

# TSD ASSIGNMENT

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**Number of Programs Completed :** 25

**Uploaded on (GitHub / Google Drive):** GITHUB

**Link to Repository / Folder:** <https://github.com/Ajinkya7890/JAVA-TSD-23011026-ajinkya>

**1. Develop a Java program to take user input for name and age and display a welcome message.**

```
// Program01

import java.util.Scanner;

public class Program01{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter your name: ");

        String name = sc.nextLine();

        System.out.print("Enter your age: ");

        int age = sc.nextInt();

        System.out.println("Welcome, "+name+"! You are "+age+" years old.");

        // Example: Enter name=Alice, age=20 => "Welcome, Alice! You are 20 years old."

        sc.close();

        sc.close();

    }

}
```

**Output:**

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program01.java } ; if ($?) {
java Program01 }
● Enter your name: Ajinkya
Enter your age: 20
Welcome, Ajinkya! You are 20 years old.
○ PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

## 2. \*Write a Java program that takes two numbers and performs basic arithmetic operations (+, -, , /).

// Program02.java

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

```
public class Program02{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter first number: ");
```

```
        double a = sc.nextDouble();
```

```
        System.out.print("Enter second number: ");
```

```
        double b = sc.nextDouble();
```

```
        System.out.print("Enter operation (+ - * /): ");
```

```
        char op = sc.next().charAt(0);
```

```
        double res = 0;
```

```
        boolean valid = true;
```

```
        switch(op){
```

```
            case '+': res = a + b; break;
```

```
            case '-': res = a - b; break;
```

```
            case '*': res = a * b; break;
```

```
            case '/':
```

```
                if(b==0){ System.out.println("Cannot divide by zero."); valid=false; }
```

```
                else res = a / b;
```

```
                break;
```

```
            default: System.out.println("Invalid operator."); valid=false;
```

```
        }
```

```

        if(valid) System.out.println("Result: "+res);

        sc.close();

    }

}

```

## OUTPUT :

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program02.j
ava } ; if ($?) { java Program02 }
● Enter first number: 21
Enter second number: 26
Enter operation (+ - * /): /
Result: 0.8076923076923077
● PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program02.j
ava } ; if ($?) { java Program02 }
Enter first number: 23
Enter second number: 45
Enter operation (+ - * /): +
Result: 68.0
● PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program02.j
ava } ; if ($?) { java Program02 }
Enter first number: 45
Enter second number: 67
Enter operation (+ - * /): -
Result: -22.0
● PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program02.j
ava } ; if ($?) { java Program02 }
Enter first number: 87
Enter second number: 34
Enter operation (+ - * /): *
Result: 2958.0
○ PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> █

```

## 3. Create a program to convert temperature from Fahrenheit to Celsius

```
// Program03.java
```

```
// Input: Fahrenheit value
```

```
// Output: Celsius value (C = (F-32)*5/9)
```

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

```
public class Program03_FtoC{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```

        System.out.print("Enter temperature in Fahrenheit: ");

        double f = sc.nextDouble();

        double c = (f - 32) * 5.0/9.0;

        System.out.printf("Temperature in Celsius: %.2f%n", c);

        sc.close();
    }
}

```

### Output:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program03_FtoC.java } ; if ($?) { java Program03_FtoC }
Enter temperature in Fahrenheit: 104
Temperature in Celsius: 40.00
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

### 4. Design a Java application to calculate simple interest using the formula: $SI = (P \times R \times T) / 100$ .

// Program04\_SimpleInterest.java

// Input: principal P, rate R, time T (years)

// Output: Simple Interest  $SI = (P \times R \times T) / 100$

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

```
public class Program04_SimpleInterest{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Principal (P): "); double P = sc.nextDouble();
```

```
        System.out.print("Rate (R %): "); double R = sc.nextDouble();
```

```
        System.out.print("Time (T years): "); double T = sc.nextDouble();
```

```

double SI = (P*R*T)/100.0;

System.out.printf("Simple Interest = %.2f%n", SI);

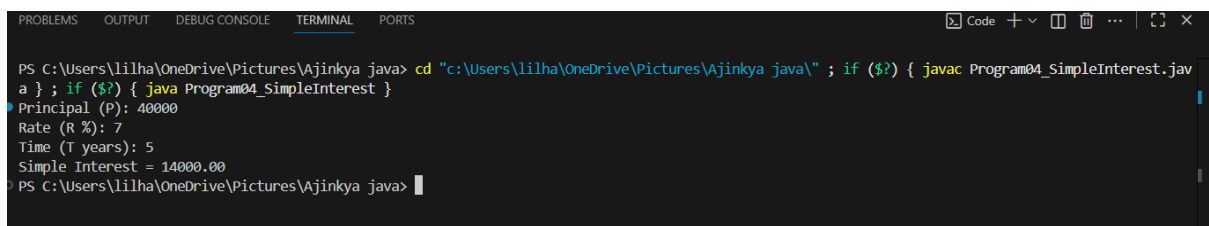
sc.close();

}

}

```

### Output:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java" ; if ($?) { javac Program04_SimpleInterest.java } ; if ($?) { java Program04_SimpleInterest }
Principal (P): 40000
Rate (R %): 7
Time (T years): 5
Simple Interest = 14000.00
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

### 5. Write a Java program to determine whether a given year is a leap year.

```
// Program05_LeapYear.java
```

```
// Input: year (int)
```

```
// Output: whether it's a leap year
```

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

```
public class Program05_LeapYear{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter year: "); int y = sc.nextInt();
```

```
        boolean leap = (y%4==0 && y%100!=0) || (y%400==0);
```

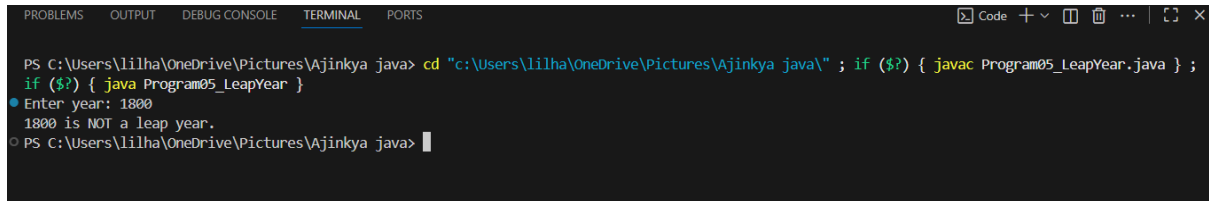
```
        System.out.println(y + (leap ? " is a leap year." : " is NOT a leap year."));
```

```
        sc.close();
```

```
    }
```

```
}
```

## OUTPUT:



```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program05_LeapYear.java } ;
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> Enter year: 1800
1800 is NOT a leap year.
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```

## 6. Develop a program to check whether an input number is prime or not using for loop..

```
// Program06_PrimeCheck.java
```

```
// Input: integer n
```

```
// Output: whether n is prime
```

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

```
public class Program06_PrimeCheck{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter number: "); int n = sc.nextInt();
```

```
        boolean prime = true;
```

```
        if(n<=1) prime=false;
```

```
        for(int i=2;i*i<=n && prime;i++){
```

```
            if(n%i==0) prime=false;
```

```
        }
```

```
        System.out.println(n + (prime ? " is prime." : " is not prime."));
```

```
        sc.close();
```

```
    }
```

```
}
```

## Output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program06_PrimeCheck.java }
; if ($?) { java Program06_PrimeCheck }
Enter number: 37
37 is prime.
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> |
```

## 7. Write a program to reverse a number using a while loop.

```
// Program07_ReverseNumber.java

// Input: integer n

// Output: reversed number

import java.util.Scanner;

public class Program07_ReverseNumber{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter integer: "); int n = sc.nextInt();

        int rev = 0;

        int original = n;

        while(n!=0){

            rev = rev*10 + n%10;

            n /= 10;

        }

        System.out.println("Reversed: "+rev); // example 123 -> 321

        sc.close();

    }

}
```

**OUTPUT:**

```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\"
} ; if ($?) { java Program07_ReverseNumber }
● Enter integer: 465
Reversed: 564
○ PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> |
```

8. Create a Java application to generate Fibonacci series up to a given number using do-while loop..

// Program08\_FibonacciDoWhile.java

import java.util.Scanner;

public class Program08\_FibonacciDoWhile{

public static void main(String[] args){

Scanner sc = new Scanner(System.in);

System.out.print("Enter number of terms: "); int terms = sc.nextInt();

int a=0, b=1, count=0;

if(terms<=0){ System.out.println("No terms."); sc.close(); return; }

do{

System.out.print(a + (count<terms-1 ? " " : ""));

int next = a + b; a = b; b = next;

count++;

} while(count<terms);

System.out.println();

sc.close();

}

}

**OUTPUT:**

```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program08_Fibonacci.java ; java Program08_FibonacciDowhile }
Enter number of terms: 5
0 1 1 2 3
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> |
```

## 9. Design a recursive program to compute the factorial of a number using function

// Program09\_FactorialRecursive.java

// Input: n (non-negative int)

// Output: n! computed recursively

import java.util.Scanner;

public class Program09\_FactorialRecursive{

    public static long factorial(int n){

        if(n<=1) return 1;

        return n \* factorial(n-1);

    }

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter n: "); int n = sc.nextInt();

        if(n<0) System.out.println("Negative not allowed.");

        else System.out.println(n+"! = "+factorial(n));

        sc.close();

    }

}

**Output:**

```
PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program
.java } ; if ($?) { java Program09_FactorialRecursive }
Enter n: 6
6! = 720
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```

10. Implement a program to check whether a given number is an Armstrong number.

// Program10\_Armstrong.java

// Input: integer n

// Output: whether n is an Armstrong number (for the number of digits)

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

```
public class Program10_Armstrong{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter number: "); int n = sc.nextInt();
```

```
        int original = n, sum = 0;
```

```
        int digits = String.valueOf(Math.abs(n)).length();
```

```
        while(n!=0){
```

```
            int d = Math.abs(n%10);
```

```
            sum += Math.pow(d, digits);
```

```
            n /= 10;
```

```
        }
```

```
        System.out.println(original + (sum==original ? " is Armstrong." : " is NOT
Armstrong."));
```

```
        sc.close();
```

```
    }
```

```
}
```

Output:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { java
if ($?) { java Program10_Armstrong }
Enter number: 121
121 is NOT Armstrong.
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

## 11. Write a Java program to find the largest and smallest number in an array

```

// Program11_MinMaxArray.java

// Input: size and array elements

// Output: largest and smallest element

import java.util.Scanner;

public class Program11_MinMaxArray{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter array size: "); int n = sc.nextInt();

        if(n<=0){ System.out.println("Empty array."); sc.close(); return; }

        int[] arr = new int[n];

        System.out.println("Enter elements:");

        for(int i=0;i<n;i++) arr[i]=sc.nextInt();

        int min=arr[0], max=arr[0];

        for(int v:arr){ if(v<min)min=v; if(v>max)max=v; }

        System.out.println("Min="+min+" Max="+max);

        sc.close();

    }

}

```

OUTPUT:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { j
; if ($?) { java Program11_MinMaxArray }
Enter array size: 5
Enter elements:
1 2 3 4 5
Min=1 Max=5
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

**12. Develop a program to sort an array using bubble sort algorithm.**

```
// Program12_BubbleSort.java
// Input: array size and elements
// Output: sorted array using bubble sort
import java.util.Scanner;

public class Program12_BubbleSort{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter size: "); int n = sc.nextInt();

        int[] a = new int[n];

        System.out.println("Enter elements:");

        for(int i=0;i<n;i++) a[i]=sc.nextInt();

        for(int i=0;i<n-1;i++){

            for(int j=0;j<n-1-i;j++){

                if(a[j]>a[j+1]){

                    int t=a[j]; a[j]=a[j+1]; a[j+1]=t;

                }

            }

        }

        System.out.print("Sorted: ");

        for(int v:a) System.out.print(v+" ");

        System.out.println();

        sc.close();

    }

}
```

**12. Develop a program to sort an array using bubble sort algorithm.**

```
// Program12_BubbleSort.java
// Input: array size and elements
```

```
// Output: sorted array using bubble sort

import java.util.Scanner;

public class Program12_BubbleSort{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter size: "); int n = sc.nextInt();

        int[] a = new int[n];

        System.out.println("Enter elements:");

        for(int i=0;i<n;i++) a[i]=sc.nextInt();

        for(int i=0;i<n-1;i++){

            for(int j=0;j<n-1-i;j++){

                if(a[j]>a[j+1]){

                    int t=a[j]; a[j]=a[j+1]; a[j+1]=t;

                }

            }

        }

        System.out.print("Sorted: ");

        for(int v:a) System.out.print(v+" ");

        System.out.println();

        sc.close();

    }

}
```

Output:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program12_BubbleSort.java ; if ($?) { java Program12_BubbleSort }
Enter size: 10
Enter elements:
5 7 1 2 4 9 0 4 8 2
Sorted: 0 1 2 2 4 4 5 7 8 9
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

13. Implement linear search to find an element in an array.

```
// Program13_LinearSearch.java
```

```
// Input: array and search key
```

```
// Output: index or not found
```

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

```
public class Program13_LinearSearch{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter size: "); int n = sc.nextInt();
```

```
        int[] a = new int[n];
```

```
        System.out.println("Enter elements:");
```

```
        for(int i=0;i<n;i++) a[i]=sc.nextInt();
```

```
        System.out.print("Enter key to search: "); int key = sc.nextInt();
```

```
        int idx = -1;
```

```
        for(int i=0;i<n;i++) if(a[i]==key){ idx=i; break; }
```

```
        if(idx>=0) System.out.println("Found at index "+idx);
```

```
        else System.out.println("Not found.");
```

```
        sc.close();
```

```
    }
```

```
}
```

Output:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) {
} ; if ($?) { java Program13_LinearSearch }
Enter size: 6
Enter elements:
4 3 9 8 7 0
Enter key to search: 7
Found at index 4
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

14. Implement binary search to find an element in an array.

// Program14\_BinarySearch.java

// Input: sorted array and key

// Output: index or not found (iterative)

import java.util.Scanner;

import java.util.Arrays;

public class Program14\_BinarySearch{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter number of elements: "); int n = sc.nextInt();

        int[] a = new int[n];

        System.out.println("Enter elements (unsorted OK, we'll sort):");

        for(int i=0;i<n;i++) a[i]=sc.nextInt();

        Arrays.sort(a);

        System.out.print("Enter key: "); int key = sc.nextInt();

        int l=0, r=n-1, idx=-1;

        while(l<=r){

            int m = l + (r-l)/2;

            if(a[m]==key){ idx=m; break; }

            else if(a[m]<key) l = m+1;

            else r = m-1;

        }

        if(idx>=0) System.out.println("Found at index "+idx+" in sorted array.");

        else System.out.println("Not found.");

```

        sc.close();
    }
}

```

Output:

```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
● PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { java
} ; if ($?) { java Program14_BinarySearch }
Enter number of elements: 6
Enter elements (unsorted OK, we'll sort):
4 6 7 8 9 1
Enter key: 7
Found at index 3 in sorted array.
○ PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

15. Write a Java program to perform matrix addition using for loop

```
// Program15_MatrixAddition.java
```

```
// Input: dimensions (r,c) and two matrices
```

```
// Output: sum matrix
```

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

```
public class Program15_MatrixAddition{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Rows: "); int r = sc.nextInt();
```

```
        System.out.print("Cols: "); int c = sc.nextInt();
```

```
        int[][] A = new int[r][c], B = new int[r][c];
```

```
        System.out.println("Enter matrix A:");
```

```
        for(int i=0;i<r;i++) for(int j=0;j<c;j++) A[i][j]=sc.nextInt();
```

```
        System.out.println("Enter matrix B:");
```

```
        for(int i=0;i<r;i++) for(int j=0;j<c;j++) B[i][j]=sc.nextInt();
```

```
        int[][] S = new int[r][c];
```

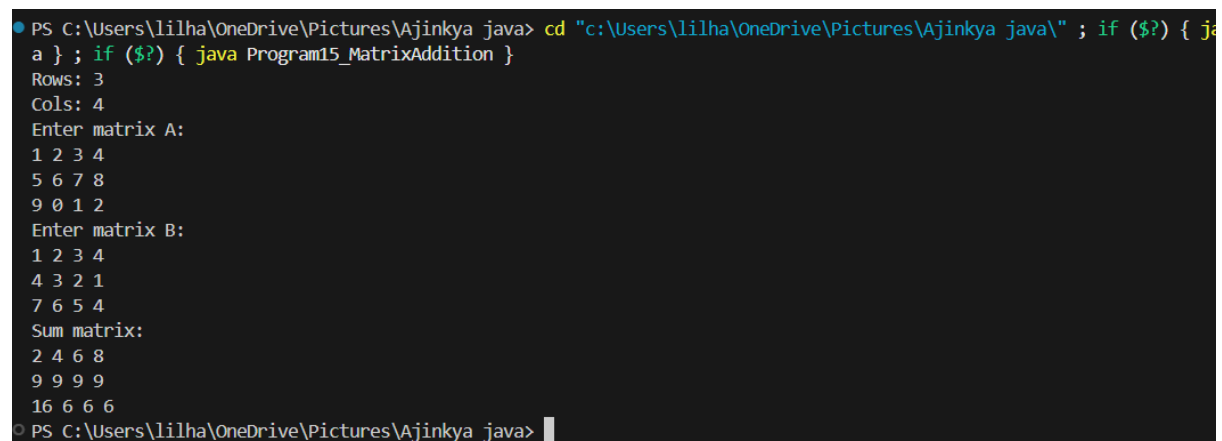
```
        System.out.println("Sum matrix:");
```

```

        for(int i=0;i<r;i++){
            for(int j=0;j<c;j++){
                S[i][j] = A[i][j] + B[i][j];
                System.out.print(S[i][j]+" ");
            }
            System.out.println();
        }
        sc.close();
    }
}

```

OUTPUT:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { java Program15_MatrixAddition }
Rows: 3
Cols: 4
Enter matrix A:
1 2 3 4
5 6 7 8
9 0 1 2
Enter matrix B:
1 2 3 4
4 3 2 1
7 6 5 4
Sum matrix:
2 4 6 8
9 9 9 9
16 6 6 6
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

16. Write a java program to find the sum of diagonal elements in an array.

// Program16\_DiagonalSum.java

// Input: square matrix size n and elements

// Output: sum of main diagonal

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

```
public class Program16_DiagonalSum{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter n (square matrix): "); int n = sc.nextInt();
```

```
        int[][] a = new int[n][n];
```

```

        System.out.println("Enter elements:");

        for(int i=0;i<n;i++) for(int j=0;j<n;j++) a[i][j]=sc.nextInt();

        int sum=0;

        for(int i=0;i<n;i++) sum += a[i][i];

        System.out.println("Sum of main diagonal = "+sum);

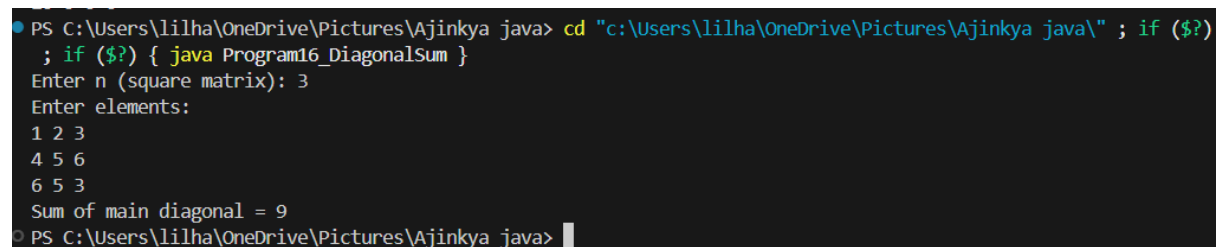
        sc.close();

    }

}

```

OUTPUT:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?)
; if ($?) { java Program16_DiagonalSum }
Enter n (square matrix): 3
Enter elements:
1 2 3
4 5 6
6 5 3
Sum of main diagonal = 9
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

17. Check whether a given string is a palindrome.

```
// Program17_PalindromeString.java
```

```
// Input: string
```

```
// Output: whether it is palindrome (ignoring case and spaces)
```

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

```
public class Program17_PalindromeString{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter string: ");
```

```
        String s = sc.nextLine().replaceAll("\\s+", "").toLowerCase();
```

```
        String rev = new StringBuilder(s).reverse().toString();
```

```
        System.out.println(rev.equals(s) ? "Palindrome" : "Not palindrome");
```

```
        sc.close();
```

```
    }
```

```
}
```

Output:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program17_Pali
ava } ; if ($?) { java Program17_PalindromeString }
Enter string: jai diwali
Not palindrome
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> |
```

18. Count the number of vowels, consonants, digits, and special characters in a string

// Program18\_CountChars.java

// Input: string

// Output: counts of vowels, consonants, digits, special characters

import java.util.Scanner;

public class Program18\_CountChars{

    public static void main(String[] args){

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter string: ");

        String s = sc.nextLine();

        int vowels=0, consonants=0, digits=0, special=0;

        for(char ch: s.toCharArray()){

            if(Character.isDigit(ch)) digits++;

            else if(Character.isLetter(ch)){

                ch = Character.toLowerCase(ch);

                if("aeiou".indexOf(ch)>=0) vowels++; else consonants++;

            } else if(!Character.isWhitespace(ch)) special++;

        }

        System.out.println("Vowels="+vowels+" Consonants="+consonants+" Digits="+digits+"  
Special="+special);

        sc.close();

    }

}

Output:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ;
; if ($?) { java Program18_CountChars }
Enter string: krsna
Vowels=1 Consonants=4 Digits=0 Special=0
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```

19. Program to reverse the string using predefined methods in String class.

```
// Program19_ReverseStringPredefined.java
```

```
// Input: string
```

```
// Output: reversed string using StringBuilder.reverse()
```

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

```
public class Program19_ReverseStringPredefined{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter string: ");
        String s = sc.nextLine();
        String rev = new StringBuilder(s).reverse().toString();
        System.out.println("Reversed: "+rev);
        sc.close();
    }
}
```

Output:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\
ined.java } ; if ($?) { java Program19_ReverseStringPredefined }
Enter string: jaiho
Reversed: ohiaj
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```

20. Write a program to remove duplicate characters from a string.

```
// Program20_RemoveDuplicates.java
```

```
// Input: string
```

```
// Output: string with duplicate characters removed (preserve first occurrence)
```

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

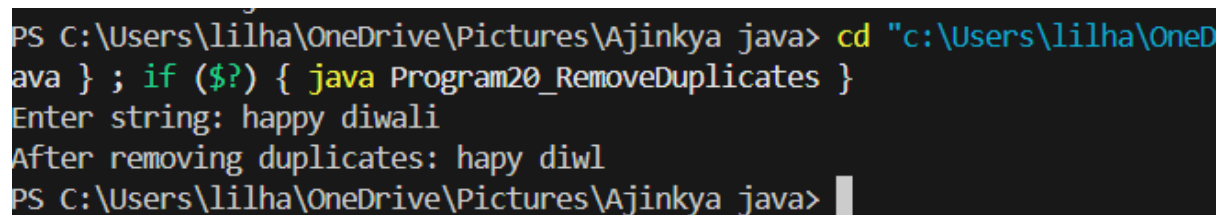
```
import java.util.LinkedHashSet;
```

```

public class Program20_RemoveDuplicates{
    public static void main(String[] args){
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter string: ");
        String s = sc.nextLine();
        LinkedHashSet<Character> set = new LinkedHashSet<>();
        StringBuilder sb = new StringBuilder();
        for(char ch: s.toCharArray()){
            if(!set.contains(ch)){ set.add(ch); sb.append(ch); }
        }
        System.out.println("After removing duplicates: "+sb.toString());
        sc.close();
    }
}

```

Output:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneD
ava } ; if ($?) { java Program20_RemoveDuplicates }
Enter string: happy diwali
After removing duplicates: hapy diwl
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

21. Develop a Java program to count the frequency of each word in a sentence.

```
// Program21_WordFrequency.java
```

```
// Input: sentence
```

```
// Output: frequency of each word (case-insensitive)
```

```

import java.util.Scanner;
import java.util.Map;
import java.util.HashMap;

public class Program21_WordFrequency{
    public static void main(String[] args){

```

```

Scanner sc = new Scanner(System.in);

System.out.println("Enter sentence:");

String s = sc.nextLine().toLowerCase();

String[] words = s.split("\\W+");

Map<String,Integer> freq = new HashMap<>();

for(String w: words) if(w.length()>0) freq.put(w, freq.getOrDefault(w,0)+1);

System.out.println("Frequencies: "+freq);

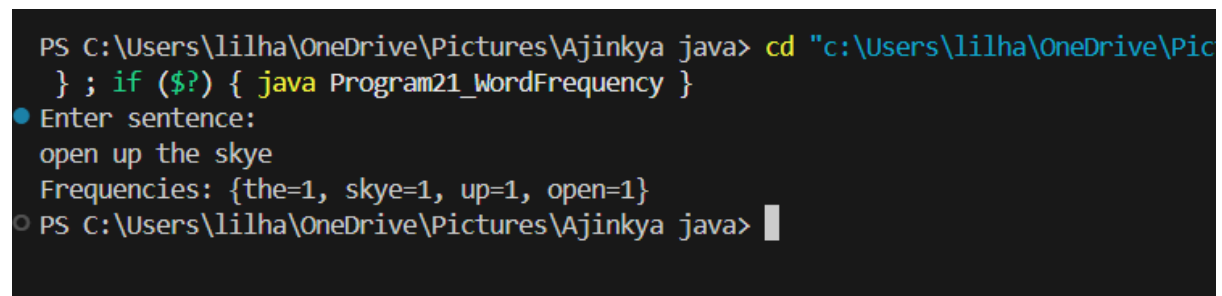
sc.close();

}

}

```

Output:



```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya"
} ; if ($?) { java Program21_WordFrequency }
Enter sentence:
open up the skye
Frequencies: {the=1, skye=1, up=1, open=1}
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

22. Design a class BankAccount with methods for deposit, withdraw, and balance inquiry.

// Program22\_BankAccount.java

// Demonstrates deposit, withdraw, balance inquiry

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

```

public class Program22_BankAccount{

    private double balance;

    public Program22_BankAccount(double init){ balance = init; }

    public void deposit(double amt){ balance += amt; }

    public boolean withdraw(double amt){

        if(amt>balance) return false;

        balance -= amt; return true;

    }

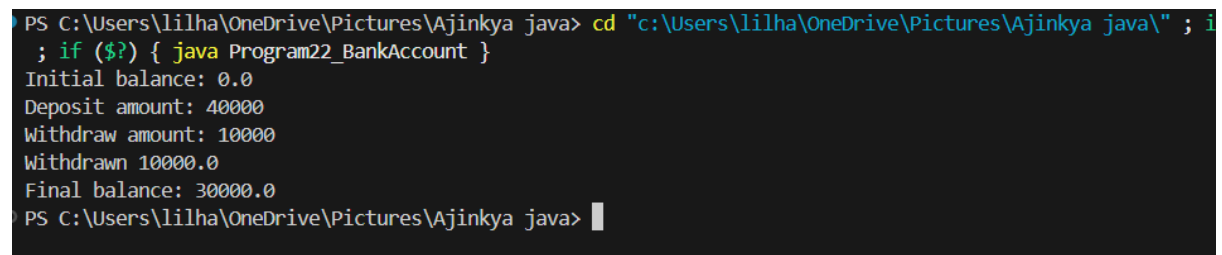
}

```

```
public double getBalance(){ return balance; }
```

```
public static void main(String[] args){  
    Scanner sc = new Scanner(System.in);  
    Program22_BankAccount acc = new Program22_BankAccount(0.0);  
    System.out.println("Initial balance: "+acc.getBalance());  
    System.out.print("Deposit amount: "); acc.deposit(sc.nextDouble());  
    System.out.print("Withdraw amount: ");  
    double w = sc.nextDouble();  
    if(acc.withdraw(w)) System.out.println("Withdrawn "+w);  
    else System.out.println("Insufficient funds.");  
    System.out.println("Final balance: "+acc.getBalance());  
    sc.close();  
}  
}
```

Output:



```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { java Program22_BankAccount }  
Initial balance: 0.0  
Deposit amount: 40000  
Withdraw amount: 10000  
Withdrawn 10000.0  
Final balance: 30000.0  
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```

23. Design a Java class Employee with the following: A method empDetails() to accept and display employee details. A method salary() to compute basic salary components. A method total() to calculate the total salary (including allowances/deductions).

```
// Program23_Employee.java
```

```
// Input: emp details and salary components, output: details and total salary
```

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

```
public class Program23_Employee{
```

```
    String name; int id;
```

```

double basic;

public void empDetails(Scanner sc){
    System.out.print("Enter id: "); id = sc.nextInt();
    sc.nextLine();
    System.out.print("Enter name: "); name = sc.nextLine();
    System.out.print("Enter basic salary: "); basic = sc.nextDouble();
}

public double salary(){ // compute allowances: HRA 20%, DA 10% as example
    return basic + (0.2*basic) + (0.1*basic);
}

public void total(){
    System.out.println("Employee ID: "+id);
    System.out.println("Name: "+name);
    System.out.printf("Total salary: %.2f%n", salary());
}

public static void main(String[] args){
    Scanner sc = new Scanner(System.in);
    Program23_Employee e = new Program23_Employee();
    e.empDetails(sc);
    e.total();
    sc.close();
}
}

```

Output:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya"
if ($?) { java Program23_Employee }
Enter id: 43
Enter name: jignesh
Enter basic salary: 3500
Employee ID: 43
Name: jignesh
Total salary: 4550.00
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>

```

24. Create a Student class with marks in 3 subjects and compute the result with percentage.

```
// Program24_StudentResult.java
```

```
// Input: marks in 3 subjects, compute total and percentage
```

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

```
public class Program24_StudentResult{
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.print("Enter marks for subject1: "); int m1=sc.nextInt();
```

```
        System.out.print("Enter marks for subject2: "); int m2=sc.nextInt();
```

```
        System.out.print("Enter marks for subject3: "); int m3=sc.nextInt();
```

```
        int total = m1+m2+m3;
```

```
        double percent = total/3.0;
```

```
        System.out.println("Total="+total+" Percentage="+String.format("%.2f", percent));
```

```
        System.out.println(percent>=40 ? "Pass" : "Fail"); // assuming 40% pass
```

```
        sc.close();
```

```
    }
```

```
}
```

Output:

```

PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\P
} ; if ($?) { java Program24_StudentResult }
Enter marks for subject1: 67
Enter marks for subject2: 79
Enter marks for subject3: 89
Total=235 Percentage=78.33
Pass

```

25. Create a class Volume and create three constructor with one arg,two arg and three arg with the help of constructor overloading concept.

```
// Program25_VolumeConstructors.java
```

```
// Demonstrates constructor overloading for a Volume class
```

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

```
public class Program25_VolumeConstructors{
```

```
    double vol;
```

```
    public Program25_VolumeConstructors(double a){ vol = a; } // 1 arg
```

```
    public Program25_VolumeConstructors(double l,double b){ vol = l*b; } // 2 arg (area)
```

```
    public Program25_VolumeConstructors(double l,double b,double h){ vol = l*b*h; } // 3 arg
```

```
    public double getVolume(){ return vol; }
```

```
    public static void main(String[] args){
```

```
        Scanner sc = new Scanner(System.in);
```

```
        System.out.println("Choose constructor: 1(one arg),2(two arg),3(three arg):");
```

```
        int k = sc.nextInt();
```

```
        Program25_VolumeConstructors v;
```

```
        if(k==1){ System.out.print("Enter value: "); v = new
Program25_VolumeConstructors(sc.nextDouble()); }
```

```
        else if(k==2){ System.out.print("Enter l and b: "); v = new
Program25_VolumeConstructors(sc.nextDouble(), sc.nextDouble()); }
```

```
        else { System.out.print("Enter l b h: "); v = new
Program25_VolumeConstructors(sc.nextDouble(), sc.nextDouble(), sc.nextDouble()); }
```

```
        System.out.println("Result (vol/area/value) = "+v.getVolume());
```

```
        sc.close();
```

```
    }
```

}

Output:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya"
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> java Program25_VolumeConstructors
Choose constructor: 1(one arg),2(two arg),3(three arg):
2
Enter l and b: 40 67
Result (vol/area/value) = 2680.0
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java>
```