

TSD ASSIGNEMNT

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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:

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*R*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:

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya"
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya> javac Program04_SimpleInterest.java
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya> java Program04_SimpleInterest
Principal (P): 40000
Rate (R %): 7
Time (T years): 5
Simple Interest = 14000.00
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya>

```

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:



A screenshot of a terminal window titled "TERMINAL". The window shows the following text:
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java" ; if (\$?) { javac Program05_LeapYear.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:

The screenshot shows a terminal window with the following content:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
```

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya" ; if ($?) { javac Program06_PrimeCheck.java }
● 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;

        }

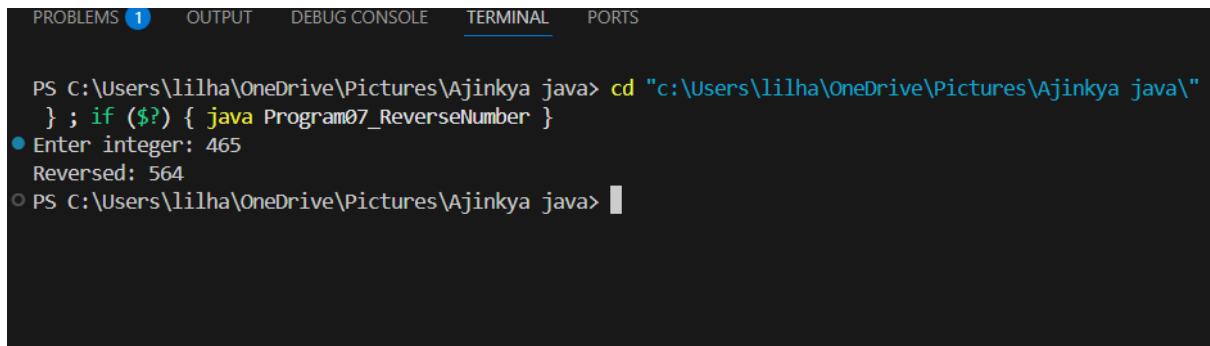
        System.out.println("Reversed: "+rev); // example 123 -> 321

        sc.close();

    }

}
```

OUTPUT:



The screenshot shows a terminal window with the following content:

```
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++;

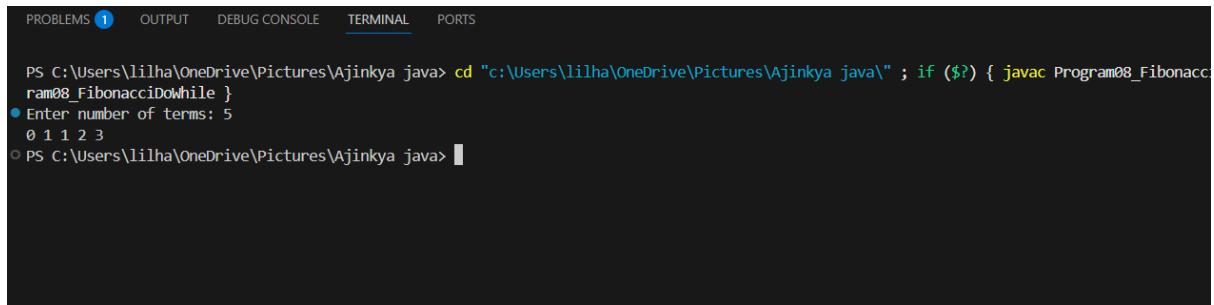
        } while(count<terms);

        System.out.println();

        sc.close();

    }
}
```

OUTPUT:



A screenshot of a terminal window from a code editor. The tabs at the top are PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL (which is underlined), and PORTS. The terminal content shows a command-line session:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac Program08_Fibonacci.java }
● Enter number of terms: 5
○ 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:

A screenshot of a terminal window from a code editor. The window has tabs at the top: PROBLEMS (1), OUTPUT, DEBUG CONSOLE, TERMINAL (which is selected), and PORTS. At the bottom right is a 'Code +' button. The terminal content shows the following:

```
PS C:\Users\lilha\OneDrive\Pictures\Ajinkya java> cd "c:\Users\lilha\OneDrive\Pictures\Ajinkya java\" ; if ($?) { javac 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 ($?) { java Program10_Armstrong }
  if ($?) { 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 ($?) { java Program11_MinMaxArray }
  ; if ($?) { 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 ($?) { javac Program12_Bubbles
; if ($?) { 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 ($?) { 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;

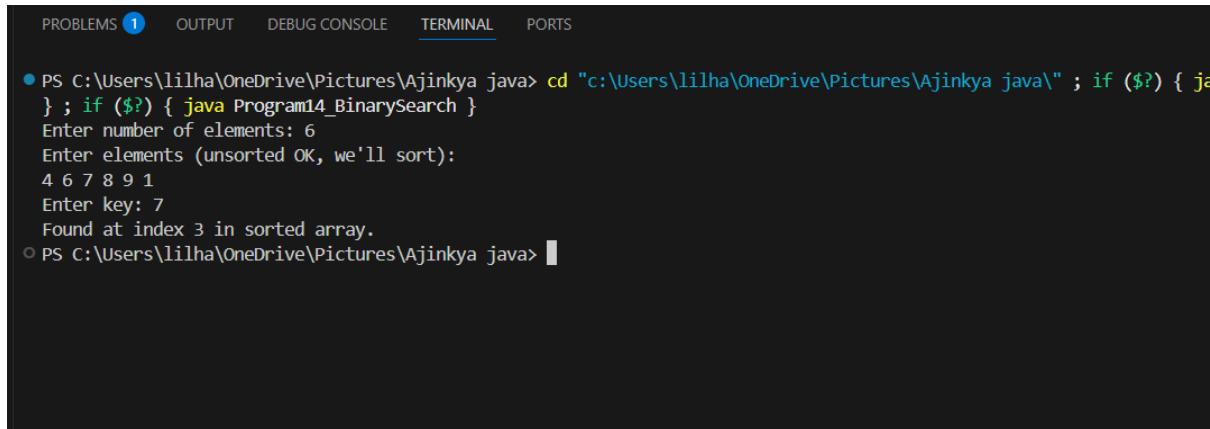
        }

        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 ($?) { ja  
} ; if ($?) { 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 ($?) { ja
a } ; if ($?) { 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 ($?) { javac Program17_PalindromeString.java } ; if ($?) { 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\OneDrive\Pictures\Ajinkya 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\Pic
 } ; 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\" ; i
; 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\Programs\Java\Program24"
} ; 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"
.java } ; if ($?) { 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>
```