

IMP JAVA Programs for QA/SDET Interview

1.) Java program to Find Odd or Even number

```
import java.util.Scanner;

public class OddEven {
    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter any number: ");
        int number = scanner.nextInt();

        if (number % 2 == 0) {
            System.out.println(number + " is even.");
        } else {
            System.out.println(number + " is odd.");
        }
    }
}
```

2.) Java program to find Prime number

```
import java.util.Scanner;

public class PrimeNumber {

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

        if (isPrime(number)) {
            System.out.println(number + " is a prime number.");
        } else {
            System.out.println(number + " is not a prime number.");
        }
    }

    public static boolean isPrime(int num) {
        for (int i = 2; i <= num / 2; i++) {
            //try each number by using %
            if (num % i == 0) {
                return false;
            }
        }
        return true;
    }
}
```

3.) Java program to find Fibonacci series upto a given number range

```
import java.util.Scanner;

public class PrimeNumber {

    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("enter number of terms");
        int number = 6;
        int first = 0, second = 1, next;
        System.out.println("Fibonacci series is ");
        for ( int i = 0; i<=number; i++)
        {
            System.out.println(first + "");
            next = second+first;
            first = second;
            second = next;
        }
    }
}
```

Output: 0 1 1 2 3 5 8

4.) Java program to swap two numbers without using third variable

```
import java.util.Scanner;

public class SwapNumbers {
    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first number: ");
        int a = 5,
        System.out.print("Enter the second number: ");
        int b = 10;
        System.out.println("Before swapping: a = " + a + ", b = " + b);

        a = a + b;
        b = a - b;
        a = a - b;
        System.out.println("After swapping: a = " + a + ", b = " + b);

    }
}
```

Output: After Swapping: a = 10 , b = 5

5.) Java program to Find Factorial on given Number

```
import java.util.Scanner;

public class FactorialNumber {

    public static void main(String[] args) {
        int factorial =1;
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter any number ");
        int number = 5;

        for (int i = 1; i <= number; i++){
            factorial = factorial * i;
        }
        System.out.println("Factorial number is :" +factorial);
    }
}
```

Input: 5!

Output: 5! = 5*4*3*2*1 = 120

6.) Java program to Reverse Number

```
import java.util.Scanner;

public class ReverseNumber {

    public static void main(String[] args) {
        int no, rev=0,r,a;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter any number : ");
        no = scanner.nextInt();
        a = no;
        while(no>0)
        {
            r = no%10;
            rev = rev*10+r;
            no=no/10;
        }

        System.out.println("Reverse : " +rev);
    }
}
```

Input: 15786

Output: 68751

7.) Java program to find **Armstrong Number**

```
import java.util.Scanner;
public class ArmstrongNumber {

    public static void main(String[] args) {
        int arm=0, a,b,c,d,no;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter any number : ");
        no = scanner.nextInt();
        d = no;
        while (no>0)
        {
            a = no%10;
            no = no/10;
            arm =arm+a*a*a;
        }
        if (arm==d) {
            System.out.println("Armstrong number");
        }
        else{
            System.out.println("Not Armstrong number");
        }
    }
}
```

8.) Java program to find **number of digits** in given number

```
import java.util.Scanner;
public class NumberOfDigits {

    public static void main(String[] args) {
        int no = 0, a = 0;
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter any number : ");
        no = scanner.nextInt();
        if (no<0)
        {
            no = no * -1;
        }
        else if (no==0) {
            no=1;
        }
        while (no>0)
        {
            no=no/10;
            a++;
        }
        System.out.println("Number of digits in given number is : " +a); }
}
```

9.) Java program to find **Palindrome number**

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a number: ");
        int number = scanner.nextInt();

        if (isPalindrome(number)) {
            System.out.println(number + " is a palindrome.");
        } else {
            System.out.println(number + " is not a palindrome.");
        }
    }

    public static boolean isPalindrome(int num) {
        int originalNumber = num;
        int reversedNumber = 0;

        while (num != 0) {
            int digit = num % 10;
            reversedNumber = reversedNumber * 10 + digit;
            num = num / 10;
        }

        return originalNumber == reversedNumber;
    }
}
```

Enter a number: 1001

1001 is a palindrome.

10.) Java program to calculate the sum of digits of a number

```
public class Main {
    public static void main(String[] args) {
        int number = 12345;

        int sumOfDigits = calculateSumOfDigits(number);

        System.out.println("Sum of digits of " + number + " is: " +
sumOfDigits);
    }

    public static int calculateSumOfDigits(int number) {
        int sum = 0;
        while (number > 0) {
            int digit = number % 10; // Extract the last digit
            sum = sum + digit; // Add the digit to sum
            number = number / 10; // Remove the last digit from number
        }
        return sum;
    }
}
```

Output:

Sum of digits of 12345 is: 15

Strings

1.) Java program to reverse a string

```
import java.util.Scanner;
public class Test {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = scanner.nextLine();
        char ch;
        String nstr = "";
        for (int i = 0; i < input.length(); i++) {
            ch = input.charAt(i);
            nstr = ch + nstr;
        }
        System.out.println("Reversed String is : " + nstr);
    }
}
```

2.) Java program to reverse each word of a given string

```
public static void main(String[] args) {
    reverseEachWordOfString("Java is good programming langauges");
}

static void reverseEachWordOfString(String inputString)
{
    String[] words = inputString.split(" ");

    String reverseString = "";
    for (int i = 0; i < words.length; i++) {
        String word = words[i];
        String nstr = "";
        char ch;
        for (int j = 0; j < word.length(); j++) {
            ch = word.charAt(j);
            nstr = ch + nstr;
        }
        reverseString = reverseString + nstr + " ";
    }

    System.out.println(inputString);
    System.out.println(reverseString);
}
```

Input: Java is good programming langauges

Output: avaJ si doog gnimmargorp seguagnal

3.) Java program to find duplicate characters in a string

```
import java.util.HashMap;
import java.util.Set;

public class Main {

    public static void main(String[] args) {
        duplicateCharacterCount("Learn Java Programming");
    }

    static void duplicateCharacterCount(String inputString) {

        HashMap<Character, Integer> charCountMap = new HashMap<>();
        char[] strArray = inputString.toCharArray();
        for (char c : strArray) {
            if (charCountMap.containsKey(c)) {
                charCountMap.put(c, charCountMap.get(c) + 1);
            } else {
                charCountMap.put(c, 1);
            }
        }

        Set<Character> charsInString = charCountMap.keySet();
        System.out.println("Duplicate Characters in : " + inputString);

        for (Character ch : charsInString) {
            if (charCountMap.get(ch) > 1) {
                System.out.println(ch + " : " + charCountMap.get(ch));
            }
        }
    }
}
```

Duplicate Characters in : Learn Java Programming

a : 4

g : 2

m : 2

n : 2

r : 3

4.) Java program to count Occurrences of Each Character in String

```
import java.util.HashMap;

public class Main {

    public static void main(String[] args) {
        CharacterCount("Test Automation Java Automation");
    }

    static void CharacterCount(String inputString) {
        HashMap<String,Integer> charCountMap = new HashMap<>();
        for(String s : inputString.split(" "))
        {
            if(charCountMap.containsKey(s))
            {
                charCountMap.put(s, charCountMap.get(s)+1);
            }
            else
            {
                charCountMap.put(s,1);
            }
        }
        System.out.println("Count of Characters in a given string : " +
            charCountMap);
    }
}
```

Count of Characters in a given string : {Java=1, Automation=2, Test=1}

5.) Java program to count the number of words in a string

```
public class Main {
    public static void main(String[] args) {
        System.out.println("Enter the String");
        Scanner sc = new Scanner(System.in);
        String s = sc.nextLine();
        int count = 1;

        for (int i = 0; i < s.length() - 1; i++) {
            if ((s.charAt(i) == ' ') && (s.charAt(i + 1) != ' ')) {
                count++;
            }
        }
        System.out.println("Number of words in a string: " +count);    }
}
```

Enter the String: Welcome to Java World
Number of words in a string: 4

6.) Java program to find all permutations of a given string

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        String str = "abc";
        permute(str, "");
    }

    static void permute(String str, String prefix) {
        if (str.length() == 0) {
            System.out.println(prefix);
        } else {
            for (int i = 0; i < str.length(); i++) {
                String rem = str.substring(0,i) + str.substring(i+1);
                permute(rem,prefix + str.charAt(i));
            }
        }
    }
}
```

abc

acb

bac

bca

cab

cba

7.) Java program to find if a string is Palindrome

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        String str = "madam";
        System.out.println(isPalindrome(str));
    }

    static boolean isPalindrome(String str) {
        int start = 0;
        int end = str.length() - 1;

        while (start < end) {
            if (str.charAt(start) != str.charAt(end)) {
                return false;
            }
            start++;
            end--;
        }
        return true;
    }
}
```

8.) Java program to determine if Two Strings are Anagrams

```
public class Main {

    public static void main(String[] args) {
        String str1 = "listen";
        String str2 = "silent";
        System.out.println(areAnagrams(str1, str2));
    }

    static boolean areAnagrams(String str1, String str2) {
        if(str1.length() != str2.length())
        {
            return false;
        }

        int[] charCount = new int[256];
        for( int i = 0; i < str1.length(); i++)
        {
            charCount[str1.charAt(i)]++;
            charCount[str2.charAt(i)]--;
        }

        for ( int count : charCount)
        {
            if ( count !=0 )
            {
                return false;
            }
        }
        return true;
    }
}
```

9.) Java program to Count Vowels and Consonants in a given string

```
public class Main {
    public static void main(String[] args) {
        String str = "Hello World";
        VowelConsonantCount(str);
    }

    static void VowelConsonantCount(String str) {
        int vowels = 0, consonants = 0;
        str = str.toLowerCase();
        for (char c : str.toCharArray()) {
            if (c >= 'a' && c <= 'z') {
                if (c == 'a' || c == 'e' || c == 'i' || c == 'o' || c == 'u')
                {
                    vowels++;
                } else {
                    consonants++;
                }
            }
        }
        System.out.println("Vowels : " + vowels);
        System.out.println("Consonants : " + consonants);
    }
}
```

Vowels : 3

Consonants : 7

10.) Java program to print unique characters

```
import java.util.Scanner;

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

        System.out.println("Unique characters in \"" + input + "\":");
        printUniqueCharacters(input);
    }

    public static void printUniqueCharacters(String str) {
        // Assume ASCII characters (0-127), use boolean array to track
        character occurrences
        boolean[] unique = new boolean[128];

        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
            if (!unique[ch]) {
                unique[ch] = true;
                System.out.print(ch + " ");
            }
        }
    }
}
```

Enter a string: **Java Automation**

Unique characters in "Java Automation":

J a v A u t o m i n

11.) Java program to print even indexed characters

```
import java.util.Scanner;

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

        System.out.println("Even indexed characters in \"" + input + "\"");
        printEvenIndexedCharacters(input);
    }

    public static void printEvenIndexedCharacters(String str) {
        for (int i = 0; i < str.length(); i++) {
            if (i % 2 == 0) {
                System.out.print(str.charAt(i));
            }
        }
    }
}
```

Enter a string: Automation

Even indexed characters in "Automation":

Atmto

12.) Java program to remove space from a given string

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string with spaces: ");
        String input = scanner.nextLine();

        String stringWithoutSpaces = removeSpaces(input);
        System.out.println("String without spaces: " +
stringWithoutSpaces);
    }

    public static String removeSpaces(String str) {
        StringBuilder result = new StringBuilder();
        for (int i = 0; i < str.length(); i++) {
            if (str.charAt(i) != ' ') {
                result.append(str.charAt(i));
            }
        }
        return result.toString();
    }
}
```

```
Enter a string with spaces: Welcome to Java World
String without spaces: WelcometoJavaWorld
```


13.) Java program to print each letter twice from a given string

```
import java.util.Scanner;

public class Main {

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = scanner.nextLine();

        String doubledString = doubleCharacters(input);
        System.out.println("Doubled characters: " + doubledString);
    }

    public static String doubleCharacters(String str) {

        StringBuilder doubled = new StringBuilder();
        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
            doubled.append(ch).append(ch); // Append each character
        }
        return doubled.toString();
    }
}
```

```
Enter a string: hello
Doubled characters: hheelllloo
```

14.) Java program to swap two string without using 3rd variable

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter first string: ");
        String str1 = scanner.nextLine();
        System.out.print("Enter second string: ");
        String str2 = scanner.nextLine();

        System.out.println("Before swapping: str1 = " + str1 + ",
str2 = " + str2);

        // Swapping without using a third variable
        str1 = str1 + str2; // Concatenate str1 and str2 and
store in str1
        str2 = str1.substring(0, str1.length() - str2.length());
        // Extract the initial part (original str1) from the concatenated
string
        str1 = str1.substring(str2.length()); // Extract the
remaining part (original str2) from the concatenated string

        System.out.println("After swapping: str1 = " + str1 + ",
str2 = " + str2);
    }
}
```

Enter first string: Hello

Enter second string: World

Before swapping: str1 = **Hello**, str2 = **World**

After swapping: str1 = **World**, str2 = **Hello**

15.) Java program to gives Output: a2b2c3d2 for the Input String Str = "aabbccdd"

```
import java.util.Scanner;

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

        String output = getCharacterCount(input);
        System.out.println("Output: " + output);
    }

    public static String getCharacterCount(String str) {
        StringBuilder result = new StringBuilder();
        int count = 1;

        for (int i = 0; i < str.length(); i++) {
            // If the next character is the same, increase the count
            if (i + 1 < str.length() && str.charAt(i) == str.charAt(i
+ 1)) {
                count++;
            } else {
                // Append the character and its count to the result
                result.append(str.charAt(i)).append(count);
                count = 1; // Reset the count
            }
        }

        return result.toString();
    }
}
```

Enter a string: aabbccdd

Output: a2b2c3d2

16.) Java program to gives two Output: “abcde”, “ABCDE” for the Input String Str = “aBACbcEDed”

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = scanner.nextLine();
        System.out.println("Original String is: "+ input);
        separateCharacters(input);
    }

    public static void separateCharacters(String input)
    {
        StringBuilder lowerCase = new StringBuilder();
        StringBuilder upperCase = new StringBuilder();

        for(char ch : input.toCharArray())
        {
            if(Character.isLowerCase(ch))
            {
                lowerCase.append(ch);
            }
            else
            {
                upperCase.append(ch);
            }
        }
        System.out.println("Output in lowercase: "+lowerCase);
        System.out.println("Output in uppercase "+upperCase);
    }
}
```

Enter a string: **aBACbcEDed**

Output in lowercase: abcde

Output in uppercase: ABCDE

17.) Java program to gives two Output: “Subburaj”, “123” for the Input String Str = “Subbu123raj”

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = scanner.nextLine();
        System.out.println("Original String is: "+ input);
        separateAlphaAndNumeric(input);
    }

    public static void separateAlphaAndNumeric(String input)
    {
        StringBuilder alphaPart = new StringBuilder();
        StringBuilder numericPart = new StringBuilder();

        for(char ch : input.toCharArray())
        {
            if(Character.isLetter(ch))
            {
                alphaPart.append(ch);
            }
            else if (Character.isDigit(ch))
            {
                numericPart.append(ch);
            }
        }

        System.out.println("Output in Alpha: "+alphaPart.toString());
        System.out.println("Output in Numeric: "+numericPart.toString());
    }
}
```

Enter a string: **Subbu123raj**

Output in lowercase: Subburaj

Output in uppercase: 123

18.) Java program to gives Output: "32412120000" for the Input String Str = "32400121200"

```
public class Main {  
    public static void main(String[] args) {  
        String input = "32400121200";  
        String output = rearrangeDigits(input);  
        System.out.println("Output: " + output);  
    }  
  
    public static String rearrangeDigits(String input) {  
        // Split the input into parts: digits and non-digits  
        StringBuilder digits = new StringBuilder();  
        StringBuilder nonDigits = new StringBuilder();  
  
        for (char c : input.toCharArray()) {  
            if (Character.isDigit(c)) {  
                digits.append(c);  
            } else {  
                nonDigits.append(c);  
            }  
        }  
  
        // Concatenate non-digits followed by digits  
        return digits.toString() + nonDigits.toString();  
    }  
}
```

Output: 32412120000

19.) Java program to gives Output: "00003241212" for the Input String Str = "32400121200"

```
public class Main {  
    public static void main(String[] args) {  
        String input = "32400121200";  
        String formattedOutput = String.format("%011d",  
Long.parseLong(input));  
        System.out.println("Formatted output: " + formattedOutput);  
    }  
}
```

Formatted output: 00003241212

20.) Java program to find the longest without repeating characters

```
import java.util.HashSet;

public class Main {
    public static void main(String[] args) {
        String s1 = "abcabcbb"; // Expected: "abc", length 3
        String s2 = "bbbbbb";   // Expected: "b", length 1
        String s3 = "pwwkew";   // Expected: "wke", length 3
        String s4 = "";         // Expected: "", length 0

        System.out.println("Longest substring without repeating
characters in s1: " + lengthOfLongestSubstring(s1)); // Output: 3
        System.out.println("Longest substring without repeating
characters in s2: " + lengthOfLongestSubstring(s2)); // Output: 1
        System.out.println("Longest substring without repeating
characters in s3: " + lengthOfLongestSubstring(s3)); // Output: 3
        System.out.println("Longest substring without repeating
characters in s4: " + lengthOfLongestSubstring(s4)); // Output: 0
    }

    public static int lengthOfLongestSubstring(String s) {
        HashSet<Character> set = new HashSet<>();
        int maxLength = 0;
        int start = 0;
        int end = 0;

        while (end < s.length()) {
            char currentChar = s.charAt(end);
            if (!set.contains(currentChar)) {
                set.add(currentChar);
                maxLength = Math.max(maxLength, end - start + 1);
                end++;
            } else {
                set.remove(s.charAt(start));
                start++;
            }
        }

        return maxLength;
    }
}
```

Arrays

1.) Find **common elements** between two arrays

```
import java.util.HashSet;
import java.util.Set;

public class CommonElements {
    public static void main(String[] args) {
        int[] array1 = {1, 2, 3, 4, 5};
        int[] array2 = {4, 5, 6, 7, 8};

        Set<Integer> commonElements = findCommonElements(array1,
array2);

        System.out.println("Common elements: " + commonElements);
    }

    public static Set<Integer> findCommonElements(int[] array1,
int[] array2) {
        Set<Integer> set1 = new HashSet<>();
        Set<Integer> commonSet = new HashSet<>();

        // Add elements of the first array to the set
        for (int num : array1) {
            set1.add(num);
        }

        // Check for common elements in the second array
        for (int num : array2) {
            if (set1.contains(num)) {
                commonSet.add(num);
            }
        }

        return commonSet;
    }
}
```

**Input: array1 = {1,2,3,4,5} and
array2 = {4,5,6,7,8}**

Output: Common elements: [4, 5]

2.) Find first and last element of ArrayList

```
import java.util.ArrayList;

public class Main {
    public static void main(String[] args) {
        ArrayList<String> arrayList = new ArrayList<>();
        arrayList.add("Apple");
        arrayList.add("Banana");
        arrayList.add("Cherry");
        arrayList.add("Date");
        arrayList.add("Elderberry");

        if (!arrayList.isEmpty()) {
            String firstElement = arrayList.get(0);
            String lastElement = arrayList.get(arrayList.size() - 1);

            System.out.println("First element: " + firstElement);
            System.out.println("Last element: " + lastElement);
        } else {
            System.out.println("The ArrayList is empty.");
        }
    }
}
```

Output:

First element: Apple

Last element: Elderberry

3.) Sort an array without using in-built method

```
public class Main {  
    public static void main(String[] args) {  
        int[] array = {5, 2, 9, 1, 6};  
  
        selectionSort(array);  
  
        System.out.println("Sorted array:");  
        for (int num : array) {  
            System.out.print(num + " ");  
        }  
    }  
  
    public static void selectionSort(int[] array) {  
        int n = array.length;  
        for (int i = 0; i < n - 1; i++) {  
            int minIndex = i;  
            for (int j = i + 1; j < n; j++) {  
                if (array[j] < array[minIndex]) {  
                    minIndex = j;  
                }  
            }  
  
            // Swap array[i] and array[minIndex]  
            int temp = array[i];  
            array[i] = array[minIndex];  
            array[minIndex] = temp;  
        }  
    }  
}
```

Output:

Sorted array:

1 2 5 6 9

4.) Remove duplicates from an Array

```
import java.util.HashSet;
import java.util.Set;

public class Main {
    public static void main(String[] args) {
        int[] array = {5, 2, 9, 1, 6, 2, 5};

        int[] uniqueArray = removeDuplicates(array);

        System.out.println("Array with duplicates removed:");
        for (int num : uniqueArray) {
            System.out.print(num + " ");
        }
    }

    public static int[] removeDuplicates(int[] array) {
        Set<Integer> set = new HashSet<>();
        for (int num : array) {
            set.add(num);
        }

        int[] result = new int[set.size()];
        int i = 0;
        for (int num : set) {
            result[i++] = num;
        }

        return result;
    }
}
```

Output:

Array with duplicates removed:

1 2 5 6 9

5.) Remove duplicates from an ArrayList

```
import java.util.ArrayList;
import java.util.HashSet;
import java.util.Set;

public class Main {
    public static void main(String[] args) {
        ArrayList<Integer> arrayList = new ArrayList<>();
        arrayList.add(5);
        arrayList.add(2);
        arrayList.add(9);
        arrayList.add(1);
        arrayList.add(6);
        arrayList.add(2);
        arrayList.add(5);

        ArrayList<Integer> uniqueList =
removeDuplicates(arrayList);

        System.out.println("ArrayList with duplicates
removed:");
        for (int num : uniqueList) {
            System.out.print(num + " ");
        }
    }

    public static ArrayList<Integer>
removeDuplicates(ArrayList<Integer> list) {
        Set<Integer> set = new HashSet<>(list);
        return new ArrayList<>(set);
    }
}
```

Output:

ArrayList with duplicates removed:

1 2 5 6 9

6.) Find the missing number in an Array

```
public class Main {
    public static void main(String[] args) {
        int[] array = {1, 2, 4, 5, 6}; // Missing number is 3
        int missingNumber = findMissingNumber(array);
        System.out.println("The missing number is: " + missingNumber);
    }

    public static int findMissingNumber(int[] array) {
        int n = array.length + 1; // Since one number is missing, the length
should be n+1
        int totalSum = n * (n + 1) / 2; // Sum of first n natural numbers

        int arraySum = 0;
        for (int num : array) {
            arraySum += num;
        }
        return totalSum - arraySum;
    }
}
```

Output:

The missing number is: 3

7.) Find the largest and smallest element in an Array

```
public class Main {  
    public static void main(String[] args) {  
        int[] array = {5, 2, 9, 1, 6, 3};  
  
        int[] result = findLargestAndSmallest(array);  
  
        System.out.println("Smallest element: " + result[0]);  
        System.out.println("Largest element: " + result[1]);  
    }  
  
    public static int[] findLargestAndSmallest(int[] array) {  
        if (array == null || array.length == 0) {  
            throw new IllegalArgumentException("Array must not be null or  
empty");  
        }  
  
        int smallest = array[0];  
        int largest = array[0];  
  
        for (int num : array) {  
            if (num < smallest) {  
                smallest = num;  
            }  
            if (num > largest) {  
                largest = num;  
            }  
        }  
        return new int[]{smallest, largest};  
    }  
}
```

Output:

Smallest element: 1

Largest element: 9

8.) Search element in an Array

```
public class Main {
    public static void main(String[] args) {
        int[] array = {5, 2, 9, 1, 6, 3};
        int target = 6;

        int index = linearSearch(array, target);

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

    public static int linearSearch(int[] array, int target) {
        for (int i = 0; i < array.length; i++) {
            if (array[i] == target) {
                return i; // Element found, return index
            }
        }
        return -1; // Element not found
    }
}
```

Output:

Element 6 found at index: 4

Element 10 not found in the array

9.) Array consists of integers and special characters, sum only integers

```
public class Main {  
    public static void main(String[] args) {  
        String[] array = {"5", "2", "9", "a", "1", "6", "#", "3"};  
  
        int sum = sumIntegers(array);  
  
        System.out.println("Sum of integers in the array: " + sum);  
    }  
  
    public static int sumIntegers(String[] array) {  
        int sum = 0;  
        for (String element : array) {  
            try {  
                int num = Integer.parseInt(element);  
                sum += num;  
            } catch (NumberFormatException e) {  
                // Ignore non-integer elements  
            }  
        }  
        return sum;  
    }  
}
```

Output:

Sum of integers in the array: 26

10.) Find Minimum and Maximum from an Array

```
public class Main {
    public static void main(String[] args) {
        int[] array = {5, 2, 9, 1, 6, 3};

        // Find maximum and minimum
        int max = findMaximum(array);
        int min = findMinimum(array);

        // Print the results
        System.out.println("Minimum value in the array: " + min);
        System.out.println("Maximum value in the array: " + max);
    }

    public static int findMaximum(int[] array) {
        if (array.length == 0) {
            throw new IllegalArgumentException("Array must not be empty");
        }
        int max = array[0]; // Initialize max to the first element
        for (int i = 1; i < array.length; i++) {
            if (array[i] > max) {
                max = array[i]; // Update max if current element is larger
            }
        }
        return max;
    }

    public static int findMinimum(int[] array) {
        if (array.length == 0) {
            throw new IllegalArgumentException("Array must not be empty");
        }
        int min = array[0]; // Initialize min to the first element
        for (int i = 1; i < array.length; i++) {
            if (array[i] < min) {
                min = array[i]; // Update min if current element is smaller
            }
        }
        return min;
    }
}
```

Output:

Minimum value in the array: 1

Maximum value in the array: 9

11.) Java program to count Odd and Even number from given array

Input: {1,2,3,4,5,6,7,8,9}

```
public class Main {
    public static void main(String[] args) {
        int[] array = {1, 2, 3, 4, 5, 6, 7, 8, 9};

        int[] count = countOddAndEven(array);

        System.out.println("Even numbers count: " + count[1]);
        System.out.println("Odd numbers count: " + count[0]);
    }

    public static int[] countOddAndEven(int[] array) {
        int[] count = new int[2]; // Index 0 for odd count, Index 1 for
even count

        for (int num : array) {
            if (num % 2 == 0) {
                count[1]++; // Increment even count
            } else {
                count[0]++; // Increment odd count
            }
        }
        return count;
    }
}
```

Output:

Even numbers count: 4

Odd numbers count: 5

12.) Java program – input array was given [1,1,2,2,3,4,5,5,6,6], Output – [3,4]

```
import java.util.HashMap;
import java.util.Map;
import java.util.ArrayList;
import java.util.List;

public class Main {
    public static void main(String[] args) {
        int[] array = {1, 1, 2, 2, 3, 4, 5, 5, 6, 6};
        List<Integer> result = findNonRepeatedElements(array);
        System.out.println("Non-repeated elements: " + result);
    }

    public static List<Integer> findNonRepeatedElements(int[]
array) {

        // Step 1: Count occurrences of each element using a
        HashMap
        Map<Integer, Integer> countMap = new HashMap<>();
        for (int num : array) {
            countMap.put(num, countMap.getOrDefault(num, 0) + 1);
        }

        // Step 2: Identify elements with count equal to 1 (non-
        repeated)
        List<Integer> nonRepeatedElements = new ArrayList<>();
        for (Map.Entry<Integer, Integer> entry :
countMap.entrySet()) {
            if (entry.getValue() == 1) {
                nonRepeatedElements.add(entry.getKey());
            }
        }
        return nonRepeatedElements;
    }
}
```

Output :

Non-repeated elements: [3, 4]

Java program to implement **hashCode** and **equals**

```
import java.util.Objects;

public class Student {
    private int id;
    private String name;

    // Constructor
    public Student(int id, String name) {
        this.id = id;
        this.name = name;
    }

    // Getters and setters (omitted for brevity)

    // hashCode method
    @Override
    public int hashCode() {
        return Objects.hash(id, name);
    }

    // equals method
    @Override
    public boolean equals(Object obj) {
        if (this == obj)
            return true;
        if (obj == null || getClass() != obj.getClass())
            return false;
        Student student = (Student) obj;
        return id == student.id && Objects.equals(name, student.name);
    }

    public static void main(String[] args) {
        // Creating objects of Student class
        Student student1 = new Student(1, "Alice");
        Student student2 = new Student(2, "Bob");
        Student student3 = new Student(1, "Alice");

        // Testing equals method
        System.out.println("student1.equals(student2): " +
student1.equals(student2)); // Output: false
        System.out.println("student1.equals(student3): " +
student1.equals(student3)); // Output: true

        // Testing hashCode method
        System.out.println("HashCode of student1: " + student1.hashCode());
        System.out.println("HashCode of student2: " + student2.hashCode());
        System.out.println("HashCode of student3: " + student3.hashCode());
    }
}
```