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:

```
import package_graphics.*;

import java.util.Scanner;

public class Q1

{

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("Arjun kamalasanan");

 System.out.println("Rollno: 19");

 System.out.println("Date: 5-4-24");

 System.out.println();

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));
```
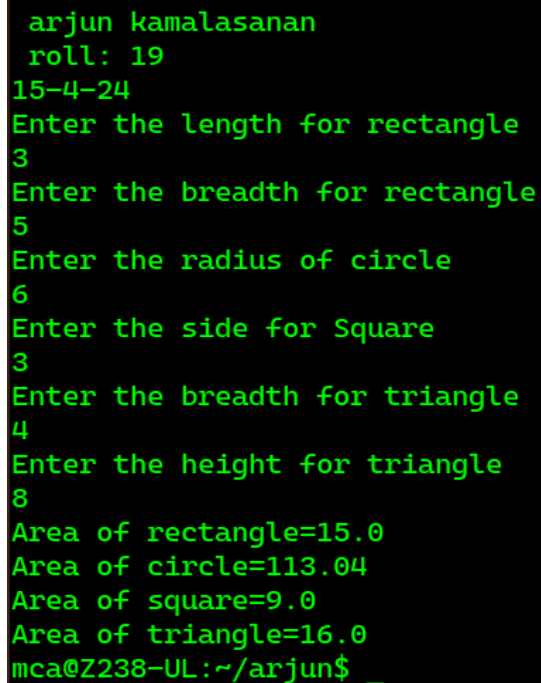
```java
System.out.println("Area of circle="+testObj.cirArea(r));

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:

```
 arjun kamalasanan
 roll: 19
15-4-24
Enter the length for rectangle
3
Enter the breadth for rectangle
5
Enter the radius of circle
6
Enter the side for Square
3
Enter the breadth for triangle
4
Enter the height for triangle
8
Area of rectangle=15.0
Area of circle=113.04
Area of square=9.0
Area of triangle=16.0
mca@Z238-UL:~/arjun$ _
```

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

ArithmeticMain.java

```java
import arithmetic.ArithmeticOperations;

import java.util.Scanner;

public class ArithmeticMain {

 public static void main(String[] args) {


 System.out.println("Arjun kamalasanan");

 System.out.println("23MCA019");

 System.out.println("15-04-24");

 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

```java
package arithmetic;

public interface Addition {
```

```java
public double add(double num1, double num2);

}
```

Subtraction.java

```java
package arithmetic;

public interface Subtraction {

 public double subtract(double num1, double num2);

}
```

Multiplication.java

```java
package arithmetic;

public interface Multiplication {

 public double multiply(double num1, double num2);

}
```
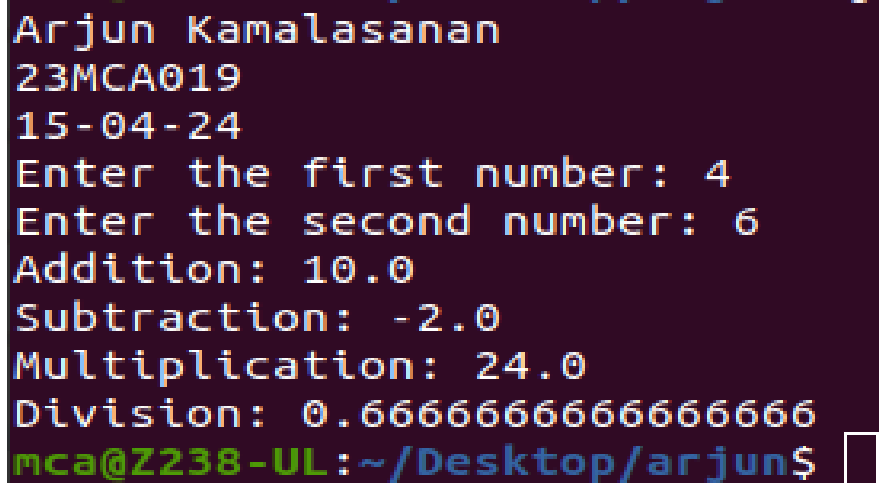
Division.java

```java
package arithmetic;

public interface Division {

 public double divide(double num1, double num2);

}
```

ArithmeticOperations.java

```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;

 }
```

```java
 @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:

```
Arjun Kamalasanan
23MCA019
15-04-24
Enter the first number: 4
Enter the second number: 6
Addition: 10.0
Subtraction: -2.0
Multiplication: 24.0
Division: 0.6666666666666666
mca@Z238-UL:~/Desktop/arjun$
```

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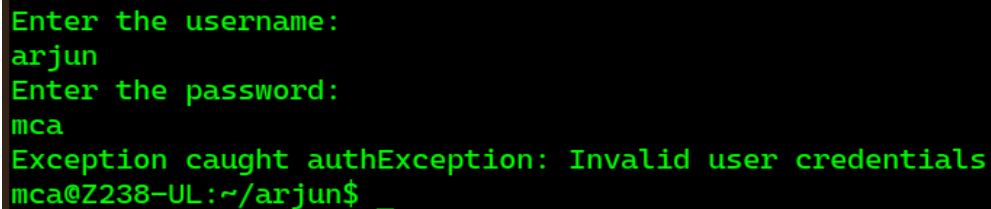
Program:

```
import java.util.Scanner;

class authException extends Exception
{
public authException(String s) {
super(s);
}
}
public class Q3
{
public static void main(String[] args) {


 System.out.println("Name: Arjun kamalasanan");
 System.out.println("Rollno: 19");
 System.out.println("15-4-24");
 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();
```

```java
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:

```
Enter the username:
arjun
Enter the password:
mca
Exception caught authException: Invalid user credentials
mca@Z238-UL:~/arjun$ _
```

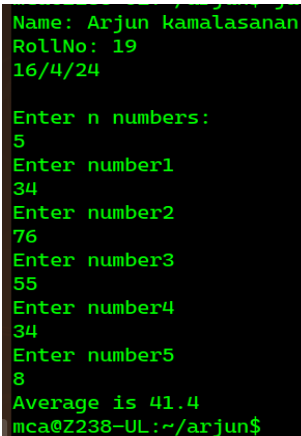**20. Find the average of N positive integers, raising a user defined exception for each negative Input.**

Program:

```java
import java.util.Scanner;

class NegException extends Exception
{
public NegException(String s)
{
super(s);
}
}
public class Q4 {
public static void main(String[] args)
{
 System.out.println("Arjun kamalasanan");
 System.out.println("Rollno: 19");
 System.out.println("Date: 16/04/24");
 System.out.println();
 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();
```

```java
if(a<0)

{

i--;

throw new NegException("Negative numbers not allowed,Try again");

}

else

{

sum=sum+a;

}

}

catch(NegException e)

{

System.out.println("NEGETIVE EXCEPTION OCCURED:"+e);

}

}

avg=sum/n;

System.out.println("Average is "+avg);

sc.close();

}

}
```

Output:

```
Name: Arjun kamalasanan
RollNo: 19
16/4/24

Enter n numbers:
5
Enter number1
34
Enter number2
76
Enter number3
55
Enter number4
34
Enter number5
8
Average is 41.4
mca@Z238-UL:~/arjun$ _
```

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

Program:

```java
import java.util.*;
public class Q11 {
 public static void main(String[] args){
System.out.println("Arjun kamalasanan");
 System.out.println("Rollno: 19");
 System.out.println(" 17/04/2024");
 System.out.println();
 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:

```
Name: Arjun kamalasanan
Rollno: 19
17/6/24

[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
mca@Z238-UL:~/arjun$ _
```

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

Program:

```java
import java.util.Stack;

public class Q12 {

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 stack

range.");

}

}

public static void main(String[] args) {


System.out.println("Arjun kamalasanan");

System.out.println("Rollno: 19");

System.out.println("16/04/2024");

System.out.println();
```
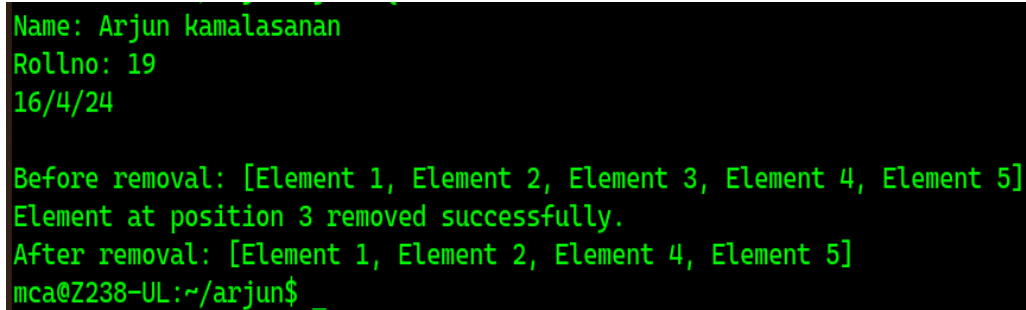
```java
Stack<String> stack = new Stack<>();

stack.push("Element 1");

stack.push("Element 2");

stack.push("Element 3");

stack.push("Element 4");

stack.push("Element 5");

int positionToRemove = 3;

System.out.println("Before removal: " + stack);

removeElementAtPosition(stack, positionToRemove);

System.out.println("After removal: " + stack);

}

}
```

Output:

```
Name: Arjun kamalasanan
Rollno: 19
16/4/24

Before removal: [Element 1, Element 2, Element 3, Element 4, Element 5]
Element at position 3 removed successfully.
After removal: [Element 1, Element 2, Element 4, Element 5]
mca@Z238-UL:~/arjun$ _
```
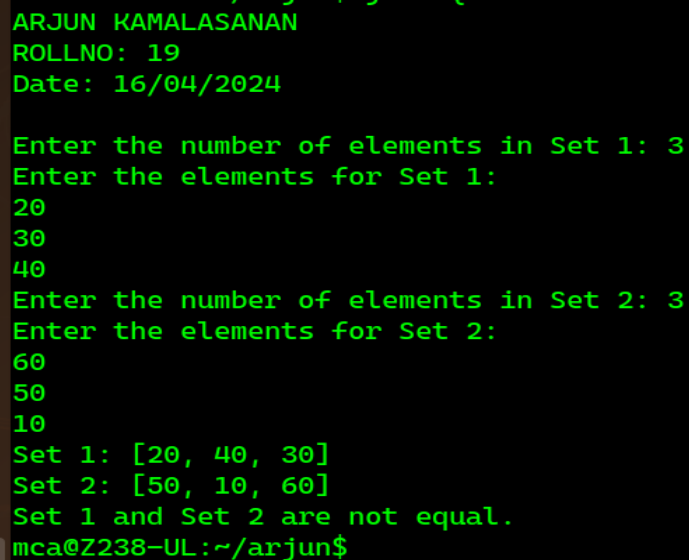
23. Write a Java program to compare two hash set

Program:

import java.util.HashSet;

import java.util.Scanner;

import java.util.Set;

public class Q16 {

public static void main(String[] args) {

System.out.println("ARJUN KAMALASANAN");

System.out.println("Rollno: 19");

System.out.println("Date: 16/04/2024");

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:");

```java
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:

```
ARJUN KAMALASANAN
ROLLNO: 19
Date: 16/04/2024

Enter the number of elements in Set 1: 3
Enter the elements for Set 1:
20
30
40
Enter the number of elements in Set 2: 3
Enter the elements for Set 2:
60
50
10
Set 1: [20, 40, 30]
Set 2: [50, 10, 60]
Set 1 and Set 2 are not equal.
mca@Z238-UL:~/arjun$ _
```