

17. Create a Graphics package that has classes and interfaces for figures Rectangle, Triangle, Square and Circle. Test the package by finding the area of these figures.

Program:

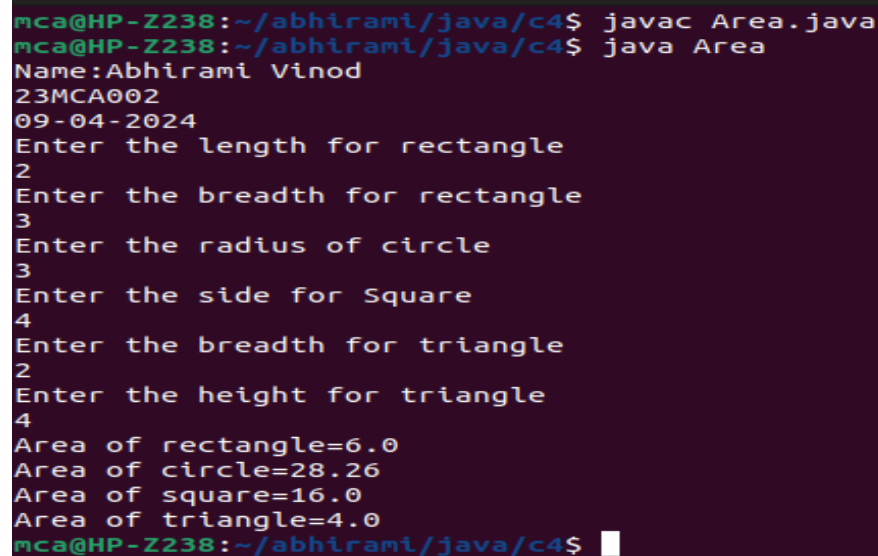
Area.java

```
import package_graphics.*;
import java.util.Scanner;
public class Area
{
    public static void main(String []args)
    {
        package_graphics testObj = new package_graphics();
        int l,h,r,a,c,d;
        Scanner s=new Scanner(System.in);
        System.out.println("Name:Abhirami Vinod\n23MCA002\n09-04-2024");
        System.out.println("Enter the length for rectangle");
        l=s.nextInt();
        System.out.println("Enter the breadth for rectangle");
        h=s.nextInt();
        System.out.println("Enter the radius of circle");
        r=s.nextInt();
        System.out.println("Enter the side for Square");
        a=s.nextInt();
        System.out.println("Enter the breadth for triangle");
        c=s.nextInt();
        System.out.println("Enter the height for triangle");
        d=s.nextInt();
        System.out.println("Area of rectangle="+testObj.recArea(l,h));
        System.out.println("Area of circle="+testObj.cirArea(r));
        System.out.println("Area of square="+testObj.squArea(a));
        System.out.println("Area of triangle="+testObj.triArea(c,d));
    }
}
```

Package_graphics.java

```
package package_graphics;
interface interface_graphics
{
}
```

```
public float recArea(int l, int h);
public float cirArea(int r);
public float squArea(int a);
public float triArea(int l, int h);
}
public class package_graphics implements interface_graphics
{
public float recArea(int l, int h)
{
return l*h;
}
public float cirArea(int r)
{
return r*r*(float)3.14;
}
public float squArea(int a)
{
return a*a;
}
public float triArea(int l, int h)
{
return l*h*(float)(.5);
}
}
```

Output:

```
mca@HP-Z238:~/abhirami/java/c4$ javac Area.java
mca@HP-Z238:~/abhirami/java/c4$ java Area
Name:Abhirami Vinod
23MCA002
09-04-2024
Enter the length for rectangle
2
Enter the breadth for rectangle
3
Enter the radius of circle
3
Enter the side for Square
4
Enter the breadth for triangle
2
Enter the height for triangle
4
Area of rectangle=6.0
Area of circle=28.26
Area of square=16.0
Area of triangle=4.0
mca@HP-Z238:~/abhirami/java/c4$
```

18. Create an Arithmetic package that has classes and interfaces for the 4 basic arithmetic operations. Test the package by implementing all operations on two given numbers.

Program:

ArithmeticMain.java

```
import arithmetic.ArithmeticOperations;
import java.util.Scanner;
public class ArithmeticMain {
    public static void main(String[] args) {
        System.out.println("Abhirami Vinod\n23MCA002\n15-04-2024");
        System.out.println();
        ArithmeticOperations operations = new ArithmeticOperations();
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter the first number: ");
        double num1 = scanner.nextDouble();
        System.out.print("Enter the second number: ");
        double num2 = scanner.nextDouble();
        System.out.println("Addition: " + operations.add(num1, num2));
        System.out.println("Subtraction: " + operations.subtract(num1, num2));
        System.out.println("Multiplication: " + operations.multiply(num1, num2));
        System.out.println("Division: " + operations.divide(num1, num2));
    }
}
```

Addition.java

```
package arithmetic;
public interface Addition {
    public double add(double num1, double num2);
}
```

Subtraction.java

```
package arithmetic;

public interface Subtraction {

    public double subtract(double num1, double num2);

}
```

Division.java

```
package arithmetic;

public interface Division {

    public double divide(double num1, double num2);

}
```

Multiplication.java

```
package arithmetic;

public interface Multiplication {

    public double multiply(double num1, double num2);

}
```

ArithmeticOperations.java

```
package arithmetic;

public class ArithmeticOperations implements Addition, Subtraction, Multiplication, Division {

    @Override

    public double add(double num1, double num2) {

        return num1 + num2;

    }

    @Override

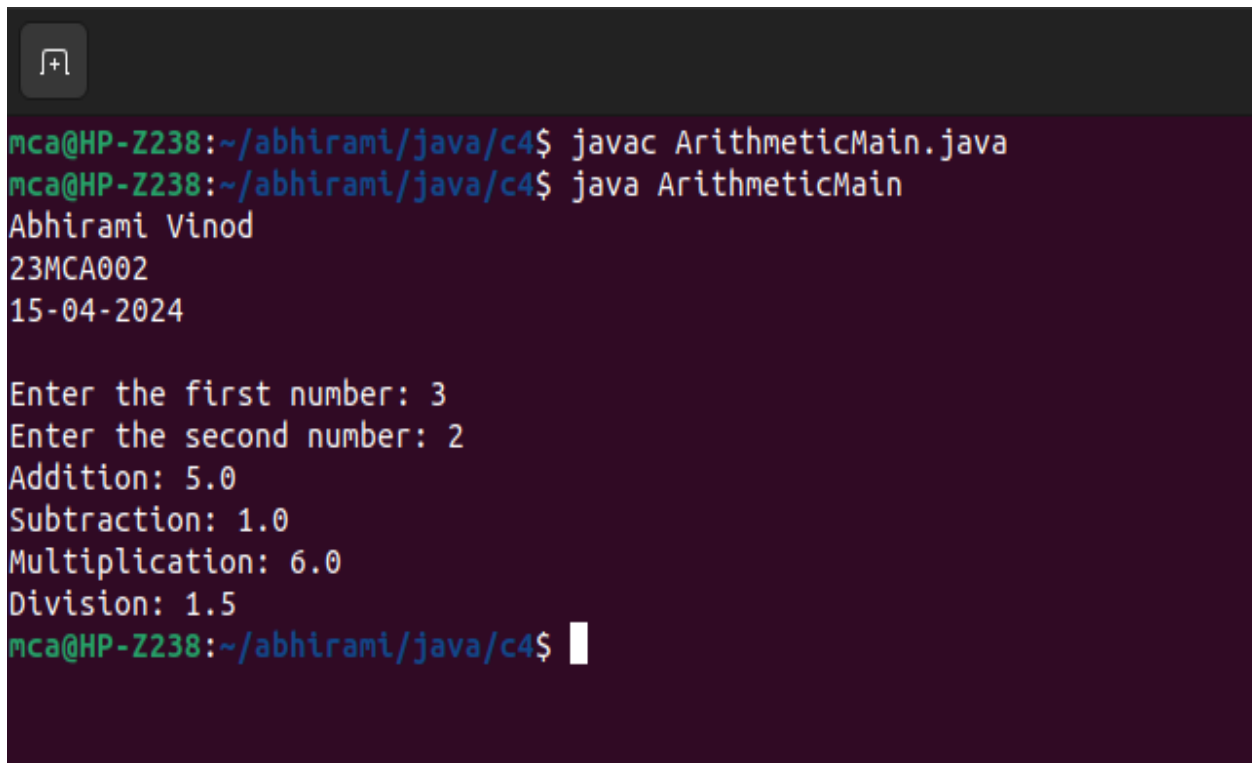
    public double subtract(double num1, double num2) {

        return num1 - num2;

    }

    @Override
```

```
public double multiply(double num1, double num2) {  
    return num1 * num2;  
}  
  
@Override  
public double divide(double num1, double num2) {  
    if (num2 == 0) {  
        throw new ArithmeticException("Division by zero error!");  
    }  
    return num1 / num2;  
}  
}
```

Output:A terminal window with a dark background and light-colored text. The prompt is 'mca@HP-Z238:~/abhirami/java/c4\$'. The user enters 'javac ArithmeticMain.java' and 'java ArithmeticMain'. The output shows the name 'Abhirami Vinod', ID '23MCA002', date '15-04-2024', and arithmetic results for inputs 3 and 2: Addition: 5.0, Subtraction: 1.0, Multiplication: 6.0, Division: 1.5. The prompt returns at the end.

```
mca@HP-Z238:~/abhirami/java/c4$ javac ArithmeticMain.java  
mca@HP-Z238:~/abhirami/java/c4$ java ArithmeticMain  
Abhirami Vinod  
23MCA002  
15-04-2024  
  
Enter the first number: 3  
Enter the second number: 2  
Addition: 5.0  
Subtraction: 1.0  
Multiplication: 6.0  
Division: 1.5  
mca@HP-Z238:~/abhirami/java/c4$
```

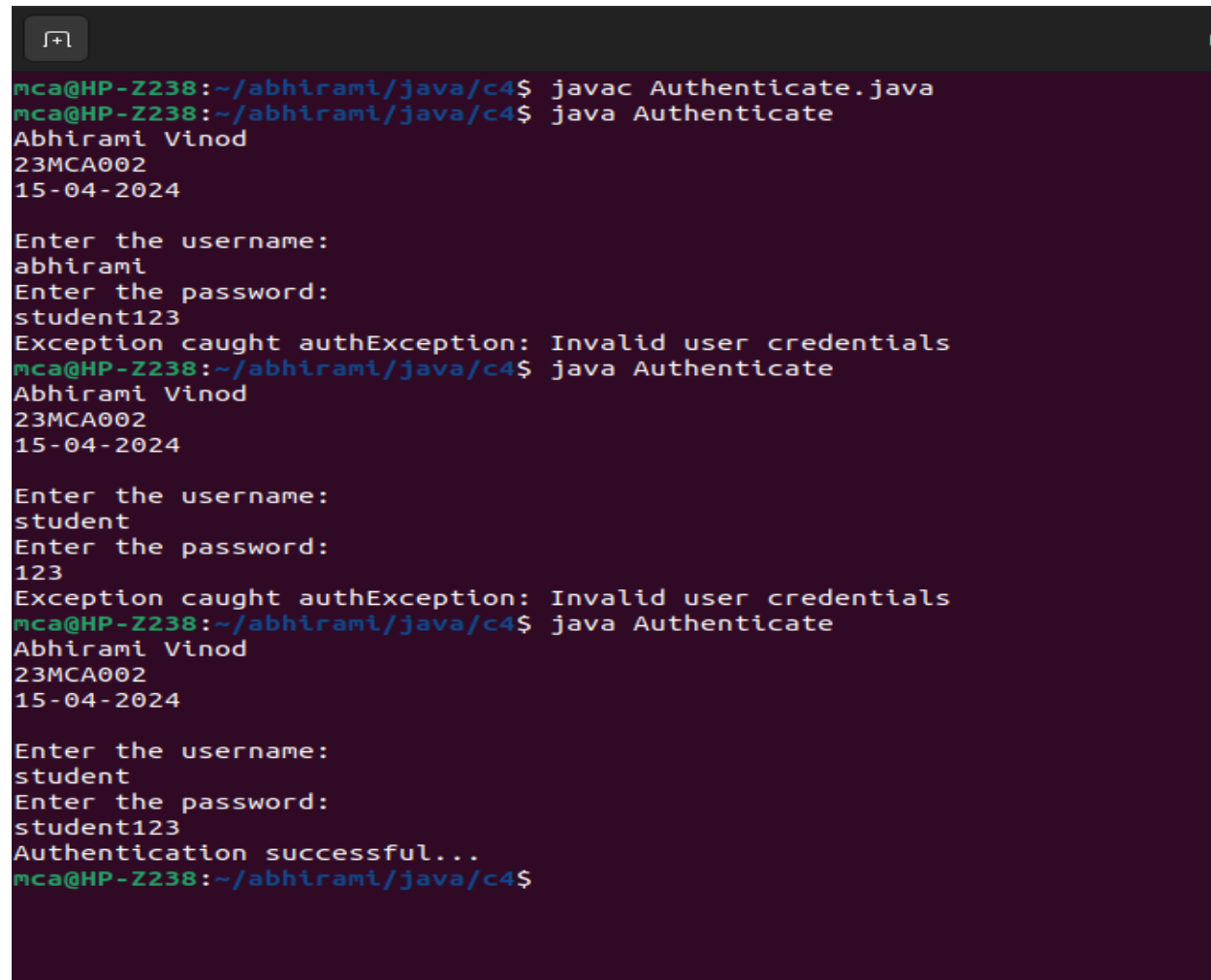
19. Write a user defined exception class to authenticate the user name and password.**Program:**

```
import java.util.Scanner;

class authException extends Exception
{
    public authException(String s) {
        super(s);
    }
}

public class Authenticate
{
    public static void main(String[] args) {
        System.out.println("Abhirami Vinod\n23MCA002\n15-04-2024");
        System.out.println();
        String username = "student";
        String passcode = "student123";
        String user_name,password;
        Scanner sc = new Scanner(System.in);
        try
        {
            System.out.println("Enter the username:");
            user_name = sc.nextLine();
            System.out.println("Enter the password:");
            password = sc.nextLine();
            if(username.equals(user_name) && passcode.equals(password))
            {
                System.out.println("Authentication successful...");
            }
            else
            throw new authException("Invalid user credentials");
        }
        catch(authException e)
```

```
{  
System.out.println("Exception caught "+e);  
}  
}  
}
```

Output:A terminal window with a dark purple background and white text. It shows the compilation and execution of a Java program named 'Authenticate.java'. The user 'mca@HP-Z238' is in the directory '~/abhirami/java/c4'. The program prompts for a username and password. The first attempt with 'abhirami' and 'student123' fails, throwing an 'authException: Invalid user credentials'. The second attempt with 'student' and '123' also fails with the same exception. The third attempt with 'student' and 'student123' is successful, displaying 'Authentication successful...'.

```
mca@HP-Z238:~/abhirami/java/c4$ javac Authenticate.java  
mca@HP-Z238:~/abhirami/java/c4$ java Authenticate  
Abhirami Vinod  
23MCA002  
15-04-2024  
  
Enter the username:  
abhirami  
Enter the password:  
student123  
Exception caught authException: Invalid user credentials  
mca@HP-Z238:~/abhirami/java/c4$ java Authenticate  
Abhirami Vinod  
23MCA002  
15-04-2024  
  
Enter the username:  
student  
Enter the password:  
123  
Exception caught authException: Invalid user credentials  
mca@HP-Z238:~/abhirami/java/c4$ java Authenticate  
Abhirami Vinod  
23MCA002  
15-04-2024  
  
Enter the username:  
student  
Enter the password:  
student123  
Authentication successful...  
mca@HP-Z238:~/abhirami/java/c4$
```

20. Find the average of N positive integers, raising a user defined exception for each negative input.

Program:

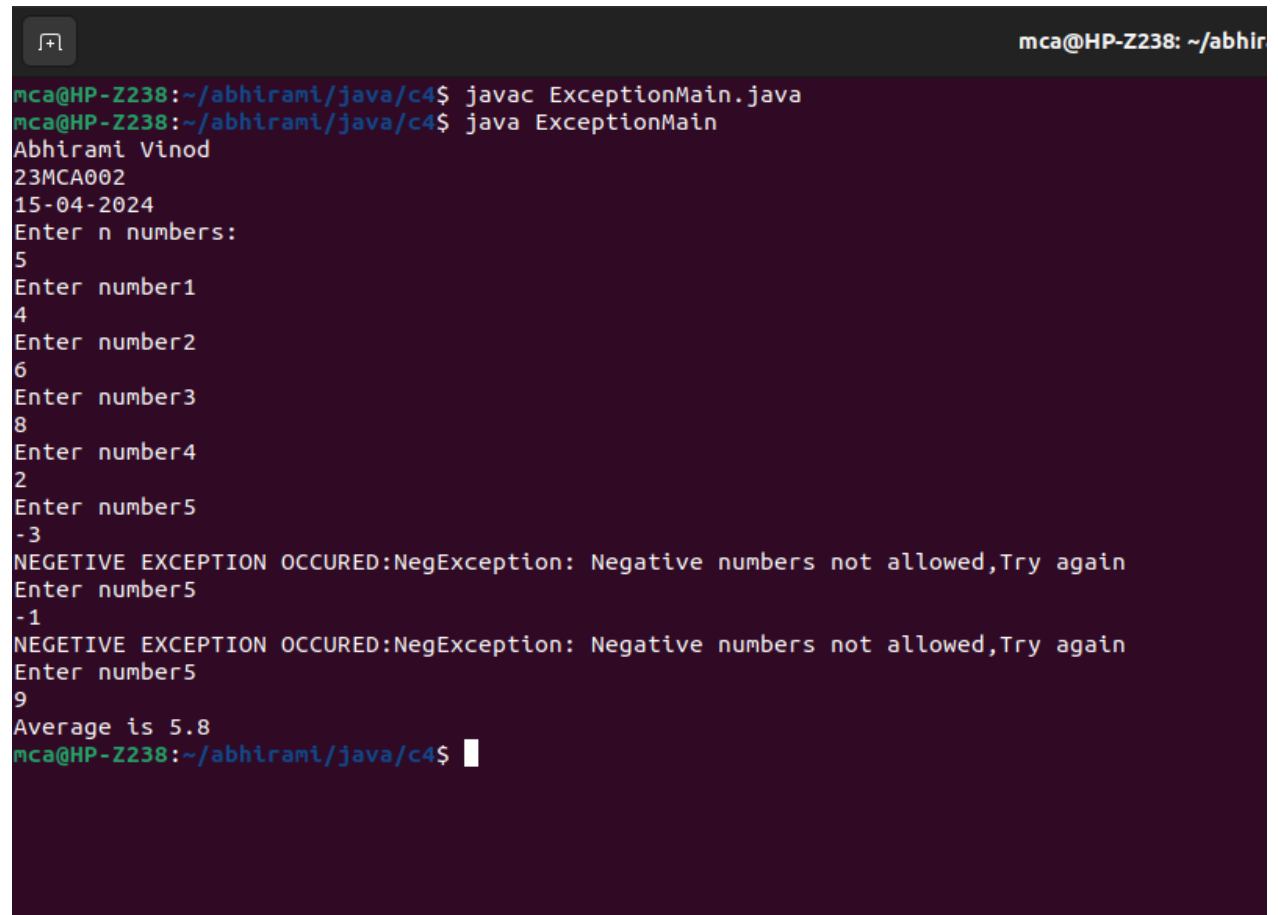
```
import java.util.Scanner;

class NegException extends Exception
{
    public NegException(String s)
    {
        super(s);
    }
}

public class ExceptionMain {
    public static void main(String[] args)
    {
        System.out.println("Abhirami Vinod\n23MCA002\n15-04-2024");
        int i;
        double sum=0,avg=0;
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter n numbers:");
        int n=sc.nextInt();
        for(i=1;i<=n;i++)
        {
            try
            {
                System.out.println("Enter number"+i);
                int a=sc.nextInt();
                if(a<0)
                {
                    i--;
                    throw new NegException("Negative numbers not allowed, Try again");
                }
            }
            else
            {
                sum=sum+a;
            }
        }
    }
}
```



```
}  
}  
catch(NegException e)  
{  
System.out.println("NEGATIVE EXCEPTION OCCURED:"+e);  
}  
}  
avg=sum/n;  
System.out.println("Average is "+avg);  
sc.close();  
}  
}
```

Output:

A terminal window titled 'mca@HP-Z238: ~/abhir' showing the execution of a Java program. The user enters their name 'Abhirami Vinod', ID '23MCA002', and date '15-04-2024'. They are prompted to enter 5 numbers. The first four are 5, 4, 6, and 8. The fifth is -3, which triggers a 'NEGATIVE EXCEPTION OCCURED:NegException: Negative numbers not allowed, Try again' message. The user enters -1, which also triggers the same message. Finally, they enter 9. The program then calculates and displays 'Average is 5.8'.

```
mca@HP-Z238:~/abhirami/java/c4$ javac ExceptionMain.java  
mca@HP-Z238:~/abhirami/java/c4$ java ExceptionMain  
Abhirami Vinod  
23MCA002  
15-04-2024  
Enter n numbers:  
5  
Enter number1  
4  
Enter number2  
6  
Enter number3  
8  
Enter number4  
2  
Enter number5  
-3  
NEGATIVE EXCEPTION OCCURED:NegException: Negative numbers not allowed, Try again  
Enter numbers  
-1  
NEGATIVE EXCEPTION OCCURED:NegException: Negative numbers not allowed, Try again  
Enter numbers  
9  
Average is 5.8  
mca@HP-Z238:~/abhirami/java/c4$
```

21. Program to remove all the elements from a linked list.**Program:**

```
import java.util.*;

public class RemoveL {

    public static void main(String[] args){

        System.out.println("Abhirami Vinod\n23MCA002\n16-04-2024");

        LinkedList<String> L=new LinkedList<>();

        L.add("Gold");

        L.add("Silver");

        L.add("Bronze");

        L.add(0,"Olympics Medals");

        System.out.println(L);

        L.remove("Bronze");

        System.out.println(L);

        L.remove(2);

        System.out.println(L);

        L.removeLast();

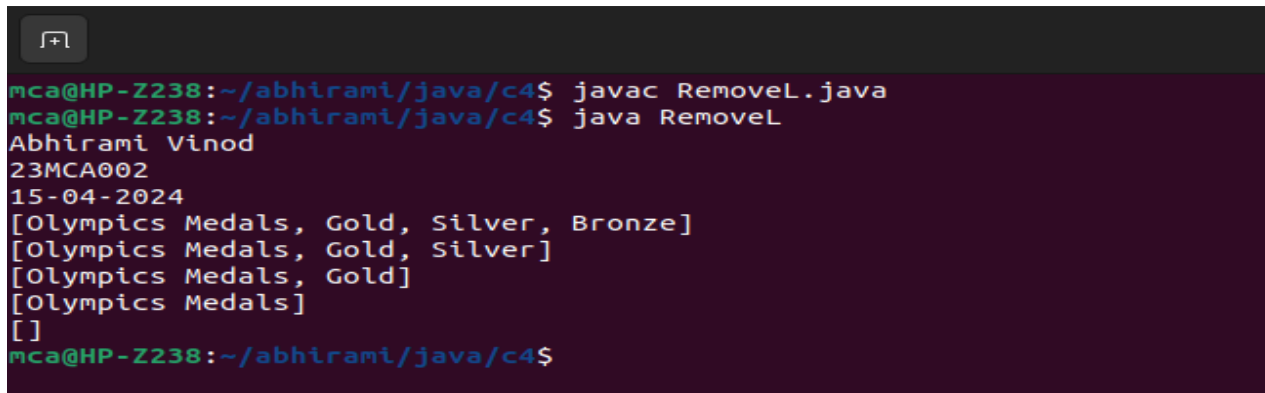
        System.out.println(L);

        L.removeFirst();

        System.out.println(L);

    }

}
```

Output:

```
mca@HP-Z238:~/abhirami/java/c4$ javac RemoveL.java
mca@HP-Z238:~/abhirami/java/c4$ java RemoveL
Abhirami Vinod
23MCA002
15-04-2024
[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
mca@HP-Z238:~/abhirami/java/c4$
```

22. Program to remove an object from the Stack when the position is passed as parameter.**Program:**

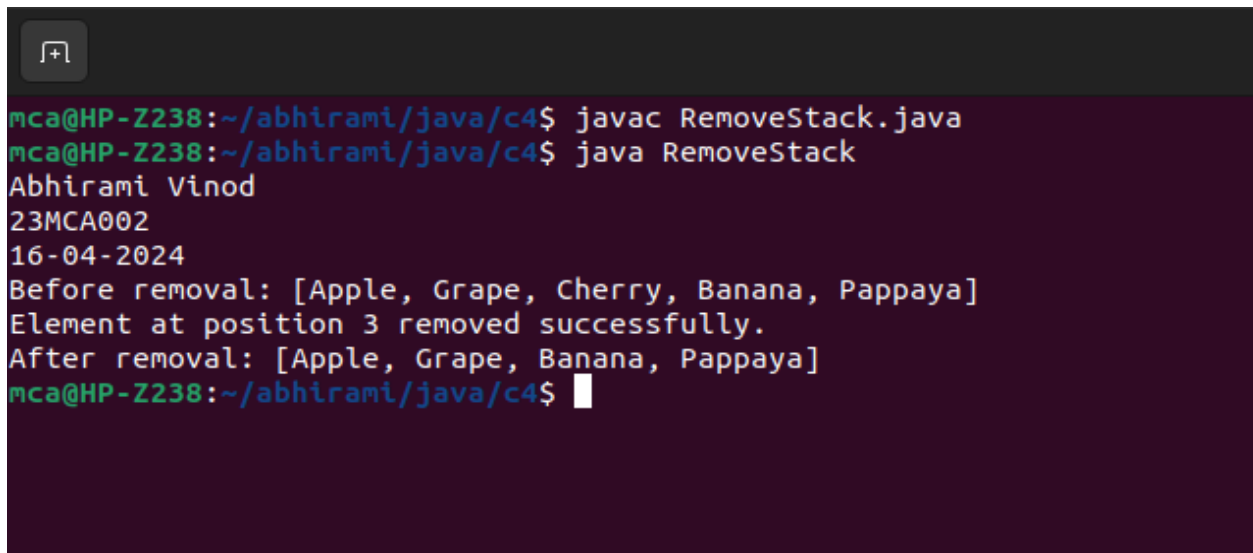
```
import java.util.Stack;

public class RemoveStack {

    public static void removeElementAtPosition(Stack<String> stack, int position) {
        if (position >= 1 && position <= stack.size()) {
            Stack<String> tempStack = new Stack<>();
            // Remove elements from the original stack until the desired position is reached
            for (int i = 1; i < position; i++) {
                tempStack.push(stack.pop());
            }
            // Remove the element at the desired position
            stack.pop();
            // Restore the remaining elements back to the original stack
            while (!tempStack.isEmpty()) {
                stack.push(tempStack.pop());
            }
            System.out.println("Element at position " + position + " removed successfully.");
        } else {
            System.out.println("Invalid position. Please provide a valid position within the stackrange.");
        }
    }

    public static void main(String[] args) {
        System.out.println("Abhirami Vinod\n23MCA002\n16-04-2024");
        Stack<String> stack = new Stack<>();
        stack.push("Apple");
        stack.push("Grape");
        stack.push("Cherry");
        stack.push("Banana");
```

```
stack.push("Pappaya");  
int positionToRemove = 3;  
System.out.println("Before removal: " + stack);  
removeElementAtPosition(stack, positionToRemove);  
System.out.println("After removal: " + stack);  
}  
}
```

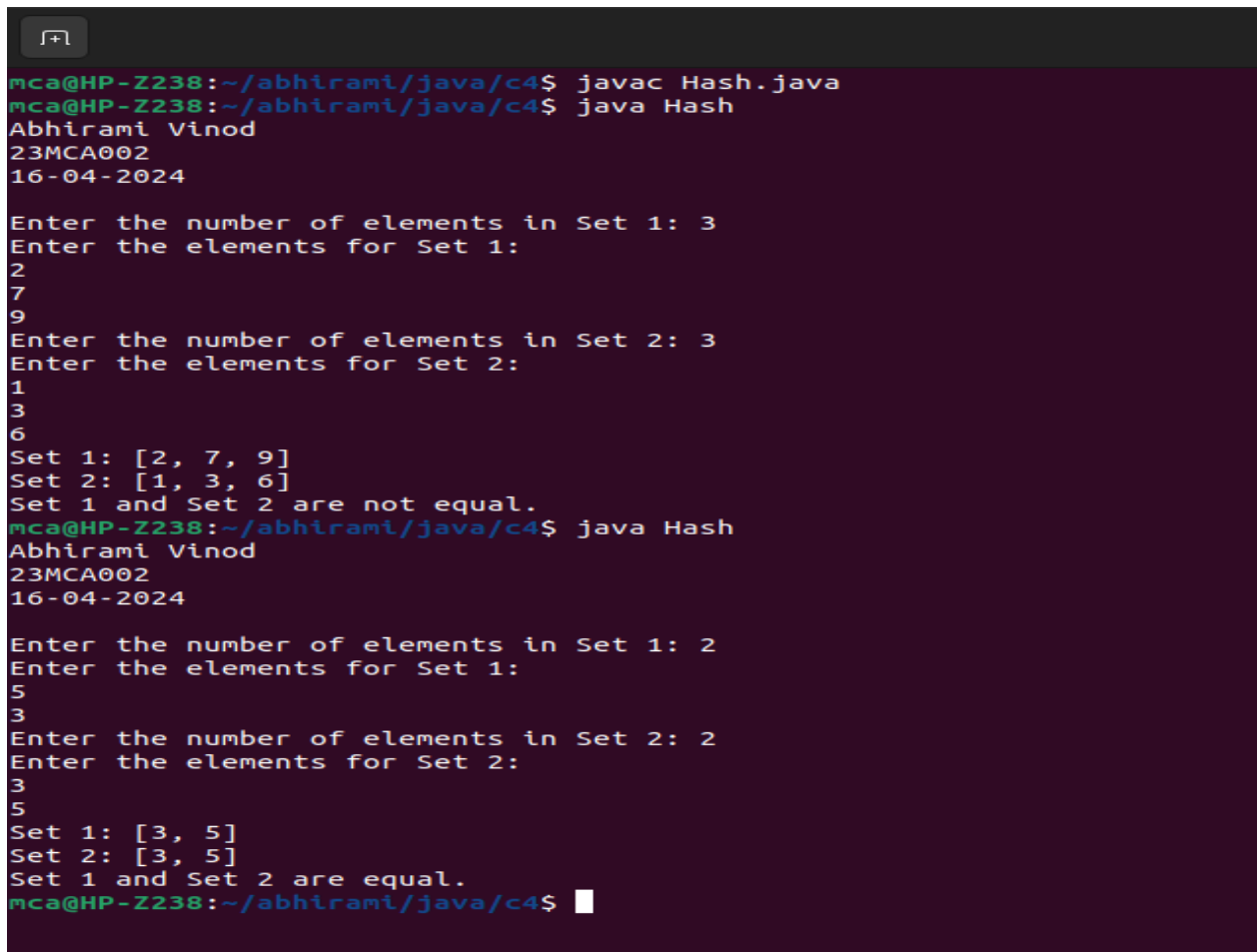
Output:A terminal window with a dark purple background and a terminal icon in the top-left corner. The text is displayed in a monospaced font with syntax highlighting: green for the prompt, blue for the path, and white for the command and output. The output shows the execution of a Java program that removes an element from a stack.

```
mca@HP-Z238:~/abhirami/java/c4$ javac RemoveStack.java  
mca@HP-Z238:~/abhirami/java/c4$ java RemoveStack  
Abhirami Vinod  
23MCA002  
16-04-2024  
Before removal: [Apple, Grape, Cherry, Banana, Pappaya]  
Element at position 3 removed successfully.  
After removal: [Apple, Grape, Banana, Pappaya]  
mca@HP-Z238:~/abhirami/java/c4$
```

23. Write a Java program to compare two hash set.**Program:**

```
import java.util.HashSet;
import java.util.Scanner;
import java.util.Set;
public class Hash {
    public static void main(String[] args) {
        System.out.println("Abhirami Vinod\n23MCA002\n16-04-2024");
        System.out.println();
        Set<Integer> set1 = new HashSet<>();
        Set<Integer> set2 = new HashSet<>();
        Scanner scanner = new Scanner(System.in);
        // Input for Set 1
        System.out.print("Enter the number of elements in Set 1: ");
        int numElements1 = scanner.nextInt();
        System.out.println("Enter the elements for Set 1:");
        for (int i = 0; i < numElements1; i++) {
            int element = scanner.nextInt();
            set1.add(element);
        }
        // Input for Set 2
        System.out.print("Enter the number of elements in Set 2: ");
        int numElements2 = scanner.nextInt();
        System.out.println("Enter the elements for Set 2:");
        for (int i = 0; i < numElements2; i++) {
            int element = scanner.nextInt();
            set2.add(element);
        }
        // Comparison
        boolean isEqual = set1.equals(set2);
```

```
// Output
System.out.println("Set 1: " + set1);
System.out.println("Set 2: " + set2);
if (isEqual) {
    System.out.println("Set 1 and Set 2 are equal.");
} else {
    System.out.println("Set 1 and Set 2 are not equal.");
}
scanner.close();
}
}
```

Output:

```
mca@HP-Z238:~/abhirami/java/c4$ javac Hash.java
mca@HP-Z238:~/abhirami/java/c4$ java Hash
Abhirami Vinod
23MCA002
16-04-2024

Enter the number of elements in Set 1: 3
Enter the elements for Set 1:
2
7
9
Enter the number of elements in Set 2: 3
Enter the elements for Set 2:
1
3
6
Set 1: [2, 7, 9]
Set 2: [1, 3, 6]
Set 1 and Set 2 are not equal.
mca@HP-Z238:~/abhirami/java/c4$ java Hash
Abhirami Vinod
23MCA002
16-04-2024

Enter the number of elements in Set 1: 2
Enter the elements for Set 1:
5
3
Enter the number of elements in Set 2: 2
Enter the elements for Set 2:
3
5
Set 1: [3, 5]
Set 2: [3, 5]
Set 1 and Set 2 are equal.
mca@HP-Z238:~/abhirami/java/c4$
```