



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Experiment - 1

**Student Name:** Mankaran Singh

**UID:** 23BCS10204

**Branch:** BE-CSE

**Section/Group:** KRG-2B

**Semester:** 5<sup>th</sup>

**Date of Performance:** 12/8/25

**Subject Name:** Project Based Learning in Java

**Subject Code:** 23CSH-304

**Aim:** To develop Java programs to analyze strings, perform matrix operations, and implement basic banking system functionality.

### Easy-level Problem-

**Aim:** To write a Java program to analyze a string input by the user. The program should: Count the number of vowels, consonants, digits and special characters in the string.

**Objective:** To understand string manipulation in Java using concepts like java basic input and string handling.

### **Procedure:**

1. Prompt user to enter a string.
2. Traverse each character in the string.
3. Classify each character using conditions:
  - If the character is vowel(a,e,i,o,u) increment the vowel count.
  - If it is consonant(alphabetic or not a vowel), increment the consonant count.
  - If digit(0-9), increment digit count.
  - If none of the above and not a space, it is a special character.
4. Print the count of vowels, consonants, digits and special characters.

### **Sample Input -**

Enter a string: Hello World 2025!

### **Sample Output -**

Vowels : 3

Consonants : 7

Digits: 4

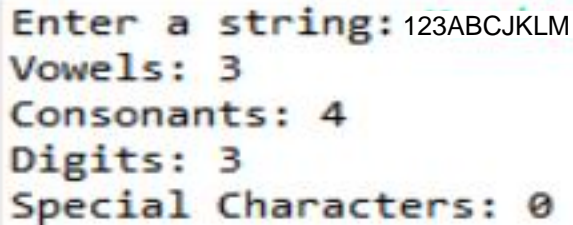
Special characters: 3

## Code -

```
package exp1;
import java.util.Scanner;

public class easy {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String str = sc.nextLine();
        int vowels = 0, consonants = 0, digits = 0, special = 0;
        str = str.toLowerCase();
        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
            if (ch >= 'a' && ch <= 'z') {
                if ("aeiou".indexOf(ch) != -1) {
                    vowels++;
                } else {
                    consonants++;
                }
            } else if (ch >= '0' && ch <= '9') {
                digits++;
            } else if (ch != ' ') {
                special++;
            }
        }
        System.out.println("Vowels: " + vowels);
        System.out.println("Consonants: " + consonants);
        System.out.println("Digits: " + digits);
        System.out.println("Special Characters: " + special);
    }
}
```

## Output -



```
Enter a string: 123ABCJKLM
Vowels: 3
Consonants: 4
Digits: 3
Special Characters: 0
```

## Medium- Level Problem -

**Aim :** To write a Java program to perform matrix operations(addition, subtraction, and multiplication) on two matrices provided by the user. The program need to check the dimensions of the matrices to ensure valid operations.

**Objective:** Understand multidimensional array manipulation and matrix operation validation using concepts of Java multidimensional array and control structures.

### **Procedure:**

1. Accept user input for 2 matrices (2D arrays).
2. Check that the dimensions of matrices are valid for the desired operations.
  - For addition/subtraction :dimensions must be equal.
  - For multiplication: columns of Matrix A = rows of Matrix B.
3. Use nested loops to perform:
  - Addition :  $result[i][j] = matrixA[i][j] + matrixB[i][j]$
  - Subtraction :  $result[i][j] = matrixA[i][j] - matrixB[i][j]$
  - Multiplication :  $result[i][j] = \sum(matrixA[i][k] * matrixB[k][j])$
4. Display the resulting matrices.

### **Sample Input :**

Matrix 1:    1 2  
              3 4  
Matrix 2:    5 6  
              7 8

### **Sample Output:**

Addition:

6 8

10 12

Subtraction:

-4 -4

-4 -4

Multiplication:19 22

43 50



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Code :

```
package exp1;
import java.util.Scanner;

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

        // Input dimensions
        System.out.print("Enter rows and columns of first matrix: ");
        int r1 = sc.nextInt();
        int c1 = sc.nextInt();
        System.out.print("Enter rows and columns of second matrix: ");
        int r2 = sc.nextInt();
        int c2 = sc.nextInt();

        int[][] A = new int[r1][c1];
        int[][] B = new int[r2][c2];

        System.out.println("Enter elements of first matrix:");
        for (int i = 0; i < r1; i++)
            for (int j = 0; j < c1; j++)
                A[i][j] = sc.nextInt();

        System.out.println("Enter elements of second matrix:");
        for (int i = 0; i < r2; i++)
            for (int j = 0; j < c2; j++)
                B[i][j] = sc.nextInt();

        // Addition & Subtraction
        if (r1 == r2 && c1 == c2) {
            System.out.println("Addition:");
            for (int i = 0; i < r1; i++) {
                for (int j = 0; j < c1; j++) {
                    System.out.print((A[i][j] + B[i][j]) + " ");
                }
                System.out.println();
            }

            System.out.println("Subtraction:");
            for (int i = 0; i < r1; i++) {
                for (int j = 0; j < c1; j++) {
                    System.out.print((A[i][j] - B[i][j]) + " ");
                }
                System.out.println();
            }
        } else {
            System.out.println("Addition/Subtraction not possible (dimension mismatch).");
        }
    }
}
```

```
// Multiplication
if (c1 == r2) {
    System.out.println("Multiplication:");
    int[][] result = new int[r1][c2];
    for (int i = 0; i < r1; i++) {
        for (int j = 0; j < c2; j++) {
            for (int k = 0; k < c1; k++) {
                result[i][j] += A[i][k] * B[k][j];
            }
        }
        System.out.print(result[i][j] + " ");
    }
    System.out.println();
} else {
    System.out.println("Multiplication not possible (dimension mismatch).");
}
}
```

## Output:

```
Enter rows and columns of first matrix: 2 2
Enter rows and columns of second matrix: 2 3
Enter elements of first matrix:

3 4
5 6
Enter elements of second matrix:
5 6
1 2
6 5
Addition/Subtraction not possible (dimension mismatch).
Multiplication:
23 42 23
37 66 35
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## **Hard -level Problem-**

**Aim :** To create a Java program to implement a basic banking system with the following features:

- Account creation(Name , Account number,).
- Deposit and withdrawal operations.
- Prevent overdraft by checking the balance before withdrawal.

**Objective:** Apply object-oriented programming concepts in a practical system using concepts like Java classes, objects and control structures.

## **Procedure:**

1. Define a 'BankAccount' class with fields like name,account number , and balance.
2. Implement methods for:
  - deposit(double amount): Adds amount to balance.
  - withdraw(double amount): checks balance before subtracting.
3. In the main program, create a new account by taking user input.
4. Allow the user to perform deposit and withdrawal operations.
5. Display appropriate messages and updated balances.

## **Sample Input:**

Create Account:

Name: John Doe

Account Number: 12345

Initial Balance: 1000

Deposit: 500

Withdraw: 2000

## **Sample Output:**

Deposit successful! Current Balance: 1500

Error: Insufficient funds. Current Balance: 1500



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Code :

```
package easy_level;
import java.util.Scanner;

class BankAccount {
    String name;
    int accountNumber;
    double balance;

    BankAccount(String name, int accountNumber, double initialBalance) {
        this.name = name;
        this.accountNumber = accountNumber;
        this.balance = initialBalance;
    }

    void deposit(double amount) {
        balance += amount;
        System.out.println("Deposit successful! Current Balance: " + balance);
    }

    void withdraw(double amount) {
        if (amount > balance) {
            System.out.println("Error: Insufficient funds. Current Balance: " + balance);
        } else {
            balance -= amount;
            System.out.println("Withdrawal successful! Current Balance: " + balance);
        }
    }

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

            // Account creation
            System.out.print("Enter Name: ");
            String name = sc.nextLine();
            System.out.print("Enter Account Number: ");
            int accNo = sc.nextInt();
            System.out.print("Enter Initial Balance: ");
            double balance = sc.nextDouble();

            BankAccount account = new BankAccount(name, accNo, balance);

            while (true) {
                System.out.println("\n1. Deposit\n2. Withdraw\n3. Exit");
                System.out.print("Choose an option: ");
                int choice = sc.nextInt();
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
switch (choice) {  
    case 1:  
        System.out.print("Enter deposit amount: ");  
        double dep = sc.nextDouble();  
        account.deposit(dep);  
        break;  
    case 2:  
        System.out.print("Enter withdrawal amount: ");  
        double wd = sc.nextDouble();  
        account.withdraw(wd);  
        break;  
    case 3:  
        System.out.println("Exiting... Thank you!");  
        return;  
    default:  
        System.out.println("Invalid choice.");  
}  
}  
}
```

## Output:

```
Enter Name: _____  
Enter Account Number: _____  
Enter Initial Balance: _____  
  
1. Deposit  
2. Withdraw  
3. Exit  
Choose an option: 2  
Enter withdrawal amount: 1600  
Withdrawal successful! Current Balance: 13400.0  
  
1. Deposit  
2. Withdraw  
3. Exit  
Choose an option: 3  
Exiting... Thank you!
```