Experiment - 1

Student Name: Archita Srivastava
UID: 23BCS12459
Branch: BE-CSE
Section/Group: KRG-2B
Semester: 5th
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 -

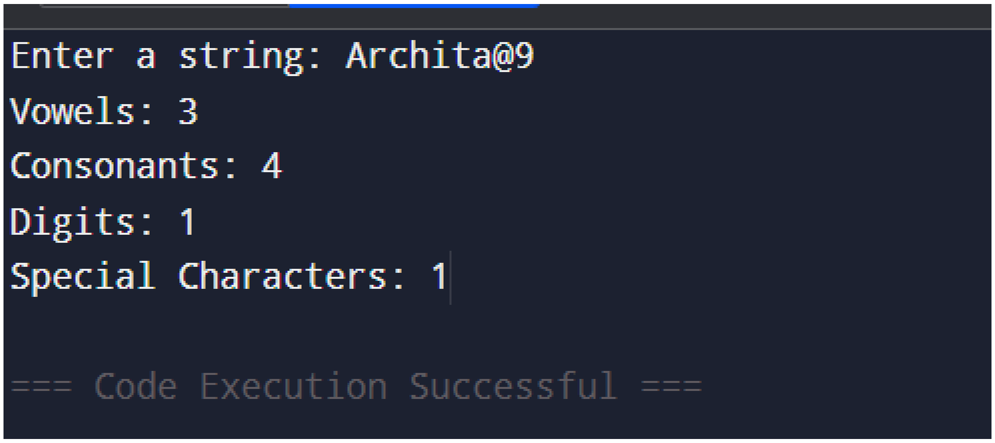
Enter a string: Archita@9

Sample Output -

```
Vowels: 3

Consonants: 4

Digits: 1

Special Characters: 1
```

Code -

```java
import java.util.Scanner;

public class StringAnalysis {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter a string: ");
        String input = sc.nextLine();
        int vowels = 0, consonants = 0, digits = 0, specialChars = 0;
        for (char ch : input.toCharArray()) {
            if (Character.isLetter(ch)) {
                ch = Character.toLowerCase(ch);
                if ("aeiou".indexOf(ch) != -1) vowels++;
                else consonants++;
            } else if (Character.isDigit(ch)) digits++;
            else if (ch != ' ') specialChars++;
        }
        System.out.println("Vowels: " + vowels);
        System.out.println("Consonants: " + consonants);
        System.out.println("Digits: " + digits);
        System.out.println("Special Characters: " + specialChars);
        sc.close();
    }
}
```



```
Enter a string: Archita@9
Vowels: 3
Consonants: 4
Digits: 1
Special Characters: 1

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

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:   1 2
              4 5
              6 7

Sample Output:

Addition/Subtraction not possible (dimension mismatch).

Multiplication:

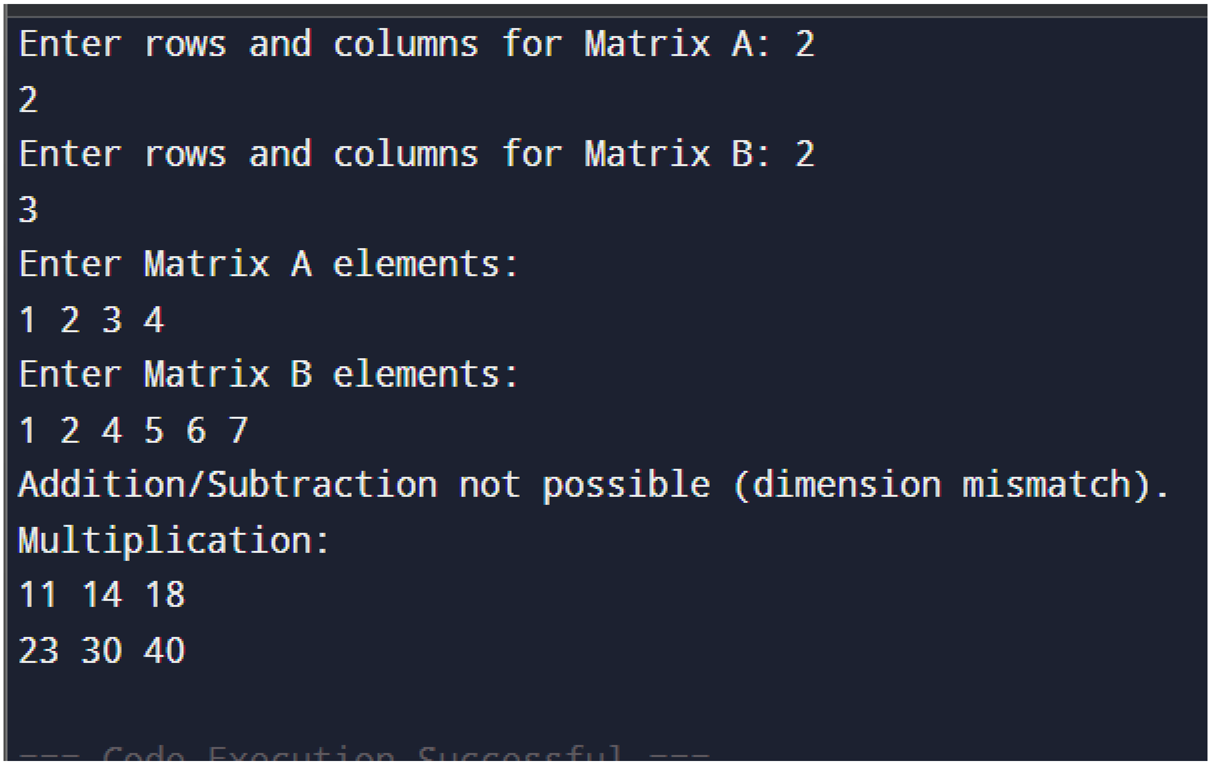
11 14 18

23 30 40

Code :

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter rows and columns for Matrix A: ");
        int r1 = sc.nextInt(), c1 = sc.nextInt();
        System.out.print("Enter rows and columns for Matrix B: ");
        int r2 = sc.nextInt(), c2 = sc.nextInt();
        int[][] A = new int[r1][c1];
        int[][] B = new int[r2][c2];
        System.out.println("Enter Matrix A elements:");
        for (int i = 0; i < r1; i++)
            for (int j = 0; j < c1; j++)
                A[i][j] = sc.nextInt();
        System.out.println("Enter Matrix B elements:");
        for (int i = 0; i < r2; i++)
            for (int j = 0; j < c2; j++)
                B[i][j] = sc.nextInt();
        if (r1 == r2 && c1 == c2) {
            int[][] add = new int[r1][c1];
            int[][] sub = new int[r1][c1];
            for (int i = 0; i < r1; i++) {
                for (int j = 0; j < c1; j++) {
                    add[i][j] = A[i][j] + B[i][j];
                    sub[i][j] = A[i][j] - B[i][j];
                }
            }
            System.out.println("Addition:");
            printMatrix(add);
            System.out.println("Subtraction:");
            printMatrix(sub);
        } else {
            System.out.println("Addition/Subtraction not possible (dimension
mismatch).");
        }
        if (c1 == r2) {
            int[][] mul = 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++) {
                        mul[i][j] += A[i][k] * B[k][j];
                    }
                }
            }
            System.out.println("Multiplication:");
            printMatrix(mul);
        } else {
            System.out.println("Multiplication not possible (c1 != r2).");
        }
        sc.close();
    }

    private static void printMatrix(int[][] matrix) {
        for (int[] row : matrix) {
            for (int val : row)
                System.out.print(val + " ");
            System.out.println();
        }
    }
}
```

Output:



```
Enter rows and columns for Matrix A: 2
2
Enter rows and columns for Matrix B: 2
3
Enter Matrix A elements:
1 2 3 4
Enter Matrix B elements:
1 2 4 5 6 7
Addition/Subtraction not possible (dimension mismatch).
Multiplication:
11 14 18
23 30 40


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

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: Archita
Account Number: 12459
Initial Balance: 100000
Deposit: 500
Withdraw: 1000

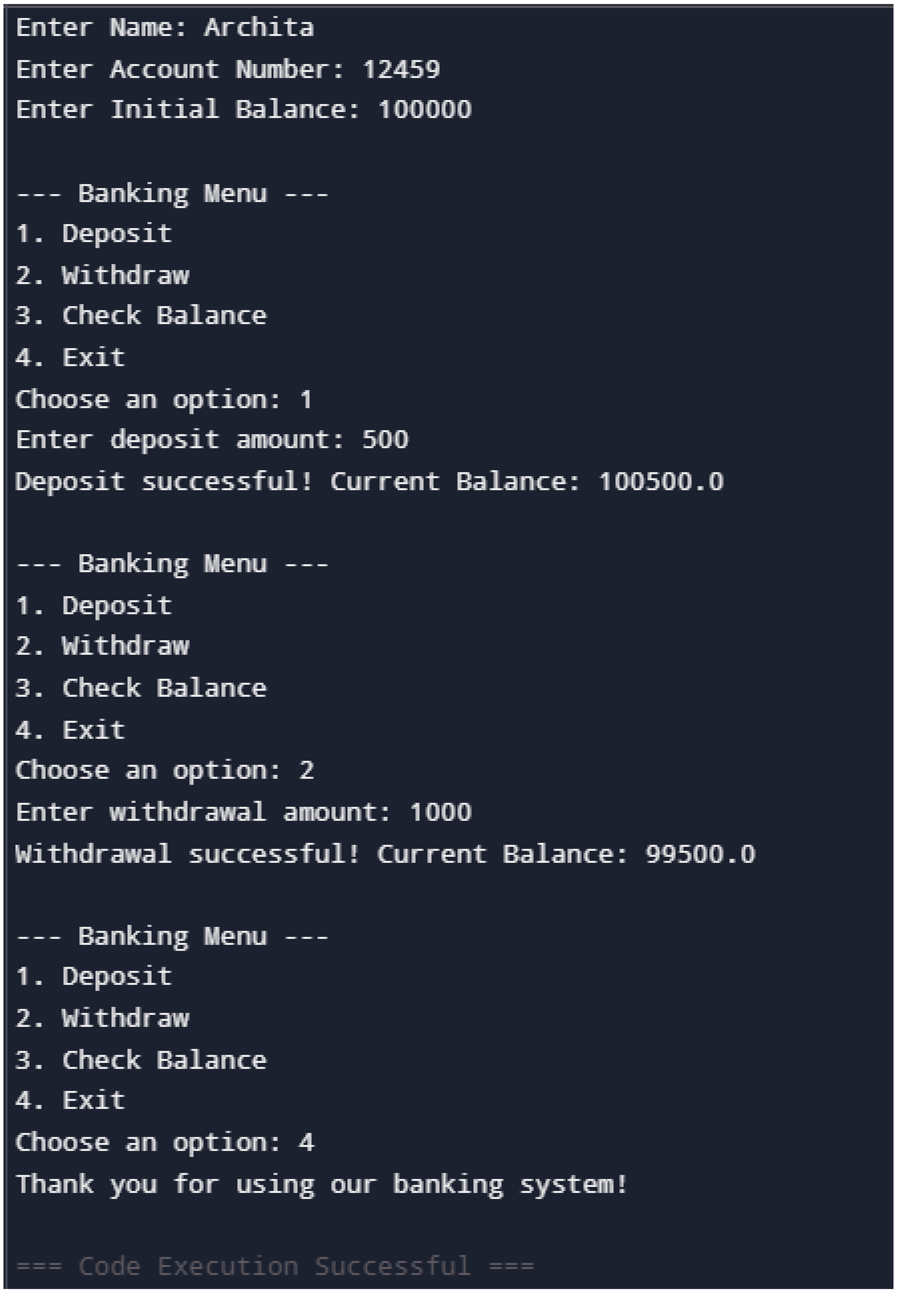
Sample Output:

Deposit successful! Current Balance: 99500.0

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();
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: Archita
Enter Account Number: 12459
Enter Initial Balance: 100000

--- Banking Menu ---
1. Deposit
2. Withdraw
3. Check Balance
4. Exit
Choose an option: 1
Enter deposit amount: 500
Deposit successful! Current Balance: 100500.0

--- Banking Menu ---
1. Deposit
2. Withdraw
3. Check Balance
4. Exit
Choose an option: 2
Enter withdrawal amount: 1000
Withdrawal successful! Current Balance: 99500.0

--- Banking Menu ---
1. Deposit
2. Withdraw
3. Check Balance
4. Exit
Choose an option: 4
Thank you for using our banking system!

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