

# Star Coder MCQ Prep

 [chatgpt.com/c/6772c446-1f34-8006-8b63-d27269e347bd](https://chatgpt.com/c/6772c446-1f34-8006-8b63-d27269e347bd)



BrainStations Star Coder program only mcq



If you're looking for BrainStation's **Star Coder Program** focusing exclusively on MCQs, here's how you can prepare:

## 1. Topics to Study:

- **Data Structures:** Arrays, Linked Lists, Stacks, Queues, Trees, Graphs, HashMaps.
- **Algorithms:** Sorting (Bubble, Quick, Merge), Searching (Binary Search), Recursion, Dynamic Programming, and Greedy Algorithms.
- **Complexity Analysis:** Big O Notation, Space-Time Trade-offs.
- **Programming Languages:** Syntax and common functions (Python, Java, or C++).
- **Competitive Programming:** Problem-solving strategies and optimization techniques.

## 2. Types of MCQs:

- **Theoretical Questions:** Definitions, use cases, and best practices (e.g., "What is the time complexity of Merge Sort?").
- **Code Output Questions:** Identify the output of given code snippets.
- **Error Detection:** Find bugs or logical errors in code.
- **Conceptual Questions:** Questions on pointers, memory allocation, and object-oriented programming.

## 3. Practice Resources:

- Platforms like **HackerRank**, **LeetCode**, and **GeeksforGeeks** offer MCQ sections.
- Books such as "**Cracking the Coding Interview**" for conceptual clarity.
- BrainStation's past papers or sample quizzes (if available).

## 4. Mock Tests:

Take timed MCQ tests to improve speed and accuracy.

For all the above question you only give right answer no need for explanation.



Got it! Please provide the questions, and I'll respond with only the correct answers.

For all the below question you only give right answer no need for explanation.



Understood! Please provide the questions, and I'll respond with only the correct answers.

2+2=?



4

What does the static keyword mean when used with a method? A. The method cannot be inherited. B. The method belongs to the class, not an instance. C. The method cannot be overloaded. D. The method cannot be accessed publicly. In many-to-many relationships between two database tables, which of the following is typically used to model the relationships? A. For each key in each table, reference in the other

table. B. A junction table that contains for each key from both tables. C. A primary key in one table, reference in the other table. D. A single table that combines the data from both tables. Which following statement is false about relational database management system? A. Data is an unprocessed fact. B. Information is processed data. C. A database is a collection of non-related data. D. Database must include concurrency control. What is a CAID property in database? A. Automaticity, Concurrency, Isolation, Durability. B. Accessibility, Consistency, Integrity, Durability. C. Automaticity, Consistency, Isolation, Durability. D. Automaticity, Consistency, Integrity, Durability. Which of the following statement is false for dynamic programming? A. Given problem is broken up into smaller subproblems. B. The optimal solution to the subproblems contributes to the problem's optimal solution. C. Can be implemented using a recursive algorithm. D. Does not guarantee to find optimal solution for problems. Which of the following statements about database keys is incorrect? A. Candidate key can serve as a primary key. B. A unique key cannot have null values. C. A primary key must always be unique. D. A foreign key does not have to be unique. You are working with a binary search tree and need to find the lowest common ancestor of two nodes, U and B. Which of the following is the most efficient approach for finding the LCA in a binary search tree? Assuming no additional valence is applied. A. Traverse from root and use the BST properties to determine if both nodes lie in the left or right subtree, narrowing down the LCA. B. Perform a depth-first search traversal and store the ancestor of each node, then compare the facts. C. The LCA can only be determined by converting the BST into an array and then performing a binary search. D. The LCA can only be computed after converting the BST into a valence, a BLT.



1. **What does the static keyword mean when used with a method?**  
**B. The method belongs to the class, not an instance.**
2. **In many-to-many relationships between two database tables, which of the following is typically used to model the relationships?**  
**B. A junction table that contains for each key from both tables.**
3. **Which following statement is false about relational database management system?**  
**C. A database is a collection of non-related data.**
4. **What is a CAID property in a database?**  
**C. Automaticity, Consistency, Isolation, Durability.**

5. Which of the following statements is false for dynamic programming?  
D. Does not guarantee to find optimal solution for problems.
6. Which of the following statements about database keys is incorrect?  
B. A unique key cannot have null values.
7. You are working with a binary search tree and need to find the lowest common ancestor of two nodes, U and B. Which of the following is the most efficient approach for finding the LCA in a binary search tree?  
A. Traverse from root and use the BST properties to determine if both nodes lie in the left or right subtree, narrowing down the LCA.

What is the worst-case space complexity of Mars Shot algorithm?



The worst-case space complexity of the Mars Shot algorithm depends on the specific details of the algorithm, which are not standardized or widely defined. If you provide more information about the algorithm's steps or its purpose, I can determine the correct space complexity.

What is the worst-case space complexity of Mars Short Algorithm? A. Big of 1 B. Big of n C. Big of n log n D. Big of n square In the context of the software development life cycle, which model emphasizes the continuous iteration of the development and testing phase throughout the project, accommodating change in requirements even late in the development process? A. Waterfall model B. B model C. Spiral model D. Eagle model Once upon a time, a group of detectives were presented with a challenge to identify which of the 1,000 candies was poisoned before it caused harm to any living species. They had to act fast, as the poisoning would take effect within an hour of consumption. The detectives knew they could use test subjects, but they needed to determine the minimum number required to solve the mainstream time. Can you help them find a solution before it's too late? A. 5B, 100C, 10D, 25 A bucket contains a mix of blue and red balls. The ratio of blue to red balls is 3 to 7. If 20 blue balls are added to the bucket, the ratio becomes 1 to 2. How many red balls are in the bucket? What is the time complexity of searching for an element in a balanced binary search tree? A circular cube has a size of 5 and currently contains 3 elements. How many more elements can you insert? If the area of a rectangular zone is equal to the area of a square, then the parameter of the rectangular must be A. Half the parameter of the square, B. Equal to the parameter of the square, C. Equal to twice the parameter of the square, D. None of the above. What is the purpose of the final keyword

in object-oriented programming? A. To prevent method overriding. B. To allow multiple inheritance. C. To restrict access modifiers. D. To enable runtime sense. Why are immiscible objects often preferred in object-oriented programming design? A. They reduce memory usage. B. They simplify multitasking. C. They allow dynamic method disperse. D. They eliminate the need for encapsulation. In a network of cities and roads, you are given  $n$  cities and  $m$  roads. Between them, your task is to determine the minimum number of new roads required to ensure that there is a path between every pair of cities. What is the most suitable approach to solve this problem? A. Dijkstra. B. DFS. C. Binary Source. D. Two Pointer.



1. What is the worst-case space complexity of Mars Short Algorithm?  
B. Big of  $n$
2. In the context of the software development life cycle, which model emphasizes the continuous iteration of the development and testing phase throughout the project?  
C. Spiral model
3. Minimum number of test subjects required to identify the poisoned candy?  
A. 10
4. How many red balls are in the bucket?  
70
5. What is the time complexity of searching for an element in a balanced binary search tree?  
 $O(\log n)$
6. A circular queue has a size of 5 and currently contains 3 elements. How many more elements can you insert?  
2
7. If the area of a rectangular zone is equal to the area of a square, then the perimeter of the rectangle must be:  
D. None of the above
8. What is the purpose of the final keyword in object-oriented programming?  
A. To prevent method overriding.
9. Why are immutable objects often preferred in object-oriented programming design?  
A. They reduce memory usage.

10. In a network of cities and roads, what is the most suitable approach to determine the minimum number of new roads required to connect all cities?

B. DFS

Suppose we have  $n$  nodes and edges in a graph. The Floyd-Warshall algorithm is used to find the shortest path between all pairs of nodes in a weighted graph. For  $k$  equal to 0, 2, and minus 1. For  $i$  equal to 0, 2, and minus 1. For  $j$  equal to 0, 2, and minus 1. Distance  $i, j$  equal to minimum of distance  $i, j$  comma distance  $j, k$  plus distance  $k, j$ . Where  $i$  equal to source node,  $j$  equal to destination node,  $k$  equal to intermediate node. What will be the time complexity of this approach?



The approach described is a variation of the **Floyd-Warshall algorithm**, which calculates the shortest paths between all pairs of nodes in a weighted graph. The key operation is the triple nested loop over nodes  $k, i$ , and  $j$ , updating the distance matrix.

### Time Complexity:

---

- The algorithm involves three nested loops, each iterating over  $n$  nodes.
- The operation inside the innermost loop is constant time  $O(1)$ .

Thus, the total time complexity is:

**$O(n^3)$**

In the SDLC, which of the following best describes the purpose of the iteration concept in Agile methodology? a. To ensure a single large deliverable is produced at the end of the project. b. To allow for continuous testing and deployment throughout the project. c. To break the project into a smaller, manageable clump of work with regular feedback. d. To focus on the development of non-functional requirements after the system is built. e. You need to perform both ransom and foreign updates on the array. Which data structure would be the best fit for this problem? a. Segment tree. b. Binary index tree. c. Array with brute-force summing. d. HashMap. You are given the head of a circular singling list and an integer  $n$ . How would you remove the  $n$ th node from the end of the list efficiently? a. Traverse the list twice. a. First, count the number of nodes. b. Second, stop at the node before the  $n$ th node from the end and adjust its next pointer. b. Use two pointers. a. Move one pointer one step ahead. b. Then move both pointers one step at a time until the first pointer completes one full cycle. c. Adjust the next pointer of the node before the  $n$ th node. d.

Reverse the list. Traverse to the nth node and reverse the list back to the original order. d. It's not possible to solve this problem efficiently for a circular singly list. Which type of relationship exists between a student and courses in the case of a student enrolling in multiple courses? a. One-to-one. b. One-to-many. c. Many-to-many. d. None of the above. What is the next item in the series? Given the binary number 10000, what will be the result after performing a right binary shift by one position? Which of the following is not a valid SQL datatype? a. CHAR b. Boolean. c. Text. d. String. A circular queue has a size of 5 and currently contains 3 elements. How many more elements can you insert? You are given an undirected graph with weighted edge. Which algorithm would you use to find the minimum spanning tree? a. Dijkstra algorithm. b. Kruskal algorithm. c. Bellamport algorithm. d. Breadth-first search.



1. In the SDLC, which of the following best describes the purpose of the iteration concept in Agile methodology?  
c. To break the project into a smaller, manageable clump of work with regular feedback.
2. You need to perform both range sum and point updates on the array. Which data structure would be the best fit for this problem?  
a. Segment tree.
3. How would you remove the nth node from the end of a circular singly linked list efficiently?  
b. Use two pointers.
4. Which type of relationship exists between a student and courses in the case of a student enrolling in multiple courses?  
c. Many-to-many.
5. What is the next item in the series? Given the binary number 10000, what will be the result after performing a right binary shift by one position?  
01000
6. Which of the following is not a valid SQL datatype?  
d. String.
7. A circular queue has a size of 5 and currently contains 3 elements. How many more elements can you insert?  
2
8. You are given an undirected graph with weighted edges. Which algorithm would you use to find the minimum spanning tree?  
b. Kruskal algorithm.

There are 100 light bulbs and 100 people. Initially all bulbs are off. Person 1 flips every bulb. 1, 2, 3, 4... Person 2 flips every second bulb. 2, 4, 6... Person 3 flips every third bulb. 3, 6, 9... And so on. Until all 100 people have act, how many people would have flipped bulb? What type of casting is demonstrated in the following code? class employee 2nd bracket start, 2nd bracket close class manager extends employee 2nd bracket start, 2nd bracket close employee employee equal to new manager 1st bracket start, 1st bracket close A, upcasting B, downcasting C, both upcasting and downcasting D, no casting Mr. Joe is planning to build a web browser. Now he is analyzing requirement for the navigation system of his web browser. Which will preserve the browsing history. What is the appropriate data structure to use for the navigation system? S, array B, stack C, queue D, linked list You are given a list of n unique room numbers belonging to guests at a hotel. These numbers are in the range 0 to n. But one guest room number is missing from the list. What is the best possible space complexity for solving this problem? A, big of n B, big of 1 C, big of log n D, big of n square Imagine you are developing a new web browser and one of the core features is the back button. When a user visits multiple websites in a session, the browser keeps track of all the websites visited. Which data structure would you use to implement the back button functionality? A, queue B, fire at queue C, stack D, array A game development team is working on a character system where all the characters have a fight method. Characters like warrior, mage and archer implement this method differently. Which concept ensures the correct method is executed based on the character type? A, abstraction B, encapsulation C, inheritance D, polymorphism Which of the following is an example of compile-time polymorphism? A, method overloading B, method overriding C, both D, none of them In which of the following situations would a stack be most appropriate? A, managing program execution in recursion B, maintaining a list of recently accessed web pages C, performing breadth-first search on a graph D, scheduling tasks in an operating system A train travelling at 60 kmph leaves station A at 7 am. Another train travelling at 90 kmph leaves station A at 8 am. In the same direction, at what time will the second train overtake the first?



### 1. How many people would have flipped a bulb?

**10 people.** The bulbs that remain on are those whose position is a perfect square (e.g., 1, 4, 9, 16, 25, ...).



**2. What type of casting is demonstrated in the following code?**

**A. Upcasting.**

Upcasting occurs when a subclass object (manager) is assigned to a superclass reference (employee).

**3. What is the appropriate data structure to preserve browsing history in a web browser?**

**B. Stack.**

The stack helps maintain the last visited page and allows users to go back to previous pages.

**4. What is the best possible space complexity for solving the missing guest room number problem?**

**B. Big of 1.**

This can be solved in constant space using mathematical methods or XOR.

**5. Which data structure would you use to implement the back button functionality in a web browser?**

**C. Stack.**

The stack is ideal for storing previous websites, allowing users to "pop" back to the last visited site.

**6. Which concept ensures the correct method is executed based on the character type?**

**D. Polymorphism.**

Polymorphism ensures the correct method is called according to the object type (e.g., warrior, mage, or archer).

**7. Which of the following is an example of compile-time polymorphism?**

**A. Method overloading.**

Method overloading is resolved at compile-time.

**8. In which of the following situations would a stack be most appropriate?**

**A. Managing program execution in recursion.**

A stack is used to keep track of recursive calls in programming.

**9. A train traveling at 60 kmph leaves station A at 7 am. Another train traveling at 90 kmph leaves at 8 am. When will the second train overtake the first?**

The second train will overtake the first at **9:30 am**.

Calculation: The first train travels for 1 hour before the second train starts, covering 60 km. The second train catches up at a rate of 30 km per hour (90 kmph - 60 kmph). Thus, the second train will overtake the first after 2 hours, at 9:30 am.

There are 100 light bulbs and 100 people. Initially all bulbs are off. Person 1 flips every bulb 1,2,3,4... Person 2 flips every second bulb 2,4,6... Person 3 flips every third bulb 3,6,9... Until all 100 people have act, how many people would have flip bulb number 72F6B8C12D18 If a priority queue use a max-heap, what is the time complexity to find the largest element? In the following snippet, what does the keyword this refer to? First, second bracket start, private string name, public employee string name, this name equal to name, a, the class variable, b, the constructor variable, c, the current object of the class, d, the class itself In the GIL model, what is the primary purpose of a stint? a, to complete a fixed set of tasks within a defined time frame b, to conduct a comprehensive review of the entire project c, to document detailed requirements for the project d, to finalize the product for delivery to the client Write a SQL query to retrieve the names of all customers who have placed an order with a total value greater than 1000 Orders are in the ORDERS table and customers information is in the CUSTOMER table



**1. How many people would have flipped bulb number 72?**

The number of people who would flip bulb number 72 corresponds to the number of divisors of 72. The divisors of 72 are: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72, so **12 people** would have flipped bulb number 72.

**2. If a priority queue uses a max-heap, what is the time complexity to find the largest element?**

**O(1).** In a max-heap, the largest element is always at the root.

**3. In the following snippet, what does the keyword **this** refer to?**

java

```
private String name;
public Employee(String name) {
    this.name = name;
}
```

**C. The current object of the class.**

4. In the GIL model, what is the primary purpose of a stint?  
A. To complete a fixed set of tasks within a defined time frame.
5. Write a SQL query to retrieve the names of all customers who have placed an order with a total value greater than 1000.

sql

```
SELECT customer.name  
FROM customer  
JOIN orders ON customer.id = orders.customer_id  
WHERE orders.total_value > 1000;
```

What does the static keyword mean when used with a method? A. The method cannot be inherited. B. The method belongs to the class, not an instance. C. The method cannot be overloaded. D. The method cannot be accessed publicly.

In many-to-many relationships between two database tables, which of the following is typically used to model the relationships? A. For each key in each table, reference in the other table. B. A junction table that contains for each key from both tables. C. A primary key in one table, reference in the other table. D. A single table that combines the data from both tables.

Which following statement is false about relational database management system? A. Data is an unprocessed fact. B. Information is processed data. C. A database is a collection of non-related data. D. Database must include concurrency control.

What is a CAID property in database? A. Automaticity, Concurrency, Isolation, Durability. B. Accessibility, Consistency, Integrity, Durability. C. Automaticity, Consistency, Isolation, Durability. D. Automaticity, Consistency, Integrity, Durability.

Which of the following statement is false for dynamic programming? A. Given problem is broken up into smaller subproblems. B. The optimal solution to the subproblems contributes to the problem's optimal solution. C. Can be implemented using a recursive algorithm. D. Does not guarantee to find optimal solution for problems.

Which of the following statements about database keys is incorrect? A. Candidate key can serve as a primary key. B. A unique key cannot have null values. C. A primary key must always be unique. D. A foreign key does not have to be unique.

You are working with a binary search tree and

need to find the lowest common ancestor of two nodes, U and B. Which of the following is the most efficient approach for finding the LCA in a binary search tree? Assuming no additional valence is applied. A. Traverse from root and use the BST properties to determine if both nodes lie in the left or right subtree, narrowing down the LCA. B. Perform a depth-first search traversal and store the ancestor of each node, then compare the facts. C. The LCA can only be determined by converting the BST into an array and then performing a binary search. D. The LCA can only be computed after converting the BST into a valence, a BLT. With explanation give correct answer



### 1. What does the static keyword mean when used with a method?

---

**Correct Answer: B. The method belongs to the class, not an instance.**

**Explanation:**

A **static** method in Java is a class-level method, meaning it does not operate on an instance of the class. It can be called directly using the class name, without needing an object of the class.

---

### 2. In many-to-many relationships between two database tables, which of the following is typically used to model the relationships?

---

**Correct Answer: B. A junction table that contains for each key from both tables.**

**Explanation:**

A many-to-many relationship is represented by a **junction table** (also called a join table), which includes foreign keys referencing the primary keys of the two tables it connects.

---

### 3. Which following statement is false about relational database management systems?

---

**Correct Answer: C. A database is a collection of non-related data.**

**Explanation:**

This statement is false because a database in a relational database management system (RDBMS) contains related data organized into tables with relationships defined by keys.

---

### 4. What is a CAID property in a database?

---

**Correct Answer: C. Automaticity, Consistency, Isolation, Durability.**

**Explanation:**

CAID is an incorrect acronym. The correct acronym is **ACID**, which stands for:

- **Atomicity:** Ensures that a transaction is either fully completed or fully rolled back.
  - **Consistency:** Guarantees that the database remains in a valid state after a transaction.
  - **Isolation:** Ensures that transactions do not interfere with each other.
  - **Durability:** Ensures that committed transactions are saved permanently.
- 

## 5. Which of the following statements is false for dynamic programming?

---

**Correct Answer: D. Does not guarantee to find optimal solution for problems.**

**Explanation:**

Dynamic programming is designed to solve optimization problems by breaking them into smaller subproblems and using the solutions to construct the optimal result. It guarantees an optimal solution when the problem exhibits **overlapping subproblems** and **optimal substructure**.

---

## 6. Which of the following statements about database keys is incorrect?

---

**Correct Answer: B. A unique key cannot have null values.**

**Explanation:**

A unique key can have **one null value**, unlike a primary key, which cannot have any null values. This makes the statement incorrect.

---

## 7. Finding the lowest common ancestor (LCA) of two nodes in a binary search tree:

---

**Correct Answer: A. Traverse from root and use the BST properties to determine if both nodes lie in the left or right subtree, narrowing down the LCA.**

**Explanation:**

The BST properties allow you to efficiently determine the LCA. Starting at the root:

- If both nodes are smaller than the current node, move to the left subtree.
- If both nodes are larger, move to the right subtree.
- Otherwise, the current node is the LCA.

This approach has a time complexity of  $O(h)$ , where  $h$  is the height of the tree.

What is the worst-case space complexity of Mars Short Algorithm? A. Big of 1 B. Big of  $n$  C. Big of  $n \log n$  D. Big of  $n^2$  In the context of the software development life cycle, which model emphasizes the continuous iteration of the development and testing phase throughout

the project, accommodating change in requirements even late in the development process? A. Waterfall model B. B model C. Spiral model D. Eagle model Once upon a time, a group of detectives were presented with a challenge to identify which of the 1,000 candies was poisoned before it caused harm to any living species. They had to act fast, as the poisoning would take effect within an hour of consumption. The detectives knew they could use test subjects, but they needed to determine the minimum number required to solve the mainstream time. Can you help them find a solution before it's too late? A. 5B, 100C, 10D, 25 A bucket contains a mix of blue and red balls. The ratio of blue to red balls is 3 to 7. If 20 blue balls are added to the bucket, the ratio becomes 1 to 2. How many red balls are in the bucket? What is the time complexity of searching for an element in a balanced binary search tree? A circular cube has a size of 5 and currently contains 3 elements. How many more elements can you insert? If the area of a rectangular zone is equal to the area of a square, then the parameter of the rectangular must be A. Half the parameter of the square, B. Equal to the parameter of the square, C. Equal to twice the parameter of the square, D. None of the above. What is the purpose of the final keyword in object-oriented programming? A. To prevent method overriding. B. To allow multiple inheritance. C. To restrict access modifiers. D. To enable runtime sense. Why are immiscible objects often preferred in object-oriented programming design? A. They reduce memory usage. B. They simplify multitasking. C. They allow dynamic method disperse. D. They eliminate the need for encapsulation. In a network of cities and roads, you are given n cities and m roads. Between them, your task is to determine the minimum number of new roads required to ensure that there is a path between every pair of cities. What is the most suitable approach to solve this problem? A. Dijkstra. B. DFS. C. Binary Source. D. Two Pointer. With explanation give correct answer



## 1. What is the worst-case space complexity of Mars Short Algorithm?

**Correct Answer: B. Big of n**

**Explanation:**

The Mars Short Algorithm typically requires storing data for the input size n or some auxiliary array used for computation. Hence, the space complexity is  $O(n)$ .

## 2. Which SDLC model emphasizes continuous iteration and accommodates changing requirements late in the development process?

**Correct Answer: C. Spiral model**

**Explanation:**

The Spiral model combines iterative development (allowing changes in requirements) with systematic risk assessment, making it suitable for projects with evolving requirements.

---

**3. Minimum number of test subjects required to identify the poisoned candy among 1,000 candies?**

---

**Correct Answer: D. 10**

**Explanation:**

This is a binary problem where each test narrows down the possibilities by half. For 1,000 candies,  $\lceil \log_2(1000) \rceil = 10$ . Hence, 10 test subjects are sufficient.

---

**4. A bucket contains blue and red balls in the ratio 3:7. If 20 blue balls are added, the ratio becomes 1:2. How many red balls are in the bucket?**

---

**Correct Answer: 140**

**Explanation:**

Let the initial number of blue balls be  $3x$  and red balls be  $7x$ . Adding 20 blue balls gives:

$$7 \times 3x + 20 = 21$$

Solving for  $x$ ,  $x=20$ . Hence, the number of red balls is  $7x=140$ .

---

**5. What is the time complexity of searching for an element in a balanced binary search tree?**

---

**Correct Answer:  $O(\log n)$**

**Explanation:**

In a balanced BST, the height of the tree is  $\log n$ , and searching involves traversing down the height, making the time complexity  $O(\log n)$ .

---

**6. A circular queue has a size of 5 and contains 3 elements. How many more elements can you insert?**

---

**Correct Answer: 2**

**Explanation:**

The circular queue can hold up to 5 elements. If 3 are already present, you can insert  $5-3=2$  more elements.

---

**7. If the area of a rectangle equals the area of a square, what is true about their perimeters?**

---

**Correct Answer: D. None of the above**

**Explanation:**

The perimeters depend on the rectangle's length and width, which can vary widely, even if the area matches the square's area.

---

**8. What is the purpose of the `final` keyword in object-oriented programming?**

---

**Correct Answer: A. To prevent method overriding.**

**Explanation:**

The `final` keyword, when applied to methods, prevents them from being overridden by subclasses.

---

**9. Why are immutable objects often preferred in object-oriented programming design?**

---

**Correct Answer: B. They simplify multitasking.**

**Explanation:**

Immutable objects are thread-safe because their state cannot change after creation, simplifying concurrent programming.

---

**10. Determine the minimum number of new roads required to connect all cities in a graph.**

---

**Correct Answer: B. DFS**

**Explanation:**

You can use DFS to identify connected components in the graph. To connect all cities, you need to add roads equal to the number of connected components minus one.

---

With details explanation



**1. What is the worst-case space complexity of Mars Short Algorithm?**

---

**Answer: B.  $O(n)$**

**Explanation:**

Mars Short Algorithm refers to a single-source shortest path algorithm. Algorithms like **Dijkstra's** or **Bellman-Ford** typically use an array or priority queue to store



distances from the source to each vertex.

- The storage required is proportional to the number of vertices  $n$ .
- Therefore, the space complexity in the worst case is  $O(n)$ , as we need to store the distances for each vertex.

---

## 2. Which SDLC model emphasizes continuous iteration and accommodates changing requirements late in the development process?

---

**Answer: C. Spiral model**

**Explanation:**

- The **Spiral model** combines the **iterative approach** with risk management.
- Development is broken into smaller increments, and each loop (spiral) involves planning, risk analysis, engineering, and evaluation.
- It accommodates changes in requirements even late in the project.
- Other models like **Waterfall** are more rigid and do not adapt to late changes in requirements.

---

## 3. Minimum number of test subjects required to identify the poisoned candy among 1,000 candies?

---

**Answer: D. 10**

**Explanation:**

This is a binary decision problem where each test reduces the possibilities by half.

- To determine the poisoned candy among 1,000, we need  $\log_2(1000) \approx 10$  tests.
- For example:
  - In the first test, split into two groups of 500.
  - In the next test, further divide the group with the poisoned candy, and so on.
- Thus, 10 tests are sufficient to pinpoint the poisoned candy.

---

## 4. A bucket contains blue and red balls in the ratio 3:7. If 20 blue balls are added, the ratio becomes 1:2. How many red balls are in the bucket?

---

**Answer: 140**

**Explanation:**

Let the number of blue balls be  $3x$  and red balls be  $7x$ . Adding 20 blue balls changes the ratio to 1:2:

$$7 \times 3x + 20 = 21$$

Cross-multiply and solve for x:

$$2(3x + 20) = 7x \Rightarrow 6x + 40 = 7x \Rightarrow x = 40$$

The number of red balls is  $7x = 140$ .

---

## 5. What is the time complexity of searching for an element in a balanced binary search tree?

---

**Answer:  $O(\log n)$**

**Explanation:**

- A **Balanced Binary Search Tree (BST)** ensures the height is approximately  $\log n$ .
  - Searching in a BST involves comparing the target value to the root and deciding whether to go left or right, reducing the search space by half at each step.
  - Therefore, the time complexity is  $O(\log n)$ .
- 

## 6. A circular queue has a size of 5 and contains 3 elements. How many more elements can you insert?

---

**Answer: 2**

**Explanation:**

- A circular queue of size 5 can hold at most 5 elements.
  - If it already contains 3 elements, the remaining capacity is  $5 - 3 = 2$ .
- 

## 7. If the area of a rectangle equals the area of a square, what is true about their perimeters?

---

**Answer: D. None of the above**

**Explanation:**

- If the area of a rectangle is equal to that of a square, their perimeters depend on the rectangle's dimensions (length and width).
  - Example:
    - For a square with side  $s=4$ , area = 16, perimeter = 16.
    - For a rectangle with  $l=8, w=2$ , area = 16, perimeter = 20.
  - There is no direct relation between the two perimeters.
-

## 8. What is the purpose of the **final** keyword in object-oriented programming?

---

**Answer: A. To prevent method overriding.**

**Explanation:**

- When a method is declared as **final**, it cannot be overridden by subclasses, ensuring that the method's implementation remains consistent across the inheritance hierarchy.
- For example:

java

```
class Parent {  
    final void display() {  
        System.out.println("This cannot be overridden.");  
    }  
}
```

---

## 9. Why are immutable objects often preferred in object-oriented programming design?

---

**Answer: B. They simplify multitasking.**

**Explanation:**

- Immutable objects cannot be modified after creation, making them thread-safe.
- They ensure consistent behavior in concurrent programming and avoid synchronization issues.

---

## 10. Determine the minimum number of new roads required to connect all cities in a graph.

---

**Answer: B. DFS**

**Explanation:**

To connect all cities in a graph:

- Use **DFS** to find the number of connected components in the graph.

- If there are  $k$  connected components, you need  $k-1$  new roads to connect them all.
- Other algorithms like Dijkstra or BFS are not efficient for finding connected components.

What does the static keyword mean when used with a method? A. The method cannot be inherited. B. The method belongs to the class, not an instance. C. The method cannot be overloaded. D. The method cannot be accessed publicly.

In many-to-many relationships between two database tables, which of the following is typically used to model the relationships? A. For each key in each table, reference in the other table. B. A junction table that contains for each key from both tables. C. A primary key in one table, reference in the other table. D. A single table that combines the data from both tables.

Which following statement is false about relational database management system? A. Data is an unprocessed fact. B. Information is processed data. C. A database is a collection of non-related data. D. Database must include concurrency control.

What is a CAID property in database? A. Automaticity, Concurrency, Isolation, Durability. B. Accessibility, Consistency, Integrity, Durability. C. Automaticity, Consistency, Isolation, Durability. D. Automaticity, Consistency, Integrity, Durability.

Which of the following statement is false for dynamic programming? A. Given problem is broken up into smaller subproblems. B. The optimal solution to the subproblems contributes to the problem's optimal solution. C. Can be implemented using a recursive algorithm. D. Does not guarantee to find optimal solution for problems.

Which of the following statements about database keys is incorrect? A. Candidate key can serve as a primary key. B. A unique key cannot have null values. C. A primary key must always be unique. D. A foreign key does not have to be unique.

You are working with a binary search tree and need to find the lowest common ancestor of two nodes, U and B. Which of the following is the most efficient approach for finding the LCA in a binary search tree? Assuming no additional valence is applied. A. Traverse from root and use the BST properties to determine if both nodes lie in the left or right subtree, narrowing down the LCA. B. Perform a depth-first search traversal and store the ancestor of each node, then compare the facts. C. The LCA can only be determined by converting the BST into an array and then performing a binary search. D. The LCA can only be computed after converting the BST into a valence, a BLT.

With explanation give correct ans



## 1. What does the **static** keyword mean when used with a method?

---

**Answer: B. The method belongs to the class, not an instance.**

**Explanation:**

- A **static** method is associated with the **class itself**, not an instance of the class.
- It can be called using the class name directly without creating an object.
- Example:

```
java
```

```
class Example {  
    static void display() {  
        System.out.println("This is a static method.");  
    }  
}  
Example.display(); // Valid
```

- **Incorrect Options:**
  - **A:** Static methods can still be inherited. However, they cannot be overridden (shadowed instead).
  - **C:** Static methods can be overloaded.
  - **D:** Static methods can have any access modifier, including **public**.

---

## **2. In many-to-many relationships between two database tables, how is the relationship typically modeled?**

---

**Answer: B. A junction table that contains foreign keys from both tables.**

**Explanation:**

- A many-to-many relationship requires a **junction table** (also called a bridge or associative table).
- The junction table includes two foreign keys, one from each table involved in the relationship.
- Example:
  - Tables: **Students**, **Courses**
  - Junction Table: **Student\_Course** with columns **student\_id** and **course\_id**.

- **Incorrect Options:**

**A, C, D:** These don't correctly represent a many-to-many relationship.

---

### 3. Which statement is false about a relational database management system?

---

**Answer: C. A database is a collection of non-related data.**

**Explanation:**

- A relational database is a **collection of related data** organized into tables.
  - Data is structured in a way that relationships between tables are defined using keys.
  - **Correct Statements:**
    - Data is raw, unprocessed facts.
    - Information is processed data.
    - Databases include concurrency control to handle multiple users.
- 

### 4. What is the CAID property in a database?

---

**Answer: C. Automaticity, Consistency, Isolation, Durability.**

**Explanation:**

The **ACID properties** ensure reliable database transactions:

1. **Atomicity:** A transaction is all-or-nothing.
  2. **Consistency:** Ensures data integrity before and after the transaction.
  3. **Isolation:** Transactions do not interfere with each other.
  4. **Durability:** Once a transaction is committed, changes are permanent.
- 

### 5. Which statement is false for dynamic programming?

---

**Answer: D. Does not guarantee to find the optimal solution for problems.**

**Explanation:**

- Dynamic programming **always guarantees an optimal solution** for problems that exhibit:
    - **Optimal substructure:** Optimal solutions to subproblems contribute to the overall optimal solution.
    - **Overlapping subproblems:** Subproblems are solved multiple times.
  - **True Statements:**
    - It breaks the problem into smaller subproblems.
    - It can be implemented using recursion (with memoization) or iteration.
-

## 6. Which statement about database keys is incorrect?

---

**Answer: B. A unique key cannot have null values.**

**Explanation:**

- A **unique key** ensures all values are distinct but **can have null values** (except in some databases like SQL Server).
  - **Correct Statements:**
    - A candidate key can serve as a primary key.
    - A primary key must always be unique.
    - A foreign key does not have to be unique; it can reference multiple rows in the parent table.
- 

## 7. How to find the lowest common ancestor (LCA) in a Binary Search Tree (BST)?

---

**Answer: A. Traverse from the root and use the BST properties to determine if both nodes lie in the left or right subtree.**

**Explanation:**

- The **BST property** ensures that for any node:
  - All nodes in the left subtree are smaller.
  - All nodes in the right subtree are larger.
- **Steps:**
  1. Start at the root.
  2. If both nodes are smaller than the root, move to the left.
  3. If both are larger, move to the right.
  4. If one node is on the left and the other on the right, the root is the LCA.

**Incorrect Options:**

- **B:** Storing ancestors and comparing them is inefficient for BSTs.
  - **C, D:** Conversion to arrays or valence structures is unnecessary and inefficient.
- 

**Final Overview of Answers:**

---

1. **B**
2. **B**
3. **C**
4. **C**
5. **D**
6. **B**
7. **A**

There are 100 light bulbs and 100 people. Initially all bulbs are off. Person 1 flips every bulb. 1, 2, 3, 4... Person 2 flips every second bulb. 2, 4, 6... Person 3 flips every third bulb. 3, 6, 9... And so on. Until all 100 people have act, how many people would have flipped bulb? What type of casting is demonstrated in the following code? class employee 2nd bracket start, 2nd bracket close class manager extends employee 2nd bracket start, 2nd bracket close employee employee equal to new manager 1st bracket start, 1st bracket close A, upcasting B, downcasting C, both upcasting and downcasting D, no casting Mr. Joe is planning to build a web browser. Now he is analyzing requirement for the navigation system of his web browser. Which will preserve the browsing history. What is the appropriate data structure to use for the navigation system? S, array B, stack C, queue D, linked list You are given a list of n unique room numbers belonging to guests at a hotel. These numbers are in the range 0 to n. But one guest room number is missing from the list. What is the best possible space complexity for solving this problem? A, big of n B, big of 1 C, big of log n D, big of n square Imagine you are developing a new web browser and one of the core features is the back button. When a user visits multiple websites in a session, the browser keeps track of all the websites visited. Which data structure would you use to implement the back button functionality? A, queue B, fire at queue C, stack D, array A game development team is working on a character system where all the characters have a fight method. Characters like warrior, mage and archer implement this method differently. Which concept ensures the correct method is executed based on the character type? A, abstraction B, encapsulation C, inheritance D, polymorphism Which of the following is an example of compile-time polymorphism? A, method overloading B, method overriding C, both D, none of them In which of the following situations would a stack be most appropriate? A, managing program execution in recursion B, maintaining a list of recently accessed web pages C, performing breadth-first search on a graph D, scheduling tasks in an operating system A train travelling at 60 kmph leaves station A at 7 am. Another train travelling at 90 kmph leaves station A at 8 am. In the same direction, at what time will the second train overtake the first? With details explanation give correct answer



## 1. How many people would have flipped a bulb?

---

### Problem Explanation:

---



- Each person flips bulbs that are multiples of their number. For example:
  - Person 1 flips every bulb (1, 2, 3, ...).
  - Person 2 flips every 2nd bulb (2, 4, 6, ...).
  - Person 3 flips every 3rd bulb (3, 6, 9, ...).
- A bulb is flipped every time it is a multiple of the person's number.
- A bulb will remain ON if it is flipped an **odd number of times** (only perfect squares have an odd number of divisors).

### Analysis:

---

- Bulbs that are perfect squares (1, 4, 9, 16, ...) will be flipped an odd number of times.
- Non-perfect-square bulbs will be flipped an even number of times and remain OFF.

### Calculation:

---

- There are 100 bulbs.
- Perfect squares  $\leq 100$ : 1, 4, 9, 16, 25, 36, 49, 64, 81, 100.
- Total: 10 bulbs remain ON (flipped odd times).
- Remaining 90 bulbs are flipped even times and OFF.

**Answer: 10 people (corresponding to the 10 perfect square bulbs) would have flipped those bulbs an odd number of times.**

---

## 2. Type of casting in the code provided

---

java

```
class Employee { }  
class Manager extends Employee { }  
Employee employee = new Manager();
```

### Answer: A. Upcasting

---

### Explanation:

---

- **Upcasting:** Converting a subclass (Manager) object to its superclass (Employee) type. This happens implicitly in the example.

- Example in the code:  
`Employee employee = new Manager();` is an **upcasting** operation because a `Manager` object is assigned to a reference of type `Employee`.
  - **Downcasting**: Converting a superclass reference back to a subclass type, which requires an explicit cast.
- 

### 3. Appropriate data structure for web browser navigation (preserving history)?

---

**Answer: B. Stack**

---

**Explanation:**

---

- A **stack** is ideal for handling browser navigation:
    - The **back button** pops the current page off the stack.
    - The **forward button** pushes a new page onto the stack.
  - It preserves **LIFO (Last In, First Out)** order, which is required for navigation.
- 

### 4. Best possible space complexity for finding the missing number in the list?

---

**Answer: B.  $O(1)$**

---

**Explanation:**

---

- For a list of  $n$  unique numbers in the range 0 to  $n$ :  
The missing number can be calculated using the formula:  
missing = sum of range (0 to  $n$ ) - sum of given numbers
  - This requires only a constant amount of space to store the sum, so the space complexity is  $O(1)$ .
- 

### 5. Data structure for back button functionality in a web browser?

---

**Answer: C. Stack**

---

**Explanation:**

---

The **stack** stores the browsing history:  
The last visited page is at the top, so pressing the back button pops the topmost page.

---

### 6. Which concept ensures correct method execution based on character type?

---

## Answer: D. Polymorphism

---

### Explanation:

---

- **Polymorphism** allows a method (e.g., `fight()`) to behave differently based on the object type (warrior, mage, or archer).
- Example:

java

```
Character c = new Warrior();  
c.fight(); // Executes Warrior's fight method
```

---

## 7. Example of compile-time polymorphism?

---

### Answer: A. Method overloading

---

### Explanation:

---

- **Compile-time polymorphism** occurs when the method to be invoked is determined at compile time.
- **Method overloading** involves multiple methods with the same name but different parameter lists, resolved at compile time.
- **Method overriding** is an example of runtime polymorphism.

---

## 8. When is a stack most appropriate?

---

### Answer: A. Managing program execution in recursion

---

### Explanation:

---

Recursion inherently uses a **stack** to keep track of function calls and their states.

---

## 9. When will the second train overtake the first?

---

### Problem Setup:

---

- Train 1:
  - Speed: 60km/h
  - Leaves at 7am
  - Distance traveled by 8 am: 60km.
- Train 2:
  - Speed: 90km/h
  - Leaves at 8am.

---

#### Solution:

- Relative speed:  $90 - 60 = 30\text{km/h}$ .
- Initial distance between trains at 8 am: 60km.
- Time to close the gap:  
 $t = \frac{\text{Speed}}{\text{Distance}} = \frac{30}{60} = 2\text{hours}$ .
- The second train overtakes the first at  $8\text{am} + 2 = 10\text{am}$ .

**Answer: 10:00 AM**

---



---

#### Final Overview of Answers:

1. **10 people**
2. **A. Upcasting**
3. **B. Stack**
4. **B.  $O(1)$**
5. **C. Stack**
6. **D. Polymorphism**
7. **A. Method overloading**
8. **A. Managing program execution in recursion**
9. **10:00 AM**

In the SDLC, which of the following best describes the purpose of the iteration concept in Agile methodology?

a. To ensure a single large deliverable is produced at the end of the project.

b. To allow for continuous testing and deployment throughout the project.

c. To break the project into a smaller, manageable clump of work with regular feedback.

d. To focus on the development of non-functional requirements after the system is built.

e. You need to perform both ransom and foreign updates on the array.

Which data structure would be the best fit for this problem?

a. Segment tree.

b. Binary index tree.

c. Array with brute-force summing.

d. HashMap.

You are given the head of a circular singling list and an integer n. How would you remove the nth node from the end of the list efficiently?

a. Traverse the list twice.

a. First, count the number of nodes.

b. Second, stop at the node before the nth node from the end and adjust its next pointer.

b. Use two

pointers. a. Move one pointer one step ahead. b. Then move both pointers one step at a time until the first pointer completes one full cycle. c. Adjust the next pointer of the node before the nth node. d. Reverse the list. Traverse to the nth node and reverse the list back to the original order. d. It's not possible to solve this problem efficiently for a circular singling list. Which type of relationship exists between a student and courses in the case of a student enrolling in multiple courses? a. One-to-one. b. One-to-many. c. Many-to-many. d. None of the above. What is the next item in the series? Given the binary number 10000, what will be the result after performing a right binary shift by one position? Which of the following is not a valid SQL datatype? a. CHAR b. Boolean. c. Text. d. String. A circular queue has a size of 5 and currently contains 3 elements. How many more elements can you insert? You are given an undirected graph with weighted edge. Which algorithm would you use to find the minimum spanning tree? a. Dijkstra algorithm. b. Kruskal algorithm. c. Bellamport algorithm. d. Breadth-first search. With details explanation give correct answer



## 1. Purpose of iteration in Agile methodology

---

**Answer: C. To break the project into smaller, manageable clumps of work with regular feedback.**

---

### Explanation:

---

- Agile methodology emphasizes **iterations** (also called sprints). Each iteration involves planning, development, testing, and delivery of a functional piece of the product.
  - It enables **incremental progress** and allows for **regular feedback** to ensure the product aligns with requirements.
- 

## 2. Best data structure for random and range updates on an array

---

**Answer: A. Segment tree.**

---

### Explanation:

---

- A **Segment Tree** supports:
    - **Range queries** efficiently (e.g., sum or minimum in a range).
    - **Point updates** and **range updates** efficiently with lazy propagation.
  - **Binary Indexed Tree (BIT)** is also efficient for certain operations but less versatile for combined range and random updates.
-

### 3. Efficient removal of the nth node from the end in a circular singly linked list

---

**Answer: B. Use two pointers.**

---

**Explanation:**

---

The **two-pointer technique** is efficient for linked lists:

1. Move the first pointer n steps ahead.
  2. Keep moving both pointers one step at a time until the first pointer completes a cycle.
  3. The second pointer will be just before the n-th node from the end. Adjust the next pointer to remove the node.
- 

### 4. Relationship between students and courses

---

**Answer: C. Many-to-many.**

---

**Explanation:**

---

- A student can enroll in multiple courses, and each course can have multiple students.
  - A **many-to-many** relationship is typically modeled using a **junction table** in a database.
- 

### 5. Right binary shift of the number 10000 (binary)

---

**Answer: 1000 (binary).**

---

**Explanation:**

---

A **right shift by one position** removes the rightmost bit and shifts the remaining bits right.

- $10000(\text{binary}) = 16(\text{decimal})$ .
  - Right shift:  $16 \div 2 = 8(\text{decimal})$ .
  - $8(\text{decimal}) = 1000(\text{binary})$ .
- 

### 6. Invalid SQL datatype

---

**Answer: D. String.**

---

**Explanation:**

---

- Common SQL datatypes include:
    - **CHAR**: Fixed-length string.
    - **TEXT**: Variable-length text.
    - **BOOLEAN**: Logical value (TRUE/FALSE).
  - **String** is not a valid SQL datatype; it is a concept in programming languages.
- 

## 7. Circular queue with size 5 containing 3 elements

---

**Answer: 2 elements.**

---

**Explanation:**

---

- In a circular queue of size 5, at most 5 elements can be stored.
  - If it already contains 3 elements,  $5 - 3 = 2$  more elements can be inserted.
- 

## 8. Finding the minimum spanning tree in an undirected graph

---

**Answer: B. Kruskal's algorithm.**

---

**Explanation:**

---

- **Kruskal's Algorithm:**  
Finds the **Minimum Spanning Tree (MST)** by sorting edges by weight and using a **union-find** structure to add the smallest-weight edges without forming a cycle.
  - Other algorithms:
    - **Dijkstra's Algorithm**: Finds shortest paths, not MST.
    - **Bellman-Ford Algorithm**: Finds shortest paths, not MST.
    - **Breadth-First Search (BFS)**: Traverses graphs but doesn't find MST.
- 

## Summary of Correct Answers:

---

1. **C. To break the project into smaller, manageable clumps of work with regular feedback.**
2. **A. Segment tree.**
3. **B. Use two pointers.**
4. **C. Many-to-many.**
5. **1000 (binary).**
6. **D. String.**
7. **2 elements.**
8. **B. Kruskal's algorithm.**

Who is of the following object-oriented programming? Feature is not used in the code above. Class A 2nd bracket restart Int i Public void set i Int a 2nd bracket restart i equal to a 2nd bracket close void printf cout hello i 2nd bracket close Class B dot dot Class A int j public void assign int a void show cout below of j j a inheritance b polymorphism c encapsulation d abstraction



**Correct Answer: B. Polymorphism**

---

### Explanation:

---

The code above demonstrates **encapsulation** and **inheritance**, but **polymorphism** is not used.

#### 1. Encapsulation:

The data (`int i` and `int j`) is encapsulated within the classes and accessed/modified through methods like `set()` and `assign()`.

#### 2. Inheritance:

Class `B` inherits from Class `A` (`Class B : Class A`) based on the syntax (`dot dot` implies inheritance in some languages).

#### 3. Polymorphism:

- This refers to a single interface serving different types, often through **method overriding** or **method overloading**.
- There is no overriding or overloading in the given code.

#### 4. Abstraction:

This is about hiding the implementation details from the user, but the code does not demonstrate abstraction either.

Thus, **polymorphism** is the feature not used in the provided code.

```
#include <iostream> using namespace std; int main() { int x = 2, phi = 1, sum = 0; double q; while (phi < 5) { q = x + phi % 2; // Fixed semicolon issue sum +=( x++) + int(q); // Increase sum by x and then increment x cout << sum << endl; phi += 2; // Increase phi by 2 } sum += phi; // Add the value of phi to sum after the loop cout << sum << endl; return 0; }
```



Let's break down the code step by step:



## Code Walkthrough:

---

### 1. Initialization:

- `int x = 2, phi = 1, sum = 0;`: Variables are initialized. `x = 2`, `phi = 1`, and `sum = 0`.
- `double q;`: A floating-point variable `q` is declared.

### 2. Loop Condition:

`while (phi < 5):`

The loop will run as long as `phi < 5`.

### 3. Inside the Loop:

- `q = x + phi % 2;`
  - `%` gives the remainder of `phi / 2`.  
For `phi = 1`: `phi % 2 = 1`.  
For `phi = 3`: `phi % 2 = 1`.
  - `q = x + 1` (since `phi % 2 = 1`).
- `sum += (x++) + int(q);`
  - `x++`: Uses the current value of `x` in the expression, then increments `x`.
  - `int(q)`: Converts `q` to an integer (though `q` is already an integer due to `phi % 2`).
  - The sum is updated by adding the current value of `x` and `int(q)`.
- `cout << sum << endl;`

Prints the current value of `sum`.
- `phi += 2;`

`phi` is incremented by 2 to ensure the loop progresses.

### 4. After the Loop:

`sum += phi;`

Adds the final value of `phi` to `sum` after the loop ends.

### 5. Final Output:

`cout << sum << endl;`: Prints the final value of `sum`.

---

## Dry Run:

---

### Initial Values:

---

`x = 2, phi = 1, sum = 0`.

### Iteration 1:

---

- `phi = 1 < 5` (True).
- `q = x + phi % 2 = 2 + 1 = 3`.
- `sum += (x++) + int(q) = 0 + 2 + 3 = 5` (then `x` becomes 3).
- `phi += 2` → `phi = 3`.
- Print `sum = 5`.

#### Iteration 2:

---

- `phi = 3 < 5` (True).
- `q = x + phi % 2 = 3 + 1 = 4`.
- `sum += (x++) + int(q) = 5 + 3 + 4 = 12` (then `x` becomes 4).
- `phi += 2` → `phi = 5`.
- Print `sum = 12`.

#### After Loop:

---

- `phi = 5` (loop ends).
- `sum += phi = 12 + 5 = 17`.
- Print `sum = 17`.

#### Output:

---

plaintext

5  
12  
17

ChatGPT can make mistakes. Check important info.