# JAVAPROGRAMS

# CSA0963

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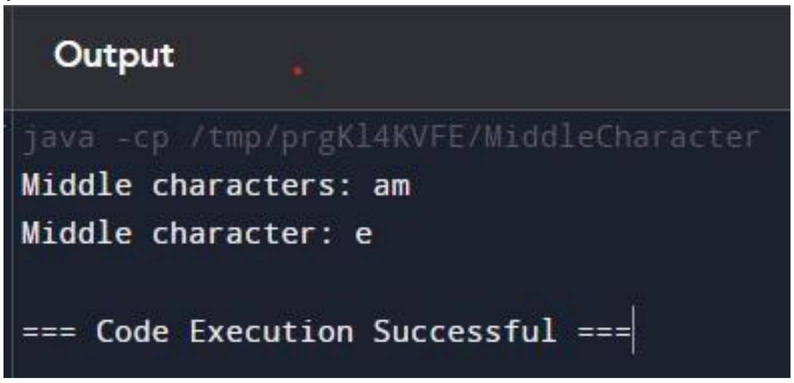
**1.Write a Java method to display the middle character of a string.**

**Note: a) If the length of the string is odd there will be two middle characters.**

**b) If the length of the string is even there will be one middle character.**

```
public class MiddleCharacter {

  public static void displayMiddleCharacter(String str) {
    int length =
    str.length(); if
    (length % 2 == 0)
    {
System.out.println("Middle character: " + str.charAt(length / 2
                                    - 1));
    } else {
       System.out.println("Middle characters: " +
str.charAt(length / 2 - 1) + str.charAt(length / 2));
    }
  }

  public static void main(String[] args) {
    displayMiddleCharacter("example");
    displayMiddleCharacter("test");
  }
}
```

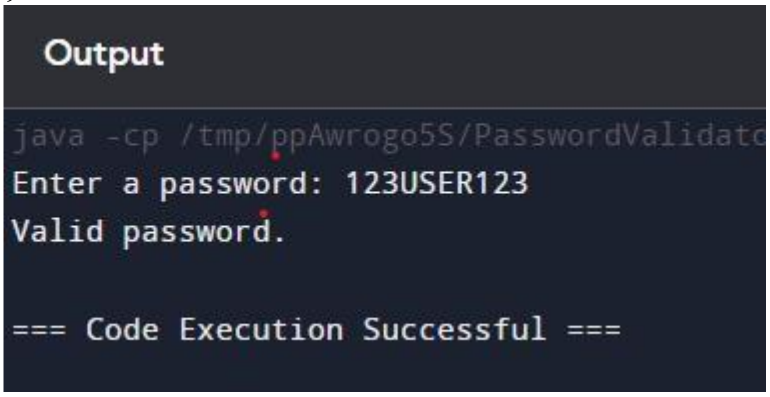


```
Output

java -cp /tmp/prgKl4KVFE/MiddleCharacter
Middle characters: am
Middle character: e

=== Code Execution Successful ===
```

**2. Write a Java method to check whether a string is a valid password.**
**Password rules:**
**A password must have at least ten characters.**
**A password consists of only letters and digits.**
**A password must contain at least two digits.**

```
import java.util.Scanner;

public class

PasswordValidator {

  public static boolean isValidPassword(String password) {
    if (password.length() <
      10) { return false;
    }

    int digitCount = 0;
    for (char c : password.toCharArray()) {
      if
        (!Character.isLetterOrDigit(
        c)) { return false;
      }
```

```
            if (Character.isDigit(c)) {
                digitCount++;
            }
        }

        return digitCount >= 2;
    }

    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a
        password: "); String password =
        scanner.nextLine();

        if (isValidPassword(password)) {
            System.out.println("Valid password.");
        } else {
            System.out.println("Invalid password.");
        }

        scanner.close();
    }
}
```

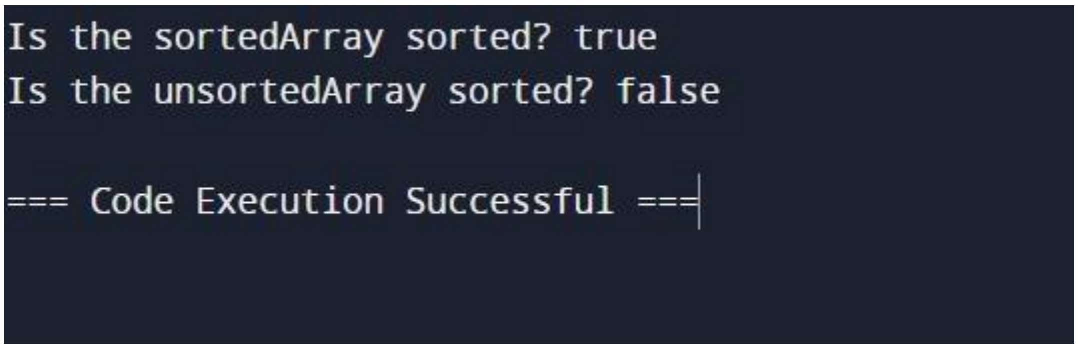


Output

```
java -cp /tmp/ppAwrogo5S/PasswordValidato
Enter a password: 123USER123
Valid password.

=== Code Execution Successful ===
```

**3. Write a Java recursive method to check if a given array is sorted in ascending order.** public class ArrayUtil {
  // Recursive method to check if the array is sorted in ascending order

```
  public static boolean isSorted(int[] array,
    int index) { // Base case: If index is at
    the last element, return true if (index >=
    array.length - 1) {
      return true;
    }
    // Check if the current element is greater than
    the next element if (array[index] > array[index
    + 1]) { return false;
    }
    // Recursive case: Check the next part of the array
    return isSorted(array, index + 1);
  }

  public static void
    main(String[] args) { int[]
    sortedArray = {1, 2, 3, 4,
    5}; int[] unsortedArray =
    {1, 3, 2, 4, 5};

    // Check if the arrays are sorted
    System.out.println("Is the sortedArray sorted? " +
    isSorted(sortedArray, 0));
    System.out.println("Is the unsortedArray sorted? " +
  isSorted(unsortedArray, 0)); }
}
```
**OUTPUT**



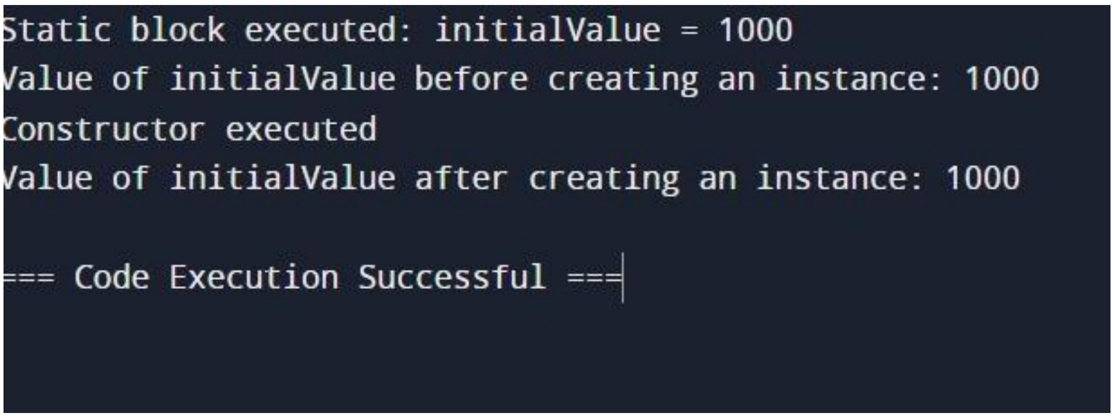
```
Is the sortedArray sorted? true
Is the unsortedArray sorted? false

=== Code Execution Successful ===
```

**4. Write a Java program to create a class called "Initializer" with a static block that initializes a static variable**

**'initialValue' to 1000. Print the value of 'initialValue' before and after creating an instance of "Initializer".**

```
4]public class
  Initializer { //
  Static variable
  static int
  initialValue;

  // Static block to initialize the static
  variable static {
    initialValue = 1000;
    System.out.println("Static block executed: initialValue = " +
    initialValue);
  }

  //  Constructor
  public
  Initializer()    {
  System.out.pri
  ntln("Construc
  tor executed");
  }

  public static void main(String[] args) {
    // Print the value of initialValue before creating an instance
    System.out.println("Value of initialValue before creating an
instance: " + Initializer.initialValue);

    // Create an instance of Initializer
    Initializer obj = new Initializer();

    // Print the value of initialValue after creating an instance
    System.out.println("Value of initialValue after creating an
    instance: " +
Initializer.initialV
  alue); }
}
```

**OUTPUT**



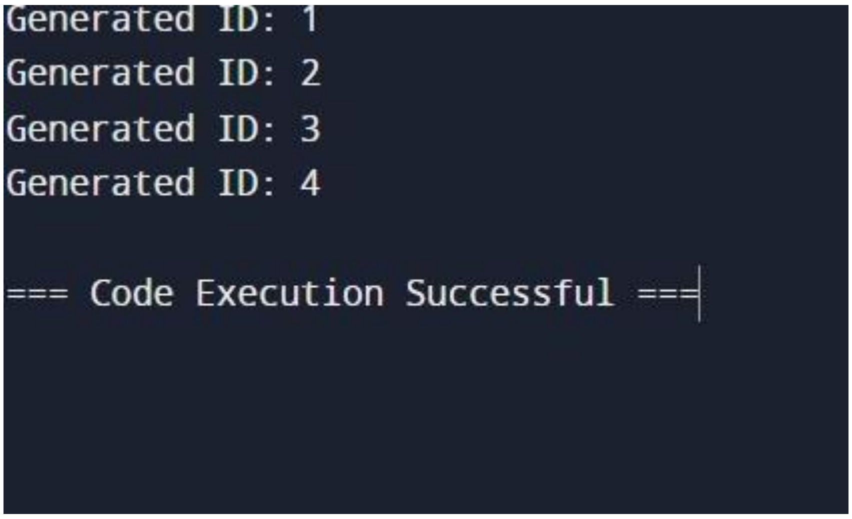
```
Static block executed: initialValue = 1000
Value of initialValue before creating an instance: 1000
Constructor executed
Value of initialValue after creating an instance: 1000

=== Code Execution Successful ===
```

**5. Write a Java program to create a class called "IDGenerator" with a static variable 'nextID' and a static method "generateID()" that returns the next ID and increments 'nextID'. Demonstrate the usage of generateID in the main method.** public class IDGenerator {

```
  // Static variable to keep track of the
  next ID private static int nextID = 1;

  // Static method to generate and return the next ID, and
  increment nextID public static int generateID() {
    return nextID++;
  }

  public static void main(String[] args) {
    // Generating and printing several IDs
    System.out.println("Generated ID: " +
    IDGenerator.generateID()); // Output:
Generated ID: 1
    System.out.println("Generated ID: " +
    IDGenerator.generateID()); // Output:
Generated ID: 2
    System.out.println("Generated ID: " +
    IDGenerator.generateID()); // Output:
Generated ID: 3
    System.out.println("Generated ID: " +
    IDGenerator.generateID()); // Output:
```

```
Generated
   ID: 4 }
}
```

**OUTPUT**



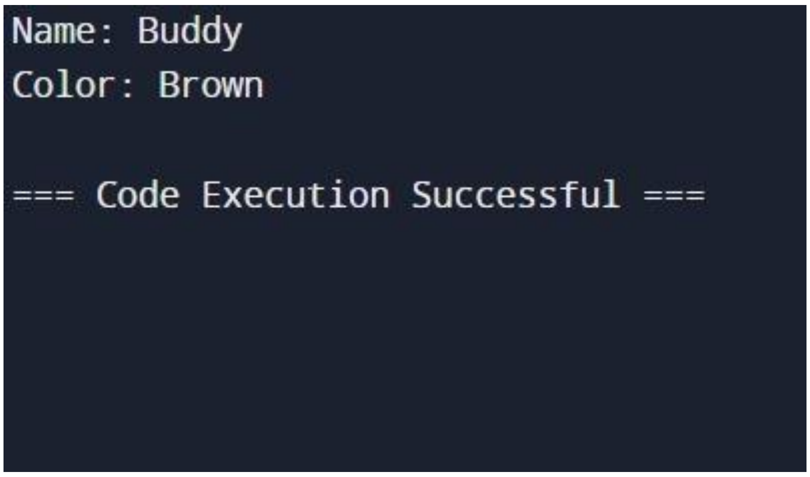
```
Generated ID: 1
Generated ID: 2
Generated ID: 3
Generated ID: 4

=== Code Execution Successful ===
```

**6. Write a Java program to create a class called Dog with instance variables name and color. Implement a parameterized constructor that takes name and color as parameters and initializes the instance variables. Print the values of the variables.**

```
public class Dog {
   // Instance variables
   private String
   name; private
   String color;

   // Parameterized constructor
   public Dog(String name,
   String color) {
      this.name = name;
      this.color = color;
   }

   // Method to print the values of the instance variables
   public void printDogDetails() {
      System.out.println("Name: " + name);
```

```
        System.out.println("Color: " + color);
    }

    public static void main(String[] args) {
        // Creating an object using the parameterized constructor
        Dog myDog = new Dog("Buddy", "Brown");

        // Printing the details of the dog
        myDog.printDogDetails();
    }
}
```

**OUTPUT**



```
Name: Buddy
Color: Brown

=== Code Execution Successful ===
```

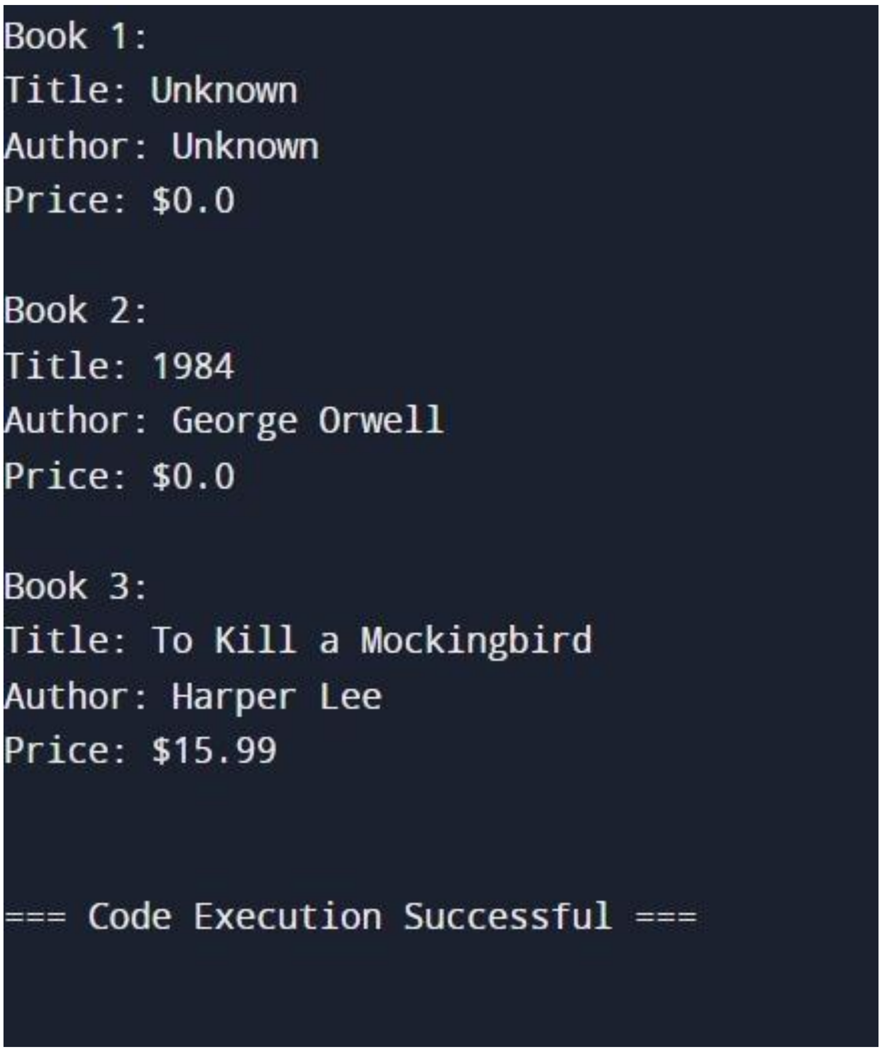
**7. Write a Java program to create a class called "Book" with instance variables title, author, and price. Implement a default constructor and two parameterized constructors: One constructor takes title and author as parameters. The other constructor takes title, author, and price as parameters.**
**Print the values of the variables for each constructor.** public class Book { // Instance variables private String title; private String author; private double price;

```
    // Default
    constructor public
    Book() {
```

```
    this.title = "Unknown";
    this.author =
    "Unknown"; this.price =
    0.0;
  }

  // Parameterized constructor with title and author
  public Book(String title,
    String author) { this.title =
    title; this.author = author;
    this.price = 0.0; // Default
    price
  }

  // Parameterized constructor with title, author, and price
  public Book(String title, String author,
    double price) { this.title = title;
    this.author = author; this.price = price;
  }

  // Method to print the values of the instance
  variables public void printBookDetails() {
  System.out.println("Title: " + title);
    System.out.println("Author: " + author);
    System.out.println("Price: $" + price);
    System.out.println();
  }

  public static void main(String[] args) {
    // Creating objects using different constructors
    Book book1 = new Book(); // Default constructor
    Book book2 = new Book("1984", "George Orwell"); //
Constructor with title and author
    Book book3 = new Book("To Kill a Mockingbird", "Harper
Lee", 15.99); // Constructor with title, author, and price
```

```
        // Printing the details of each book
        System.out.println("Book 1:");
        book1.printBookDetails();

        System.out.println("Book 2:");
        book2.printBookDetails();

        System.out.println("Book 3:");
        book3.printBookDetails();
    }
}
```

**OUTPUT**

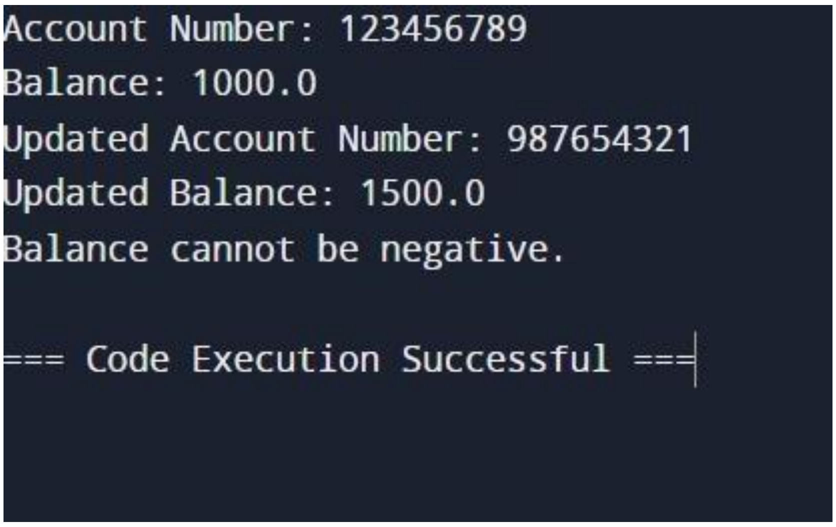


```
Book 1:
Title: Unknown
Author: Unknown
Price: $0.0

Book 2:
Title: 1984
Author: George Orwell
Price: $0.0

Book 3:
Title: To Kill a Mockingbird
Author: Harper Lee
Price: $15.99


=== Code Execution Successful ===
```

**8. Write a Java program to create a class called BankAccount with private instance variables accountNumber and balance. Provide public getter and setter methods to access and modify these variables.** public

```
class BankAccount { // Private instance variables private String
accountNumber; private double balance;

  // Constructor to initialize the account
  public BankAccount(String accountNumber, double
  initialBalance) {
    this.accountNumber =
    accountNumber; this.balance =
    initialBalance;
  }

  // Getter for
  accountNumber public
  String
  getAccountNumber() {
    return accountNumber;
  }

  // Setter for accountNumber
  public void setAccountNumber(String accountNumber) {
    this.accountNumber = accountNumber;
  }

  // Getter for balance
  public double
  getBalance() {
    return balance;
  }

  // Setter for balance
  public void setBalance(double balance) {
    if (balance >= 0) {
      this.balance = balance;
    } else {
      System.out.println("Balance cannot be negative.");
    }
  }
  // Main method to test the
  BankAccount class public static void
  main(String[] args) {
    // Create a BankAccount object
    BankAccount account = new BankAccount("123456789",
    1000.0);

    // Print initial details
    System.out.println("Account Number: " +
    account.getAccountNumber());
    System.out.println("Balance: " + account.getBalance());

    // Modify account details
    account.setAccountNumber("987654321");
    account.setBalance(1500.0);

    // Print updated details
    System.out.println("Updated Account Number: " +
account.getAccountNumber());
    System.out.println("Updated Balance: " +
    account.getBalance());

    // Attempt to set a negative balance
    account.setBalance(-500.0); // This should trigger
  the error message }
}
```

**OUTPUT**

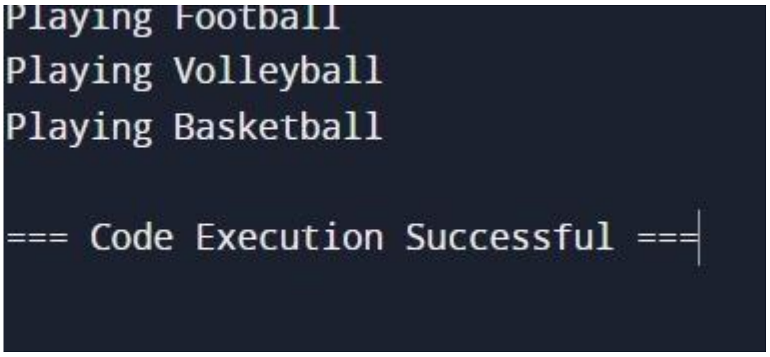


```
Account Number: 123456789
Balance: 1000.0
Updated Account Number: 987654321
Updated Balance: 1500.0
Balance cannot be negative.

=== Code Execution Successful ===
```

**9. Write a Java program to create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports.**

```
// Define the Playable
interface interface Playable {
  void play();
}

// Implement the Playable interface in the
Football class class Football implements
Playable {
  @Override
  public void
  play() {
    System.out.println("Playing Football");
  }
}

// Implement the Playable interface in the
Volleyball class class Volleyball implements
Playable {
  @Override
  public void
  play() {
    System.out.println("Playing Volleyball");
  }
}

// Implement the Playable interface in the
Basketball class class Basketball implements
Playable {
  @Override
  public void
  play() {
    System.out.println("Playing Basketball");
  }
}

// Main class to test the
implementation public class
SportsTest {
  public static void main(String[] args) {
    // Create instances of each sport
    Playable football = new Football();
    Playable volleyball = new Volleyball();
    Playable basketball = new Basketball();

    // Call the play method for each sport
    football.play();
    volleyball.play();
    basketball.play();
  }
}
```

**OUTPUT**



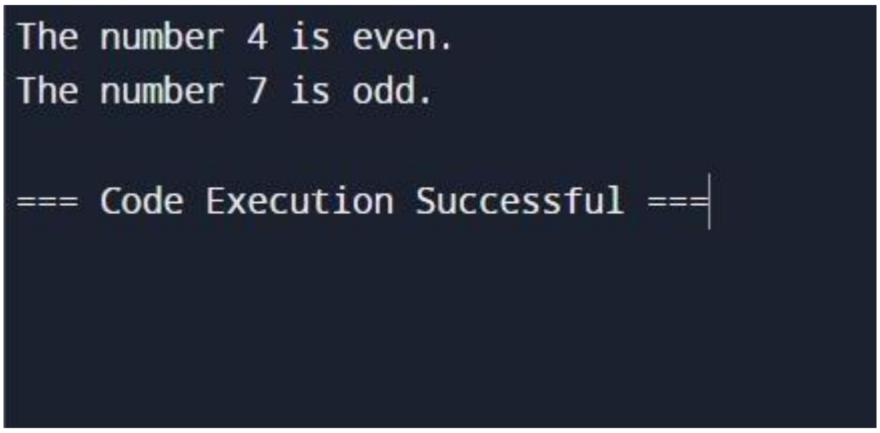
```
Playing Football
Playing Volleyball
Playing Basketball

=== Code Execution Successful ===
```

**10. Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.** public class OddNumberCheck {

```
  public static void main(String[] args) {
    try {
      // Test the method with various
      numbers checkEven(4); // Even
```

```
        number checkEven(7); // Odd
        number checkEven(10); // Even
        number
      } catch (OddNumberException e) {
        System.out.println(e.getMessage());
      }
    }

    // Method to check if the number is even; throws exception if
    odd
    public static void checkEven(int number) throws
    OddNumberException {
      if (number % 2 != 0) {
   throw new OddNumberException("The number " + number
                                                   + " is odd.");
      } else {
        System.out.println("The number " + number
      + " is even."); }
    }
  }

  // Custom exception class for odd
  numbers class
  OddNumberException extends
  Exception { public
  OddNumberException(String
  message) {
      super(message);
    }
  }
```

**OUTPUT**

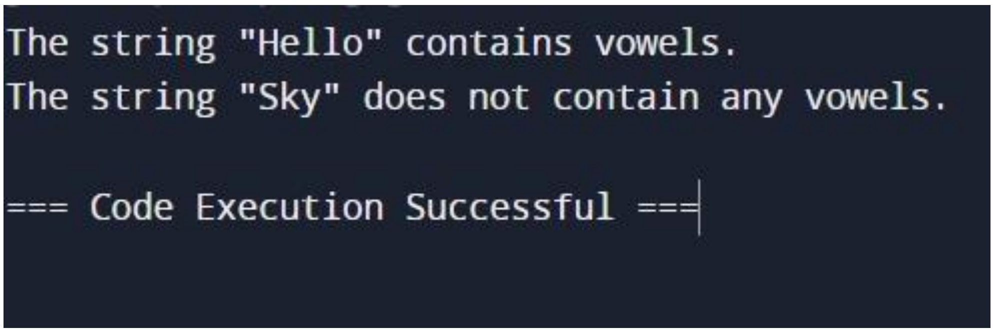


```
The number 4 is even.
The number 7 is odd.

=== Code Execution Successful ===
```

**11.Write a Java program to create a method that takes a string as input and throws an exception if the string does not contain vowels.** public class VowelCheck {

```
  public static void main(String[] args) {
    try {
      // Test the method with various strings
      checkVowels("Hello"); // Contains vowels
      checkVowels("Sky");  // Does not contain
      vowels checkVowels("Rhythm"); // Does not
      contain vowels
    } catch (NoVowelException e) {
      System.out.println(e.getMessage());
    }
  }

  // Method to check if the string contains vowels
  public static void checkVowels(String input) throws
  NoVowelException {
    // Regular expression to match vowels
    (case insensitive) if
    (!input.matches(".[aeiouAEIOU].")) {
    throw new NoVowelException("The string \"" + input + "\"
                                                    does not contain
any vowels.");
    } else {
      System.out.println("The string \"" + input + "\"
    contains vowels."); }
    }
}

// Custom exception class
class NoVowelException extends Exception {
    public NoVowelException(String message) {
        super(message);
    }
}
```

**OUTPUT**



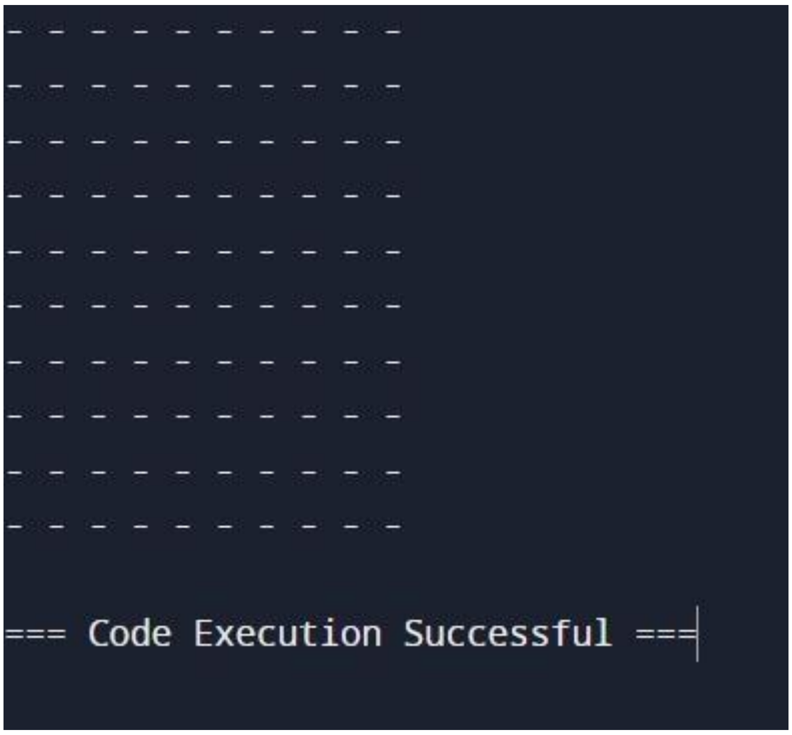
```
The string "Hello" contains vowels.
The string "Sky" does not contain any vowels.

=== Code Execution Successful ===
```

**12. Write a Java program to print the following grid.**
**Expected Output :**

```
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
```

```
public class PrintGrid {
    public static void main(String[] args) {
        // Define the number of rows
        and columns int rows = 10; int
        columns = 10;
    // Loop through each
    row for (int i = 0; i <
    rows; i++) {
      // Loop through each column in the
      current row for (int j = 0; j <
      columns; j++) {
        // Print a dash and a space
        System.out.print("- ");
      }
      // Move to the next line after each row
      System.out.println();
    }
  }
}
```

**OUTPUT**



```
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 
- - - - - - - - - - 


=== Code Execution Successful ===
```

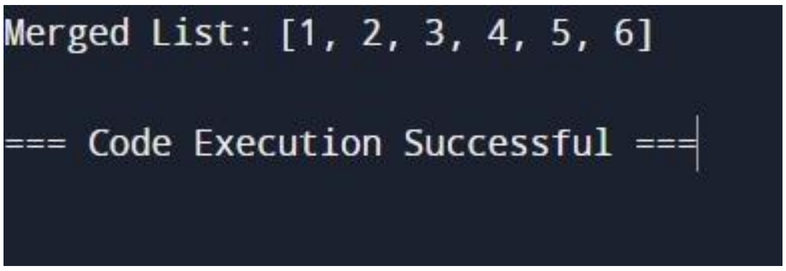
**13. Write a Java program to create a generic method that takes two lists of the same type and merges them into a single list. This method alternates the elements of each list.**

```
import java.util.ArrayList;
```

```
import

java.util.List;

public class

MergeLists {

  public static void main(String[] args) {
    // Create two sample lists
    List<Integer> list1 = new ArrayList<>();
    List<Integer> list2 = new ArrayList<>();

    // Add elements to the first list
    list1.add(1);
    list1.add(3);
    list1.add(5);

    // Add elements to the second list
    list2.add(2);
    list2.add(4);
    list2.add(6);

    // Call the generic merge method
    List<Integer> mergedList = mergeListsAlternating(list1,
    list2);

    // Print the merged list
    System.out.println("Merged List: " +
  mergedList); }
  // Generic method to merge two lists of the same type
    public static <T> List<T> mergeListsAlternating(List<T>
                                              list1, List<T> list2) {
    List<T> mergedList = new ArrayList<>();
    int size1 = list1.size(); int
    size2 = list2.size(); int
```

```
        maxSize = Math.max(size1,
        size2);

        // Alternating elements from
        both lists for (int i = 0; i <
        maxSize; i++) { if (i <
        size1) {
            mergedList.add(list1.get(i));
          } if (i <
          size2) {
            mergedList.add(list2.get(i));
          }
        }

        return mergedList;
    }
}
```

**OUTPUT**



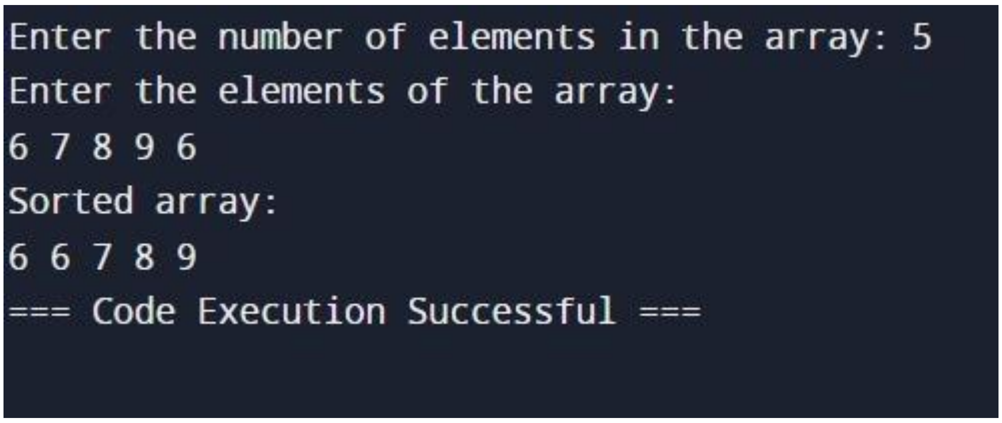
```
Merged List: [1, 2, 3, 4, 5, 6]

=== Code Execution Successful ===
```

**14. Write a Java program to sort an array of given integers using the Selection Sort Algorithm**

```
 import java.util.Scanner;

public class SelectionSortExample {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        // Input array size
        System.out.print("Enter the number of elements
        in the array: "); int n = scanner.nextInt();
        // Initialize the
        array int[] array =
        new int[n];

        // Input array elements
        System.out.println("Enter the elements of the array:");
        for (int i = 0; i < n; i++) {
          array[i] = scanner.nextInt();
        }
        // Perform Selection Sort
        selectionSort(array);

        // Display the sorted array
        System.out.println("Sorted
        array:"); for (int element :
        array) {
          System.out.print(element + " ");
        }

        scanner.close();
      }

    // Selection Sort function
    public static void selectionSort(int[] array) {
        int n = array.length;

        // Traverse through all array
        elements for (int i = 0; i < n -
        1; i++) {
          // Find the minimum element in the
          unsorted part int minIndex = i; for
          (int j = i + 1; j < n; j++) {
            if (array[j] < array[minIndex]) {
              minIndex = j;
            }
          }
```

```
            // Swap the found minimum element with the first element
            int temp =
            array[minIndex];
            array[minIndex] =
            array[i]; array[i] = temp;
        }
    }
}
```

**OUTPUT**



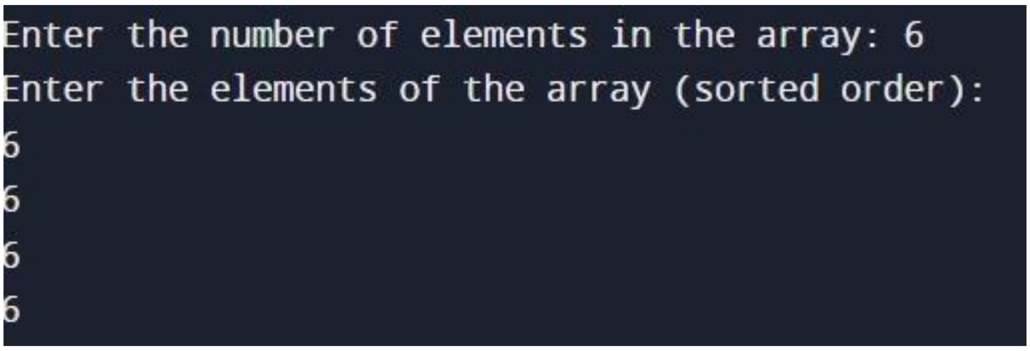
```
Enter the number of elements in the array: 5
Enter the elements of the array:
6 7 8 9 6
Sorted array:
6 6 7 8 9
=== Code Execution Successful ===
```

**15.Write a Java program to find a specified element in a given array of elements using Binary Search.**

```
import
java.util.Arrays;
import
java.util.Scanner;

public class BinarySearchExample {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        // Input array size
        System.out.print("Enter the number of elements
        in the array: "); int n = scanner.nextInt();

        // Initialize the
        array int[] array =
        new int[n];
    // Input array elements
    System.out.println("Enter the elements of the array (sorted
    order):");
    for (int i = 0; i < n; i++) {
      array[i] = scanner.nextInt();
    }

    // Input the element to search for
    System.out.print("Enter the element to
    search for: "); int key = scanner.nextInt();

    // Perform Binary Search
    int result =
    binarySearch(array, key);

    // Display the
    result if (result
    == -1) {
      System.out.println("Element not found in the array.");
    } else {
      System.out.println("Element found at index: " + result);
    }

    scanner.close();
  }

  // Binary Search function
  public static int binarySearch(int[] array, int key) {
    int left = 0; int right
    = array.length - 1;

    while (left <= right) {
      int mid = left + (right - left) / 2;

      // Check if the key is
      present at mid if
      (array[mid] == key) {
        return mid; // Element found, return index
```

```
            }
            // If the key is greater, ignore the left half
            if (array[mid] < key) {
              left = mid + 1;
            }
            // If the key is smaller, ignore the
            right half else {
              right = mid - 1;
            }
          }

          // Element not
          found return -1;
        }
      }
```

**OUTPUT**



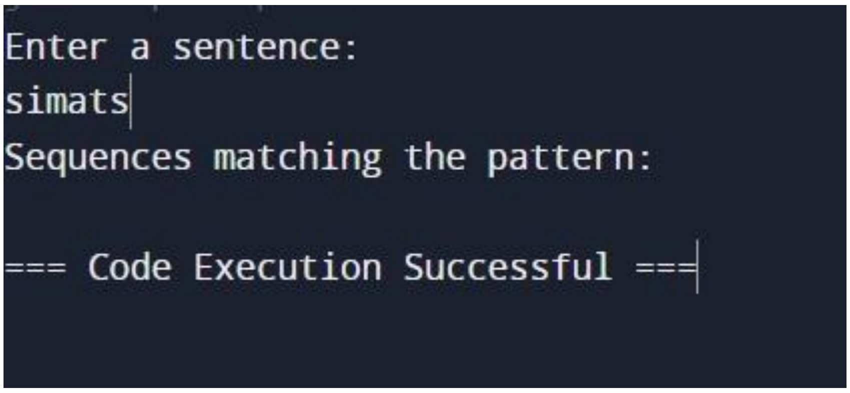
```
Enter the number of elements in the array: 6
Enter the elements of the array (sorted order):
6
6
6
6
```

**16.Write a Java program to find sequences of lowercase letters joined by an underscore.**

```
 import java.util.regex.Matcher;
import
java.util.regex.Pattern;
import java.util.Scanner;

public class LowercaseUnderscoreMatcher {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
```

```
        // Regular expression to match sequences of lowercase
letters joined by an underscore
        String regex = "\\b[a-z]+_[a-z]+\\b";

        // Compile the regular expression
        Pattern pattern = Pattern.compile(regex);

        System.out.println("Enter a
        sentence:"); String input =
        scanner.nextLine();

        // Match the pattern in the input sentence
        Matcher matcher = pattern.matcher(input);

        System.out.println("Sequences matching the pattern:");
        while (matcher.find()) {
            System.out.println(matcher.group());
        }

        scanner.close();
    }
}
```

**OUTPUT**



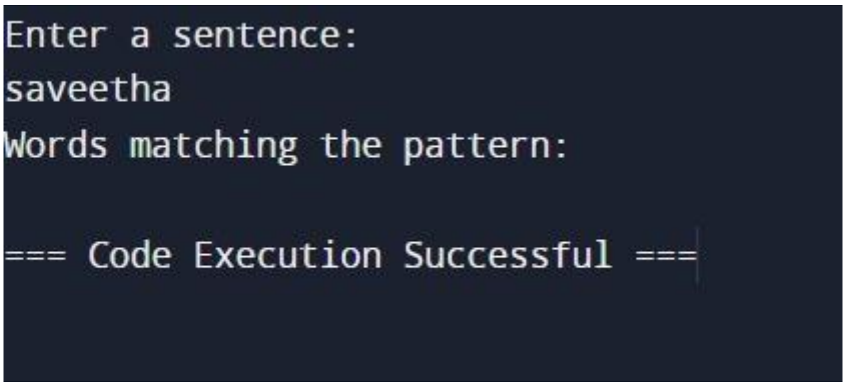
```
Enter a sentence:
simats
Sequences matching the pattern:

=== Code Execution Successful ===
```

**17. Write a Java program that matches a word containing 'g', not at the start or end of the word.**

```
import
java.util.regex.Matcher;
import
```

```
java.util.regex.Pattern;
import java.util.Scanner;

public class WordMatcher {
   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);

      // Regular expression to match a word containing 'g' but not
      at the start or end
      String regex = "\\b[a-fh-zA-FH-Z]g[a-zA-Z]\\b";

      // Compile the regular expression
      Pattern pattern = Pattern.compile(regex);

      System.out.println("Enter a
      sentence:"); String input =
      scanner.nextLine();

      // Match the pattern in the input sentence
      Matcher matcher = pattern.matcher(input);

      System.out.println("Words matching the
      pattern:"); while (matcher.find()) {
         System.out.println(matcher.group());
      }

      scanner.close();
   }
}
```

**OUTPUT**



```
Enter a sentence:
saveetha
Words matching the pattern:

=== Code Execution Successful ===
```