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.

Package

```
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);
}
}
```

Area

```
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(&quot;Name:Merin Babu\n23MCA042\n09-04-2024&quot;);
System.out.println(&quot;Enter the length for rectangle&quot;);
l=s.nextInt();
System.out.println(&quot;Enter the breadth for rectangle&quot;);
h=s.nextInt();
System.out.println(&quot;Enter the radius of circle&quot;);
r=s.nextInt();
System.out.println(&quot;Enter the side for Square&quot;);
a=s.nextInt();
System.out.println(&quot;Enter the breadth for triangle&quot;);
c=s.nextInt();
System.out.println(&quot;Enter the height for triangle&quot;);
d=s.nextInt();
System.out.println(&quot;Area of rectangle=&quot;+testObj.recArea(l,h));
System.out.println(&quot;Area of circle=&quot;+testObj.cirArea(r));
System.out.println(&quot;Area of square=&quot;+testObj.squArea(a));
System.out.println(&quot;Area of triangle=&quot;+testObj.triArea(c,d));
}
}
```

Output:

```
mca@Z238-UL:~/Merinjava$ javac Area.java
mca@Z238-UL:~/Merinjava$ java Area
Name:Merin Babu
23MCA042
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
3
Area of rectangle=6.0
Area of circle=28.26
Area of square=16.0
Area of triangle=3.0
```

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.

Arithmetic

```
import arithmetic.ArithmeticOperations;
import java.util.Scanner;
public class ArithmeticMain {
public static void main(String[] args) {
System.out.println("Name:Merin Babu\n23MCA042\n09-04-2024");

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));
}
}
```

Arithmetic Operations

```
package arithmetic;
public class ArithmeticOperations implements Addition, Subtraction, Multiplication, Division
{public double add(double num1, double num2) {
return num1 + num2;}
public double subtract(double num1, double num2) {
return num1 - num2;
}public double multiply(double num1, double num2) {
return num1 * num2;
}public double divide(double num1, double num2) {
if (num2 == 0) {
throw new ArithmeticException("Division by zero error!");
}
return num1 / num2;
}
}
```

Addition

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

Division

```
package arithmetic;
public interface Division {
public double divide(double num1, double num2);
}
```

Multiplication

```
package arithmetic;
public interface Multiplication {
public double multiply(double num1, double num2);
}
```

Subtraction

```
package arithmetic;
public interface Subtraction {
public double subtract(double num1, double num2);
}
```

Output:

```
mca@Z238-UL:~/Merinjava$ javac ArithmeticMain.java
mca@Z238-UL:~/Merinjava$ java ArithmeticMain
Name:Merin Babu
23MCA042
09-04-2024
Enter the first number: 12
Enter the second number: 6
Addition: 18.0
Subtraction: 6.0
Multiplication: 72.0
Division: 2.0
```

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:Merin Babu\n23MCA042\n09-04-2024");
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:

```
mca@Z238-UL:~/Merinjava$ javac Authentication.java
mca@Z238-UL:~/Merinjava$ java Authentication
Name:Merin Babu
23MCA042
09-04-2024

Enter the username:
merinbabu042
Enter the password:
12345678
Exception caught authException: Invalid user credentials
```

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 Npos {
public static void main(String[] args)
{
System.out.println("Merin Babu\n23MCA042 \n16-04-24\n");
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();
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:

```
mca@Z238-UL:~/Merinjava$ javac Npos.java
mca@Z238-UL:~/Merinjava$ java Npos
Merin Babu
23MCA042
16-04-24


Enter n numbers:
3
Enter number1
12
Enter number2
34
Enter number3
55
Average is 33.666666666666664
```

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

Program:

```
import java.util.*;
public class Remove{
public static void main(String[] args){
System.out.println("Merin Babu\n23MCA042 \n16-04-24\n");
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:

```
mca@Z238-UL:~/Merinjava$ javac Remove.java
mca@Z238-UL:~/Merinjava$ java Remove
Merin Babu
23MCA042
16-04-24


[Olympics Medals, Gold, Silver, Bronze]
[Olympics Medals, Gold, Silver]
[Olympics Medals, Gold]
[Olympics Medals]
[]
```

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

Program:

```
import java.util.Stack;
public class Element{
public static void removeElementAtPosition(Stack<String> stack, int position) {
if (position >= 1 && position <= stack.size()) {
Stack<String> tempStack = new Stack<>();
for (int i = 1; i < position; i++) {
tempStack.push(stack.pop());}
stack.pop();
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("Merin Babu\n23MCA042 \n16-04-24\n");
System.out.println();
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:

```
mca@Z238-UL:~/Merinjava$ javac Element.java
mca@Z238-UL:~/Merinjava$ java Element
Merin Babu
23MCA042
16-04-24


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]
```

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("Merin Babu\n23MCA042 \n16-04-24\n");
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@Z238-UL:~/Merinjava$ javac Hash.java
mca@Z238-UL:~/Merinjava$ java Hash
Merin Babu
23MCA042
16-04-24


Enter the number of elements in Set 1: 2
Enter the elements for Set 1:
2
1
Enter the number of elements in Set 2: 3
Enter the elements for Set 2:
5
4
3
Set 1: [1, 2]
Set 2: [3, 4, 5]
Set 1 and Set 2 are not equal.
```