparrow$)
Q.2.	After 1st CCW 90° (Step 1)	West ($\leftarrow$)
	After 2nd CCW 90° (Step 2)	South ($\downarrow$)
	After 3rd CCW 90° (Step 3)	East ($\rightarrow$)

After **three** counterclockwise rotations of 90° each, the arrow points **East**.

∴ Answer **(C)**.



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Solution

Concept & Chapter: Counting Figures (Rectangles in Grid) — Visual Reasoning. Choose 2 of 3 horizontal lines and 2 of 4 vertical lines: $\binom{3}{2} \times \binom{4}{2} = 3 \times 6 = 18$ rectangles total. Answer: (D).

Visual / Numerical — Rectangles in a 2×3 Grid.

To form a rectangle, choose any 2 distinct horizontal lines and any 2 distinct vertical lines from the grid. Each such pair of horizontal and vertical lines uniquely defines one rectangle (its four sides).

A 2×3 grid of unit squares has:

- Q.3.
- $2 + 1 = 3$ horizontal lines $\Rightarrow \binom{3}{2} = 3$ ways to choose 2.
 - $3 + 1 = 4$ vertical lines $\Rightarrow \binom{4}{2} = 6$ ways to choose 2.

$$\text{Total rectangles} = \binom{3}{2} \times \binom{4}{2} = 3 \times 6 = 18.$$

This count includes all unit squares (1×1), dominoes (1×2 and 2×1), larger rectangles, and the full grid rectangle.

$\therefore$ Answer (D).

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Q.4.

Solution

Concept & Chapter: Counting Unit Squares — Visual Reasoning. The staircase shape has 3 squares in the bottom row plus 1 in the top-left, giving 4 complete unit squares. Answer: (A).

Visual — Counting Complete Unit Squares.

The staircase shape is formed by starting with a 3×2 rectangle (6 unit squares total) and removing the top-right 2×1 strip (2 unit squares):

$$6 - 2 = 4 \text{ complete unit squares.}$$

The four squares are clearly labelled 1–4 in the figure: squares 1, 2, 3 occupy the full bottom row, and square 4 sits in the top-left position. Only complete squares entirely inside the boundary are counted; the excluded top-right region does not belong to the shape.

$\therefore$ Answer (A).

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Solution

Concept & Chapter: Pattern Completion (Latin Square) — Visual Reasoning. Each shape appears once per row and column; Row 3 and Col 2 are both missing Triangle, confirming the answer. Answer: (B).

Visual — Latin Square Pattern Completion.

The 3×3 grid follows a **Latin square** rule: each shape (Circle, Square, Triangle) appears *exactly once* in every row and *exactly once* in every column.

Q.5.

	Col 1	Col 2	Col 3
Row 1	Circle	Square	Triangle
Row 2	Triangle	Circle	Square
Row 3	Square	?	Circle

Row check: Row 3 contains Square and Circle; the missing shape is **Triangle**.

Column check: Column 2 contains Square (R1) and Circle (R2); missing $\Rightarrow$ **Triangle**.

Both conditions independently confirm that the missing shape is **Triangle**.

$\therefore$ Answer (B).

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Q.6.

Solution

Concept & Chapter: Pipes and Cisterns — Numerical Ability. Net fill rate $= \frac{1}{6} - \frac{1}{10} = \frac{1}{15}$ tank/hour, so the tank fills completely in 15 hours. Answer: (C).

Numerical — Pipes and Cisterns.

$$\text{Rate of Pipe A (filling)} = \frac{1}{6} \text{ tank per hour.}$$

$$\text{Rate of Pipe B (draining)} = \frac{1}{10} \text{ tank per hour.}$$

$$\text{Net fill rate} = \frac{1}{6} - \frac{1}{10} = \frac{5}{30} - \frac{3}{30} = \frac{2}{30} = \frac{1}{15} \text{ tank per hour.}$$

$$\text{Time to fill the tank} = \frac{1}{1/15} = 15 \text{ hours.}$$

Since the net rate is positive, the tank does fill up (Pipe A's filling rate exceeds Pipe B's draining rate).

$\therefore$ Answer (C).

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Q.7.



Solution

Concept & Chapter: Letter-Value Code — Numerical Ability. Assign A=1, B=2, ...; C=3, A=1, T=20, so the sum for “CAT” is $3+1+20=24$. Answer: **(D)**.

Numerical — Letter-Position Code.

Assign each letter its ordinal position in the English alphabet (A = 1, B = 2, ...):

$$C = 3, \quad A = 1, \quad T = 20.$$

$$\text{Sum} = 3 + 1 + 20 = 24.$$

∴ Answer **(D)**.

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Q.8.

Solution

Concept & Chapter: Calendar Day — Numerical Ability. July has 31 days; $31 = 4 \times 7 + 3$, so add 3 days to Monday: Monday → Tuesday → Wednesday → Thursday. Answer: **(A)**.

Numerical — Calendar Day Calculation.

July has **31 days**. The number of days elapsed from 15 July to 15 August is exactly 31 days (one complete “month length” of July).

$$31 = 4 \times 7 + 3,$$

i.e., 4 complete weeks plus **3 extra days**. Adding 3 days to Monday:

$$\text{Monday} \xrightarrow{+1} \text{Tuesday} \xrightarrow{+1} \text{Wednesday} \xrightarrow{+1} \text{Thursday}.$$

Therefore, 15 August 2024 falls on a **Thursday**.

∴ Answer **(A)**.

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Q.9.

Solution

Concept & Chapter: Ratio and Proportion — Numerical Ability. Cross-multiply $\frac{2}{3} = \frac{6}{x}$ to get $2x = 18$, so $x = 9$. Answer: **(B)**.

Numerical — Continued Proportion.

The proportion $2 : 3 = 6 : x$ is equivalent to $\frac{2}{3} = \frac{6}{x}$. Cross-multiplying:

$$2 \times x = 3 \times 6 \implies 2x = 18 \implies x = 9.$$



Verification: $\frac{2}{3} = \frac{6}{9} = \frac{2}{3}$. ✓
 ∴ Answer (B).

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Solution

Concept & Chapter: Word Analogy (Antonym) — Verbal Reasoning. Start:End is an antonym pair; the antonym of Beginning is Conclusion (the end or close of something). Answer: (C).

Verbal — Antonym Analogy.

Start and *End* are direct antonyms. The analogy therefore asks for the word that is the antonym of *Beginning*.

- Q.10.
- **Conclusion:** the end or close of something — the direct opposite of a beginning. ✓
 - *Middle:* a midpoint in a sequence, not an opposite.
 - *Pause:* a temporary halt or interruption, not an opposite.
 - *Start:* a synonym of Beginning, not its opposite.

∴ Answer (C).

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Solution

Concept & Chapter: Odd One Out (Classification) — Verbal Reasoning. Library, Museum, and Art Gallery are cultural/knowledge institutions; Airport is a transport facility and does not belong. Answer: (D).

Verbal — Odd One Out (Cultural / Knowledge Institutions).

- Q.11.
- **Library:** a civic institution dedicated to storing, preserving, and lending books and knowledge resources.
 - **Museum:** an institution that collects, conserves, researches, and exhibits cultural or scientific artefacts.
 - **Art Gallery:** a space devoted to displaying and promoting works of art.
 - **Airport:** a transport infrastructure facility; it exists to handle aviation operations and passenger logistics — it serves no cultural or knowledge function.

Libraries, museums, and art galleries are all *cultural and knowledge institutions*. An **airport** does not belong to this category.

∴ Answer (D).



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Solution

Concept & Chapter: Word Analogy (Animal Habitat) — Verbal Reasoning. Bird lives in a Nest; by analogy, the established conventional home of a Fox is a Den. Answer: (A).

Verbal — Animal Habitat Analogy.

A *bird's* natural home is a *nest*. By analogy, the natural home of a *fox* is a **den** — a sheltered lair (typically a cave, hollow log, or underground chamber) where the fox rests and raises its cubs.

- Q.12.
- *Hive*: home of bees (and other social insects).
 - *Burrow*: while foxes can occasionally dig tunnels, the established conventional term for a fox's home in English and in analogy questions is *den*.
 - *Lodge*: home of beavers.

∴ Answer (A).

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Solution

Concept & Chapter: Word Analogy (Material–Property) — Verbal Reasoning. Glass is defined by being fragile; Diamond is defined by being the hardest natural mineral (Mohs 10). Answer: (B).

Verbal — Material–Property Analogy.

The analogy pairs each material with its *defining physical property*: *Glass* is characterised by being *fragile* (it breaks easily under mechanical stress). By the same logic, *diamond* is characterised by being **hard** — it is the hardest naturally occurring mineral, rated 10 on the Mohs hardness scale, the maximum possible.

- Q.13.
- *Transparent* (A): an optical property of glass; not diamond's defining characteristic.
 - *Expensive* (C) and *Precious* (D): economic or cultural descriptors, not intrinsic physical properties.

∴ Answer (B).

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Solution

Concept & Chapter: Indian Architecture (Rajasthan Forts) — Architectural Awareness. Mehrangarh Fort was founded in 1459 by Rao Jodha, 15th chief of the Rathore Rajput clan, on a rocky outcrop above Jodhpur. Answer: (C).

Architectural Awareness — Indian (Rajput Heritage, Rajasthan).

Rao Jodha, the 15th chief of the Rathore Rajput clan, founded the city of **Jodhpur** in 1459 and immediately began construction of **Mehrangarh Fort** on a high rocky outcrop 125 m above the city. Its name derives from *Mihir* (the Sun), reflecting the Rathore clan's traditional claim of solar descent.

Subsequent Rathore rulers expanded the fort over the centuries; it now houses a richly stocked museum of royal artefacts, paintings, costumes, and weapons. Mehrangarh remains one of the largest and best-preserved forts in India.

- Q.14.
- Akbar (A): Mughal Emperor; built Fatehpur Sikri (Agra district) and Agra Fort.
 - Rana Pratap Singh (B): Mewar (Udaipur) ruler, contemporary of Akbar; not connected to Jodhpur.
 - Prithviraj Chauhan (D): 12th-century ruler of Ajmer-Delhi; predates Mehrangarh by three centuries.

∴ Answer (C).

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Solution

Concept & Chapter: Indian Architecture (Palace Heritage, Karnataka) — Architectural Awareness. Mysore Palace (Amba Vilas) is the official residence of the Wadiyar dynasty, completed in 1912 in Indo-Saracenic style. Answer: (D).

Architectural Awareness — Indian (Royal Palace Heritage, Karnataka).

The **Mysore Palace** (officially Amba Vilas Palace) is the official residence and seat of the **Wadiyar (Wodeyar) dynasty** of Mysore. The present palace, replacing an earlier wooden structure that was destroyed by fire, was completed in 1912 and designed by British architect Henry Irwin in the **Indo-Saracenic style** — a fusion of Hindu, Islamic, Rajput, and Gothic elements rendered in grey granite with pink marble domes.

The Wadiyars ruled the Kingdom of Mysore from the 14th century until the state's accession to independent India in 1947. The palace is today one of the most visited monuments in India and is famous for its spectacular illumination during the Dasara festival.



- Q.15.
- Hoysala (A): medieval Karnataka dynasty (10th–14th century); celebrated for Belur and Halebidu temples.
 - Chola (B): Tamil Nadu dynasty; associated with Brihadishvara Temple, Thanjavur.
 - Maratha (C): ruled parts of Karnataka at various times but were not the royal house of Mysore.

∴ Answer (D).

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Solution

Concept & Chapter: Indian Architecture (Stepwells, UNESCO WHS) — Architectural Awareness. Rani ki Vav is a subterranean stepwell (vav) built c.1063 CE in Patan, Gujarat, inscribed as a UNESCO World Heritage Site in 2014. Answer: (A).

Architectural Awareness — Indian (Gujarat, UNESCO WHS 2014).

Rani ki Vav (“Queen’s Stepwell”) was built c.1063 CE by Queen Udayamati of the Solanki dynasty in memory of her husband King Bhimdev I. A **stepwell** (vav in Gujarati) is a subterranean structure of descending steps leading to a water source; it functioned both as a water-harvesting reservoir and as a public gathering place for local communities.

Rani ki Vav has seven levels of elaborate stairs and is adorned with over 500 principal sculptures — primarily depicting avatars of Vishnu, apsaras (celestial dancers), and scenes from Hindu mythology — carved in sandstone on its surrounding walls and pillars. It was inscribed on the **UNESCO World Heritage List in 2014**.

- Q.16.
- Granary (B): granaries are above-ground storage structures for grain; not the function of Rani ki Vav.
 - Fortification (C): Patan has ancient fortification walls, but Rani ki Vav is a stepwell, not a fort.
 - Observatory (D): associated with the Jantar Mantar complexes in Jaipur, Delhi, etc., not Patan.

∴ Answer (A).

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Solution

Concept & Chapter: Indian Architecture (Dome Acoustics, Karnataka) — Architectural Awareness. Gol Gumbaz’s large hemispherical dome creates a Whispering



Gallery where sound travels around the interior circumference. Answer: **(B)**.

Architectural Awareness — Indian (Adil Shahi Architecture, Karnataka).

Gol Gumbaz (1656) in Bijapur (Vijayapura), Karnataka, is the mausoleum of Sultan Muhammad Adil Shah of the Adil Shahi dynasty. Its hemispherical dome has an outer diameter of approximately 44 m, making it one of the largest unsupported domes in the world.

At the base of the dome, a circular internal gallery — the **Whispering Gallery** — runs around the interior circumference. Due to the curvature of the dome's shell, a whisper or soft sound produced at one point on the gallery wall travels around the curved surface and is clearly audible on the opposite side (roughly 37 m away). This striking acoustic property is the building's most celebrated curiosity.

- Q.17. • Largest minaret (A): Qutb Minar, Delhi, is India's tallest historic minaret; Gol Gumbaz has no notable minaret.
- Longest corridor (C): not a recognised feature of this monument.
- Underground water-harvesting (D): not associated with Gol Gumbaz.

∴ Answer **(B)**.

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Solution

Concept & Chapter: International Architecture (Contemporary Museum, Jean Nouvel) — Architectural Awareness. The National Museum of Qatar in Doha (2019) was designed by Jean Nouvel, with 539 interlocking disc-shaped panels evoking desert rose crystals. Answer: **(C)**.

Architectural Awareness — International (Contemporary Museum).

The **National Museum of Qatar** (NMoQ) in Doha opened in March 2019 and was designed by French architect **Jean Nouvel**. The building's exterior is composed of 539 interlocking disc-shaped concrete and steel panels of varying diameters and angles of inclination, inspired by the natural crystalline structure of a **desert rose** — a disc-shaped selenite crystal cluster that forms in the sandy and saline soils of Qatar's desert. The building wraps around the historic Sheikh Abdullah Bin Jassim Al Thani Palace (1912), which it preserves as its central nucleus.

- Q.18. • Zaha Hadid (A): designed the MAXXI Museum (Rome) and the Heydar Aliyev Centre (Baku).
- Frank Gehry (B): designed the Guggenheim Museum Bilbao and the Walt Disney Concert Hall.



- Norman Foster (D): designed the Reichstag dome renovation (Berlin) and the Hearst Tower (New York).

∴ Answer (C).

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Solution

Concept & Chapter: International Architecture (Contemporary Museum, Zaha Hadid) — Architectural Awareness. The MAXXI in Rome (2010) was designed by Zaha Hadid Architects, featuring flowing concrete walls and curvilinear gallery volumes. Answer: (D).

Architectural Awareness — International (Contemporary Museum).

The **MAXXI** (Museo Nazionale delle Arti del XXI Secolo — National Museum of 21st Century Arts) in Rome was designed by **Zaha Hadid Architects (ZHA)** and opened in May 2010, winning the RIBA Stirling Prize (Britain's most prestigious architecture award) that same year.

The building is celebrated for its **flowing, curvilinear concrete walls**, overlapping and intersecting gallery volumes, continuous glass skylights that channel natural light deep into the interior, and a deliberately non-linear circulation path that makes each visit a unique spatial journey. These are hallmarks of Hadid's parametric design approach.

- Q.19.
- Renzo Piano (A): Italian architect; co-designed the Centre Pompidou (Paris) and designed the Shard (London).
 - Rafael Moneo (B): Spanish architect; designed the Prado Museum extension (Madrid) and Atocha Station.
 - Jean Nouvel (C): designed the National Museum of Qatar (Doha).

∴ Answer (D).

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Solution

Concept & Chapter: International Architecture (BIG, Copenhagen) — Architectural Awareness. 8 House by Bjarke Ingels Group features a figure-8 plan with a continuous cycling path winding from street level to the rooftop. Answer: (A).

Architectural Awareness — International (Contemporary Residential, Copenhagen).

8 House (completed 2010, Ørestad, Copenhagen) was designed by **Bjarke Ingels**



Group (BIG). Its name comes from the **figure-8 (figure-eight, or “∞” rotated 90°) footprint** of the building as seen from above.

The project’s defining architectural feature is a **continuous sloping path** — wide enough for cyclists — that winds from street level at the southwest corner all the way up to the rooftop penthouse at the northeast corner, passing terraced private gardens along the route. Residents can cycle between their homes and the ground without using a lift, creating a vertical neighbourhood with a strong community character.

The building contains 476 homes (a mix of social housing and market-rate units), offices, and retail spaces across approximately 61,000 m².

- Q.20.**
- Fully glazed curtain wall (B): incorrect; the façade uses a mix of brick, timber, glazing, and green terraces.
 - Underground suspended gardens (C): not a feature of 8 House.
 - Rotating floors (D): not a feature; the building has no moving structure.

∴ Answer (A).

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Solution

Concept & Chapter: Negation of Conditional (Logical Connectives) — Mathematical Reasoning. $\neg(p \rightarrow q) \equiv p \wedge \sim q$; the conditional is false only when p is true and q is false. Answer: (B).

Mathematical Reasoning — Negation of a Conditional Statement.

The conditional $p \rightarrow q$ is **false** in exactly one case: when p is **true** and q is **false**. Therefore its negation is the statement that asserts precisely this case:

$$\neg(p \rightarrow q) \equiv p \wedge \sim q.$$

Q.21.

p	q	$p \rightarrow q$	$p \wedge \sim q$ (negation)
T	T	T	F
T	F	F	T
F	T	T	F
F	F	T	F

- Option (A), $\sim p \rightarrow \sim q$: this is the *inverse* of $p \rightarrow q$ (not its negation).
- Option (C), $\sim p \vee q$: logically *equivalent* to $p \rightarrow q$ itself — not its negation.
- Option (D), $\sim p \wedge \sim q$: neither p nor q is true; this is a different statement.

∴ Answer (B).



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Solution

Concept & Chapter: Tautology (Law of Excluded Middle) — Mathematical Reasoning. $p \vee \sim p$ is always true for any truth value of p , satisfying the definition of a tautology. Answer: (C).

Mathematical Reasoning — Tautology (Law of Excluded Middle).

A **tautology** is a compound proposition that is **true for every possible assignment** of truth values to its variables.

Q.22.

p	$p \wedge \sim p$	$p \vee \sim p$	$p \rightarrow q^*$	$p \wedge q^*$
T	F	T	T or F	T or F
F	F	T	T	F

*also depends on the value of q

$p \vee \sim p$ is **always TRUE** — the **Law of Excluded Middle**: every proposition is either true or its negation is true; there is no third option.

- $p \wedge \sim p$ (A): always **FALSE** (a contradiction — Law of Non-Contradiction).
- $p \rightarrow q$ (B): not a tautology; it is false when p is true and q is false.
- $p \wedge q$ (D): not a tautology; it is false whenever p or q is false.

∴ Answer (C).

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Solution

Concept & Chapter: Invalid Syllogism (Undistributed Middle) — Mathematical Reasoning. The argument commits the Fallacy of the Undistributed Middle; “creative” is not exclusively distributed to architects. Answer: (D).

Mathematical Reasoning — Syllogistic Validity.

The argument has the form:

- Q.23. (i) All architects are creative. (Major premise: All A are B)
 (ii) Rahul is creative. (Minor premise: x is B)
 (iii) ∴ Rahul is an architect. (Conclusion: x is A)

This is **logically invalid**. It commits the **Fallacy of the Undistributed Middle**: the middle term “creative” (B) is not universally distributed in either premise. Many people are creative without being architects. Knowing that Rahul is creative tells us only that he belongs to the broad set of “creative people” — *not* that he belongs to the smaller subset “architects.”

Contrast with valid patterns using the same major premise:



- *Modus ponens*: “Rahul is an architect $\Rightarrow$ Rahul is creative.” ✓
- *Modus tollens*: “Rahul is *not* creative $\Rightarrow$ Rahul is not an architect.” ✓

$\therefore$ Answer (D).

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Solution

Concept & Chapter: Singleton Set — Sets & Relations. A singleton set contains exactly one element; $\{0\}$ has one member (the number zero), while $\{\}$, $\{0, 1\}$, and $\mathbb{N}$ do not. Answer: (A).

Sets — Singleton Set.

A **singleton set** is a set that contains **exactly one element**.

- Q.24.
- $\{0\}$: contains exactly **one** element, the number zero. ✓ **This is a singleton.**
 - $\{\}$ (the empty set, B): contains **zero** elements. Not a singleton.
 - $\{0, 1\}$ (C): contains **two** elements. Not a singleton.
 - $\mathbb{N}$ (D): the set of all natural numbers; contains **infinitely many** elements.

Important note: the number 0 is a perfectly well-defined mathematical object (not “nothing”). The set $\{0\}$ has one member and is *not* the empty set.

$\therefore$ Answer (A).

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Solution

Concept & Chapter: Reflexive Relation — Sets & Relations. A relation is reflexive iff $(a, a) \in R$ for every $a \in A$; this distinguishes it from symmetry (A) and transitivity (B). Answer: (C).

Sets — Reflexive Relation.

A relation R on a set A is **reflexive** if and only if every element of A is related to itself:

$$R \text{ is reflexive} \iff (a, a) \in R \text{ for all } a \in A.$$

The other options describe distinct relational properties:

- Q.25.
- Option (A): $\forall a, b \in A, (a, b) \in R \Rightarrow (b, a) \in R$ — this is **symmetry**.
 - Option (B): $\forall a, b, c \in A, (a, b), (b, c) \in R \Rightarrow (a, c) \in R$ — this is **transitivity**.
 - Option (D): $(a, b) \in R$ and $(b, a) \in R$ for *some* $a, b \in A$ — this is neither a standard property (reflexivity requires $(a, a) \in R$ for *all* a , not merely a pair of distinct elements).

$\therefore$ Answer (C).

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Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	D	4	A	5	B
6	C	7	D	8	A	9	B	10	C
11	D	12	A	13	B	14	C	15	D
16	A	17	B	18	C	19	D	20	A
21	B	22	C	23	D	24	A	25	C

