1. Seating Arrangement (Linear & Circular)

Q1.

Eight people—A, B, C, D, E, F, G, and H—are sitting in a row facing north.

- B is third to the left of G.
- D is immediate right of A.
- C is second to the right of E.
- F is at one of the ends.
  Who is sitting at the extreme right end?

Answer: H

Solution:

- Placing F at one end, aligning other conditions, the final arrangement is:
  `F A D B E C G H`
  H is at the rightmost end.

Q2.

Six persons—P, Q, R, S, T, and U—are sitting in a circle facing the center.

- P is second to the left of R.
- Q is to the immediate right of P.
- T is opposite to R.

Who is sitting to the immediate left of T?

Answer: U

Solution:

- Placing T opposite to R and fulfilling other conditions:
  `P → Q → S → T → U → R`
  U is to the left of T.

---

2. Blood Relations

Q3.

A is B’s father. B is C’s sister. D is B’s mother. How is D related to C?

Answer: Mother

Solution:

- A is B’s father → B (Female) is C’s sister.
- D is B’s mother → Hence, **D is also C’s mother**.

Q4.

Pointing to a boy, Ramesh said, "He is the son of my sister's mother." How is the boy related to Ramesh?

Answer: Brother

Solution:

- Sister’s mother = **Ramesh’s mother**.
- **Her son = Ramesh’s brother**.

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3. Coding-Decoding

Q5.

If **CAT = XZG**, then how is **DOG** coded?

Answer: WLT

Solution:

- Each letter is replaced with its reverse letter in the alphabet.
- **C (3) → X (24), A (1) → Z (26), T (20) → G (7)**
- **D (4) → W (23), O (15) → L (12), G (7) → T (20)**

Q6.

In a certain code, **MOBILE** is written as **NPCJMF**. How is **LAPTOP** written in the same code?

Answer: MBQUQP

Solution:
Each letter is replaced by the next letter:

- **M → N, O → P, B → C, I → J, L → M, E → F**
- **L → M, A → B, P → Q, T → U, O → P, P → Q**

---

4. Direction Sense

Q7.

A person moves 10m north, then turns right and moves 5m, then turns right again and moves 10m, then turns left and moves 5m. Where is he now from the starting point?

Answer: 5m East

Solution:

1. Moves **10m North** → (+10m)

2. Moves **5m East** → (+5m)

3. Moves **10m South** → Back to start

4. Moves **5m East** → **5m East from start**.

Q8.

A man walks 15m north, turns left and walks 10m, then turns left and walks 5m. Which direction is he facing?

Answer: South

Solution:

- After 15m North → Left (West)

- After 10m West → Left (South)

- After 5m South → **Facing South**

---

5. Syllogisms & Logical Deduction

Q9.

Statements:

1. All cats are dogs.

2. Some dogs are lions.
   Conclusions:
   I. Some cats are lions.
   II. Some dogs are cats.

Answer: Only II follows

Solution:

- All **cats are dogs** (✅)
- Some **dogs are lions** (✅)
- But **cats** → **dogs** → **lions** is not direct.
- **Only II follows**.

---

6. Number & Letter Series

Q10.

Find the missing number:
2, 6, 12, 20, __, 42

Answer: 30

Solution:

- Pattern: **+4, +6, +8, +10...**
- **Next term**: **20 + 10 = 30**

Q11.

Find the missing letter:
A, D, G, J, __, P

Answer: M

Solution:
Pattern: **+3 letters**

- **A (1), D (4), G (7), J (10), (M), P (16)**

---

7. Puzzles (Logical & Analytical)

Q12.

Six friends—A, B, C, D, E, and F—are sitting in a row.

- A is between B and C.
- D is to the left of B.
- F is not at the extreme end.

Who is at the extreme left?

Answer: D

Solution:

- Placing them correctly:
  ```
  D B A C F E
  ```
  D is at the extreme left.

---

8. Data Sufficiency

Q13.

Is P older than Q?

1. P was born before R.
2. R is younger than Q.

Answer: Yes

Solution:

- **P → R (older)**
- **Q → R (older)**

- **Thus, P > Q**

Q14.

Is X a doctor?

1. X has an MBBS degree.
2. All MBBS degree holders are doctors.

Answer: Yes

Solution:

- MBBS → **Doctor**.
- X has **MBBS**.
- Hence, **X is a doctor**.

Q15.

Does M like chocolates?

1. M likes sweets.
2. Some sweets are chocolates.

Answer: No Conclusion

Solution:

- M **likes sweets** (✅)
- But **not all sweets are chocolates**, so **not sufficient**.

📌 Aptitude Questions & Solutions

1. Probability

Q1: A dice is rolled twice. What is the probability of getting a sum of 8?

Solution:
Possible outcomes for sum = 8:

- (2,6), (3,5), (4,4), (5,3), (6,2) → **5 cases**
  Total outcomes when rolling two dice = **6 × 6 = 36**
  Probability = **5/36**

---

2. Profit & Loss

Q2: A man sells an article for ₹800 at a loss of 20%. What was the cost price?

Solution:
Loss % = **20%**
Selling Price = **₹800**
Cost Price = **SP / (1 - Loss%)**
= **800 / 0.8 = ₹1000**

📌 Technical Questions & Java Solutions

3. Data Structures (Hashmap Implementation in Java)

Q3: Implement a simple HashMap in Java.

Solution (Java Code):

java
CopyEdit

```java
import java.util.LinkedList;

class SimpleHashMap<K, V> {
    private static final int SIZE = 10;
    private LinkedList<Entry<K, V>>[] map;

    public SimpleHashMap() {
        map = new LinkedList[SIZE];
        for (int i = 0; i < SIZE; i++) {
            map[i] = new LinkedList<>();
        }
    }

    private int getHash(K key) {
        return Math.abs(key.hashCode() % SIZE);
    }

    public void put(K key, V value) {
        int index = getHash(key);
        for (Entry<K, V> entry : map[index]) {
            if (entry.key.equals(key)) {
                entry.value = value;
                return;
            }
        }
        map[index].add(new Entry<>(key, value));
    }

    public V get(K key) {
        int index = getHash(key);
        for (Entry<K, V> entry : map[index]) {
            if (entry.key.equals(key)) {
                return entry.value;
            }
        }
        return null;
    }
    static class Entry<K, V> {
        K key;
        V value;
        Entry(K key, V value) {
            this.key = key;
            this.value = value;
        }
    }

    public static void main(String[] args) {
        SimpleHashMap<String, Integer> hashMap = new
SimpleHashMap<>();
        hashMap.put("Shivansh", 22);
        System.out.println(hashMap.get("Shivansh")); // Output: 22
    }
}
```

4. Algorithms (Longest Increasing Subsequence - Dynamic Programming)

Q4: Write a Java program to find the longest increasing subsequence in an array.

Solution (Java Code):

java
CopyEdit

```
import java.util.Arrays;

class LIS {
    public static int longestIncreasingSubsequence(int[] arr) {
        int n = arr.length;
        int[] dp = new int[n];
        Arrays.fill(dp, 1);

        for (int i = 1; i < n; i++) {
            for (int j = 0; j < i; j++) {
                if (arr[i] > arr[j]) {
                    dp[i] = Math.max(dp[i], dp[j] + 1);
                }
            }
        }
        return Arrays.stream(dp).max().orElse(1);
    }

    public static void main(String[] args) {
        int[] arr = {10, 22, 9, 33, 21, 50, 41, 60};
        System.out.println(longestIncreasingSubsequence(arr)); // Output: 5
    }
}
```

---

5. SQL Query (Second Highest Salary)

Q5: Write an SQL query to find the second-highest salary from an `Employee` table.

Solution (SQL Query):

sql
CopyEdit

```
SELECT MAX(salary) AS SecondHighestSalary
FROM Employee
WHERE salary < (SELECT MAX(salary) FROM Employee);
```

---

6. OOPs (Java - Polymorphism Example)

Q6: Explain method overloading and overriding with Java examples.

Solution (Java Code):

java
CopyEdit

```
// Method Overloading (Compile-time Polymorphism)
class MathOperations {
    int add(int a, int b) {
        return a + b;
    }

    int add(int a, int b, int c) {
        return a + b + c;
    }
}

// Method Overriding (Runtime Polymorphism)
class Parent {
    void show() {
        System.out.println("Parent class method");
    }
}

class Child extends Parent {
    @Override
    void show() {
        System.out.println("Child class method");
    }
}

public class PolymorphismExample {
    public static void main(String[] args) {
        MathOperations obj = new MathOperations();
        System.out.println(obj.add(5, 10)); // Output: 15
        System.out.println(obj.add(5, 10, 20)); // Output: 35

        Parent p = new Child();
        p.show(); // Output: Child class method
    }
}
```

---

7. React.js - Functional vs. Class Component

Q7: Explain the difference between a functional and class component in React.js.

Solution:

- **Functional Component:** Simple function-based component without state.
- **Class Component:** Uses lifecycle methods and `this.state`.

Example:

jsx
CopyEdit

```
// Functional Component
const Greet = () => <h1>Hello, Shivansh!</h1>;

// Class Component
class GreetClass extends React.Component {
  render() {
    return <h1>Hello, Shivansh!</h1>;
  }
}
```

---

8. Spring Boot - REST API Example

Q8: Write a Spring Boot REST API to return a greeting message.

Solution (Java Code using Spring Boot):

java
CopyEdit

```
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

@RestController
@RequestMapping("/api")
public class GreetingController {

    @GetMapping("/greet")
    public String greet() {
        return "Hello, welcome to Spring Boot!";
    }
}
```

---

9. Puzzles (Logical Reasoning)

Q9: A clock shows 3:15. What is the angle between the hour and the minute hands?

Solution:
Angle formula:
Angle=∣(30×Hour−5.5×Minutes)∣\text{Angle} = |(30 × Hour - 5.5 × Minutes)|Angle=∣(30×Hour−5.5×Minutes)∣
=∣(30×3−5.5×15)∣= |(30 × 3 - 5.5 × 15)|=∣(30×3−5.5×15)∣
=∣90−82.5∣=7.5°= |90 - 82.5| = 7.5°=∣90−82.5∣=7.5°

Answer: **7.5°**

---

10. Data Sufficiency

Q10: A train covers 200 km in some hours. What is its speed?

Statements:

1. The train covers 50 km in 1 hour.
2. The time taken is 4 hours.

Solution:
From Statement 1: Speed = 50 km/h
From Statement 2: Speed = Distance/Time = 200/4 = 50 km/h

Answer: **Either statement alone is sufficient.**