OBJECT ORIENTED PROGRAMMING LAB (LAB RECORD)

SUBMITTED BY:
ALEENA JOSEPH
MCA BATCH A S2
ROLL NO: 08
Reg.No: AJC20MCA-2008

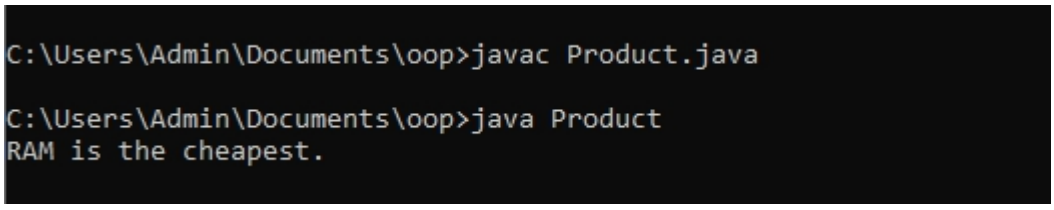
1. **Define a class 'product' with data members pcode, pname and price. Create 3 objects of the class and find the product having the lowest price.**

```
import java.util.*;
public class Product
{
int pcode;
String pname;
int price;
public static void main(String[] args)
{
int smallest;
Product p1 = new Product();
Product p2 = new Product();
Product p3 = new Product();
p1.pcode=1001;
p1.pname="RAM";
p1.price=7000;
p2.pcode=1002;
p2.pname="Processor";
```

```
p2.price=37000;

p3.pcode=1003;

p3.pname="SSD";

p3.price=16700;

if(p1.price<p2.price)

{

if(p3.price<p1.price)

{

smallest = p3.price;

System.out.println(p3.pname+ " is the cheapest.");

}

else

{

smallest = p1.price;

System.out.println(p1.pname+ " is the cheapest.");

}

}

else

{
```

```
if(p2.price<p3.price)

{

smallest = p2.price;

System.out.println(p2.pname+ " is the cheapest.");

}

else

{

smallest = p3.price;

System.out.println(p3.pname+ " is the cheapest.");

}

}

}

}
```

OUTPUT



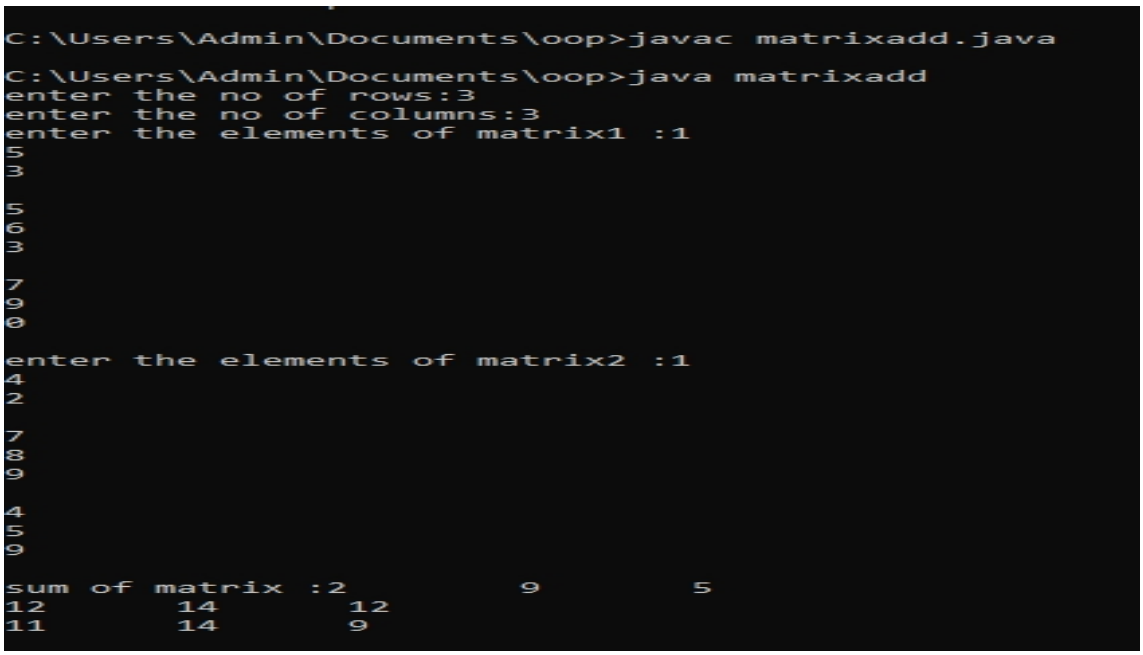
2. Read 2 matrices from the console and perform matrix addition.

```
import java.util.*;
class matrixadd
{
public static void main(String[] args)
{
int row,col,i,j;
Scanner sc=new Scanner(System.in);
System .out.print("enter the no of rows:");
row=sc.nextInt();
System .out.print("enter the no of columns:");
col=sc.nextInt();
int mat1[][]=new int[row][col];
int mat2[][]=new int[row][col];
int mat3[][]=new int[row][col];
System.out.print("enter the elements of matrix1 :");
for(i=0;i<row;i++)
{
for(j=0;j<col;j++)
```

```
{
mat1[i][j]=sc.nextInt();
}
System.out.println();
}
System.out.print("enter the elements of matrix2 :");
for(i=0;i<row;i++)
{
for(j=0;j<col;j++)
{
mat2[i][j]=sc.nextInt();
}
System.out.println();
}
for(i=0;i<row;i++)
{
for(j=0;j<col;j++)
{
mat3[i][j]=mat1[i][j]+mat2[i][j];
}
}
```

```
System.out.print("sum of matrix :");

for(i=0;i<row;i++)

{

for(j=0;j<col;j++)

{

System.out.print(mat3[i][j]+"\t");

}

System.out.println();

}

}
```

OUTPUT

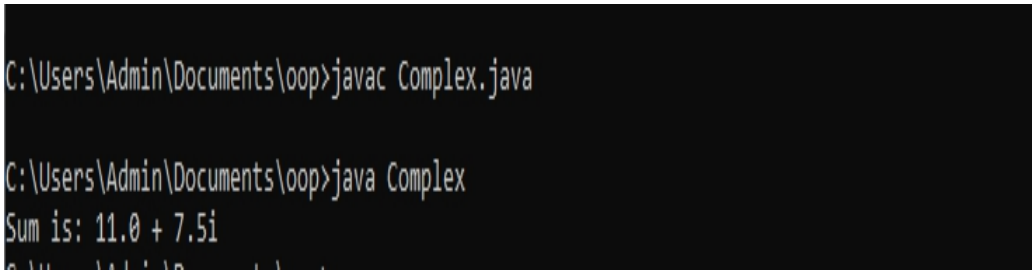


3. Add complex numbers

```
public class Complex
{
double a, b;
Complex(double r, double i)
{
this.a = r;
this.b = i;
}
public static Complex sum(Complex c1, Complex c2)
{
Complex temp = new Complex(0, 0);
temp.a = c1.a + c2.a;
temp.b = c1.b+ c2.b;
return temp;
}
public static void main(String args[])
{
Complex c1 = new Complex(5, 4);
```

```
Complex c2 = new Complex(6, 3.5);

Complex temp = sum(c1, c2);

System.out.printf("Sum is: "+ temp.a+" + "+ temp.b +"i");

}

}
```

OUTPUT



4. Read a matrix from the console and check whether it is symmetric or not.

```
import java.util.Scanner;
public class Symmetric
{
public static void main(String[] args)
{
Scanner sc = new Scanner(System.in);
System.out.println("Enter the no. of rows : ");
int rows = sc.nextInt();
System.out.println("Enter the no. of columns : ");
int cols = sc.nextInt();
int matrix[][] = new int[rows][cols];
System.out.println("Enter the elements :");
for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
matrix[i][j] = sc.nextInt();
```

```
}
}
System.out.println("Printing the input matrix :");
for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
System.out.print(matrix[i][j]+"\t");
}
System.out.println();
}
if(rows != cols)
{
System.out.println("The given matrix is not a square matrix, so it can't be symmetric.");
}
else
{
boolean symmetric = true;
for (int i = 0; i < rows; i++)
{
```

```
for (int j = 0; j < cols; j++)
{
if(matrix[i][j] != matrix[j][i])
{
symmetric = false;
break;
}
}
}
if(symmetric)
{
System.out.println("The given matrix is symmetric...");
}
else
{
System.out.println("The given matrix is not symmetric...");
}
}
sc.close();
}
}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac Symmetric.java

C:\Users\Admin\Documents\oop>java Symmetric
Enter the no. of rows :
3
Enter the no. of columns :
3
Enter the elements :
1
3
5
7
9
78
9
0
5
Printing the input matrix :
1       3       5
7       9       78
9       0       5
The given matrix is not symmetric...
```

5. Program to Sort strings

```
public class sortstring
{
public static void main(String[] args)
{
String names[]={"amal","jyothi","college","of","engineering"};
String temp;
int n= names.length;
int i;
int j;
for(i=0;i<n;i++)
{
for(j=i+1;j<n;j++)
{
if(names[i].compareTo(names[j])>0)
{
temp=names[i];
names[i]=names[j];
names[j]=temp;
```

```
}
}
}
System.out.println("the sorted array of string is :");
for(i=0;i<n;i++)
{
System.out.println(names[i]);
}
}
}
```

OUTPUT

6. Search an element in an array.

```
import java.util.*;
public class searchele{
public static void main(String[] args)
{
int n,i,b,flag=0;
Scanner s=new Scanner(System.in);
System.out.println("enter the number of elements for the array :");
n=s.nextInt();
int a[]=new int[n];
System.out.println("enter the elements of the array :");
for(i=0;i<n;i++)
{
a[i]=s.nextInt();
}
System.out.println("enter the element u want to search :");
b=s.nextInt();
for(i=0;i<n;i++)
{
```

```
if(a[i]==b)
{
flag=1;
break;
}
else
{
flag=0;
}
}
if(flag==1)
{
System.out.println("element found at position :"+(i+1));
}
else
{
System.out.println("element not found");
}
}
}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac searchele.java

C:\Users\Admin\Documents\oop>java searchele
enter the number of elements for the array :
5
enter the elements of the array :
1
4
5
7
10
enter the element u want to search :
99
element not found
```

7. Perform string manipulations.

```
public class Sample_String
{
public static void main(String[] args)
{
String str_Sample = "RockStar";
System.out.println("Length of String: " + str_Sample.length());
System.out.println("Character at position 5: " + str_Sample.charAt(5));
System.out.println("EndsWith character 'r': " +
  str_Sample.endsWith("r"));
System.out.println("Replace 'Rock' with 'Duke': " +
str_Sample.replace("Rock", "Duke"));
}
}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac Sample_String.java

C:\Users\Admin\Documents\oop>java Sample_String
Length of String: 8
Character at position 5: t
EndsWith character 'r': true
Replace 'Rock' with 'Duke': DukeStar
```

8. Program to create a class for Employee having attributes eNo, eName eSalary. Read n employ information and Search for an employee given eNo, using the concept of Array of Objects.

```
import java.util.Scanner;
public class Employee
{
int empid;
String name;
float salary;
public void getInput()
{
Scanner in = new Scanner(System.in);
System.out.print("Enter the empid :: ");
empid = in.nextInt();
System.out.print("Enter the name :: ");
name = in.next();
System.out.print("Enter the salary :: ");
salary = in.nextFloat();
}
```

```
public void display()
{
System.out.println("Employee id = " + empid);
System.out.println("Employee name = " + name);
System.out.println("Employee salary = " + salary);
}
public static void main(String[] args)
{
Employee e[] = new Employee[5];
for(int i=0; i<5; i++)
{
e[i] = new Employee();
e[i].getInput();
}
System.out.println("**** Data Entered as below ****");
for(int i=0; i<5; i++)
{
e[i].display();
}
}
}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac Employee.java

C:\Users\Admin\Documents\oop>java Employee
Enter the empid :: 1001
Enter the name :: ALEENA
Enter the salary :: 25000
Enter the empid :: 1002
Enter the name :: HIMA
Enter the salary :: 10000
Enter the empid :: 1003
Enter the name :: AMALA
Enter the salary :: 40000
Enter the empid :: 1004
Enter the name :: AMEENA
Enter the salary :: 45000
Enter the empid :: 1005
Enter the name :: RANI
Enter the salary :: 13000
**** Data Entered as below ****
Employee id = 1001
Employee name = ALEENA
Employee salary = 25000.0
Employee id = 1002
Employee name = HIMA
Employee salary = 10000.0
Employee id = 1003
Employee name = AMALA
Employee salary = 40000.0
Employee id = 1004
Employee name = AMEENA
Employee salary = 45000.0
Employee id = 1005
Employee name = RANI
Employee salary = 13000.0
```

9. Area of different shapes using overloaded functions

```
public class shape
{
int side,as,ar;
public void area(int a)//area of square
{
side=a;
as=a*a;
System.out.println("area of square is"+as);
}
public void area(double r)//area of circle
{
double radi=r;
double ac=(22/7)*radi*radi;
System.out.println("area of circle is"+ac);
}
public void area(int l,int w)//area of rectangle
{
 int len=l;
```

```
int wid=w;
ar=len*wid;
System.out.println("area of rectangle"+ar);
}
public void area(int h,double r)//area of cylinder
{
 int he=h;
double rad=r;
double acy=(2*(22/7)*rad*he)+((22/7)*rad*rad);
System.out.println("area of cylinder"+acy);
}
public static void main(String[] args)
{
shape s=new shape();
s.area(4);//area of square
s.area(5.52);//area of circle
s.area(5,4);//area of rectangle
s.area(5,4.5);      //area of cylinder
}
}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac shape.java
shape.java:33: error: reached end of file while parsing
}
 ^
1 error

C:\Users\Admin\Documents\oop>javac shape.java

C:\Users\Admin\Documents\oop>java shape
area of square is16
area of circle is91.41119999999998
area of rectangle20
area of cylinder195.75
```

10. Create a class 'Employee' with data members Empid, Name, Salary, Address and constructors to initialize the data members. Create another class 'Teacher' that inherit the properties of class employee and contain its own data members department, Subjects taught and constructors to initialize these data members and also include display function to display all the data members. Use array of objects to display details of N teachers.

```
import java.util.*;

class Employee

 {

int empid;

String name,address;

double salary;

public Employee(int empid, String name, String address, double salary)
{

this.empid = empid;

this.name = name;

this.address = address;

this.salary = salary;

}

}
```

```
public class Teacher extends Employee

{

String subject,department;

public Teacher(int empid, String name, String address, double salary,String department,String subject )

{

super(empid, name, address, salary);

this.subject = subject;

this.department = department;

}

void display()

{

System.out.println("Empid : "+this.empid+" Name : "+this.name+" Salary : "+this.salary+" Address : "+this.address+" department : "+this.department+" Subjects : "+this.subject);

}

public static void main(String[] args)

{

// TODO Auto-generated method stub

Scanner sc=new Scanner(System.in);

int n;

System.out.println("Enter number of Teachers : ");
```

```
n=sc.nextInt();
Teacher obj[]=new Teacher[n];
for(int i=0;i<n;i++)
{
int j = i+1;
System.out.print("Enter Empid of teacher "+j+" : ");
int Empid = sc.nextInt();
System.out.print("Enter Name of teacher "+j+" : ");
String Name = sc.next();
System.out.print("Enter Salary of teacher "+j+" : ");
double Salary = sc.nextDouble();
System.out.print("Enter Address of teacher "+j+" : ");
String Address = sc.next();
System.out.print("Enter department of teacher "+j+" : ");
String department =sc.next();
System.out.print("Enter Subjects of teacher "+j+" : ");
String Subjects =sc.next();
obj[i] = new Teacher(Empid, Name, Address, Salary, department, Subjects);
}
```

```
System.out.println("\n-----------------------------------------------------------------\n");

System.out.println("Teacher's List \n");

for(int i=0;i<n;i++)

{

obj[i].display();

}

}

}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\08-06-2021>java Teacher
Enter number of Teachers :
2
Enter Empid of teacher 1 : 1
Enter Name of teacher 1 : Rini
Enter Salary of teacher 1 : 40000
Enter Address of teacher 1 : Alappuzha
Enter department of teacher 1 : Mca
Enter Subjects of teacher 1 : Network
Enter Empid of teacher 2 : 2
Enter Name of teacher 2 : Vivin
Enter Salary of teacher 2 : 50000
Enter Address of teacher 2 : Trivandrum
Enter department of teacher 2 : Mca
Enter Subjects of teacher 2 : Java

-----------------------------------------------------------------

Teacher's List

Empid : 1 Name : Rini Salary : 40000.0 Address : Alappuzha department : Mca Subjects : Network
Empid : 2 Name : Vivin Salary : 50000.0 Address : Trivandrum department : Mca Subjects : Java
```

11. Create a class 'Person' with data members Name, Gender, Address, Age and a constructor to initialize the data members and another class 'Employee' that inherits the properties of class Person and also contains its own data members like Empid, Company_name, Qualification, Salary and its own constructor. Create another class 'Teacher' that inherits the properties of class Employee and contains its own data members like Subject, Department, Teacherid and also contain constructors and methods to display the data members. Use array of objects to display details of N teachers.

```
import java.util.Scanner;
class Person
{
String name,gender,address;
int age;
public Person(String name, String gender, String address, int age)
{
super();
this.name = name;
this.gender = gender;
this.address = address;
this.age = age;
}
```

```
}
class Employee extends Person
{
int empid;
String company_name,qualification;
double salary;
public Employee(String name, String gender, String address, int age, int empid, String company_name,String qualification, double salary)
{
super(name, gender, address, age);
this.empid = empid;
this.company_name = company_name;
this.qualification = qualification;
this.salary = salary;
}
}
class Teacher extends Employee
{
String subject,department;
int teacherid;
public Teacher(String name, String gender, String address, int age, int empid, String company_name,String qualification, double salary, String subject, String department, int teacherid)
{
```

```
super(name, gender, address, age, empid, company_name, qualification, salary);

this.subject = subject;

this.department = department;

this.teacherid = teacherid;

}

void display()

{

System.out.println("....Personal details...");

System.out.println(" Name : "+this.name+" Gender : "+this.gender+" Age :"+this.age);

System.out.println("...Employee details....");

System.out.println("Empid : "+this.empid +" company_name : "+this.company_name+" Salary : "+this.salary+" Address : "+this.address+" qualification : "+this.qualification);

System.out.println("...Teacher's details...");

System.out.println(" teacherid : "+this.teacherid+ " department : "+this.department+" Subjects : "+this.subject);

}

}

public class Main

{

public static void main(String[] args)

{
```

```
Scanner s=new Scanner(System.in);
int n;
System.out.println("Enter number of Teachers : "); n=s.nextInt();
Teacher obj[]=new Teacher[n];
for(int i=0;i<n;i++)
{
System.out.println("Enter the person name:"); String nam1=s.next();
System.out.println("Enter the Gender: "); String gen1=s.next();
System.out.println("Enter the Address: "); String adr1=s.next();
System.out.println("Enter the Age:"); int age1=s.nextInt();
System.out.println("Enter the Employee id: ");
int id1=s.nextInt();
System.out.println("Enter the Company name: ");
String cname1=s.next();
System.out.println("Enter the Salary:");
double sal1=s.nextDouble();
System.out.println("Enter the Qualification:");
String qu1=s.next();
System.out.println("Enter the Teacher id: ");
int tid1=s.nextInt();
System.out.println("Enter the Department:");
String dept1=s.next();
System.out.println("Enter the Subject:");
```

```
String sub1=s.next();
obj[i]=new
Teacher(nam1,gen1,adr1,age1,id1,cname1,qu1,sal1,sub1,dept1,tid1);
}
System.out.println("\n----------\n");
for(int i=0;i<n;i++)
{
obj[i].display();
}
}
}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\08-06-2021>java Main
Enter number of Teachers :
1
Enter the person name:
Rini
Enter the Gender:
Female
Enter the Address:
Alappuzha
Enter the Age:
26
Enter the Employee id:
5
Enter the Company name:
AJCE
Enter the Salary:
40000
Enter the Qualification:
MCA
Enter the Teacher id:
2
Enter the Department:
MCA
Enter the Subject:
Network

------------------------------------------------------------------------

....Personal details...
 Name : Rini Gender : Female Age :26
...Employee details....
Empid : 5 company_name : AJCE Salary : 40000.0 Address : Alappuzha qualification : MCA
...Teacher's details...
 teacherid : 2 department : MCA Subjects : Network
```

12. Write a program has class Publisher, Book, Literature and Fiction. Read the information and print the details of books from either the category, using inheritance.

```
import java.util.Scanner;
class Publisher
{
String Pubname;
Publisher()
{
Scanner s=new Scanner(System.in);
System.out.println("Enter publisher name");
Pubname=s.next();
}
}
class Book extends Publisher
{
String title, author;
int price;
Book()
{
Scanner s=new Scanner(System.in);
System.out.println("Enter Title of the book");
```

```
title=s.next();
System.out.println("Enter Author's name");
author=s.next();
System.out.println("Enter price");
price=s.nextInt();
}
}
class Literature extends Book
{
Literature()
{
System.out.println("Literature Books");
}
void display()
{
System.out.println("Publisher name: "+Pubname);
System.out.println("Title of the book: "+title);
System.out.println("Author's name: "+author);
System.out.println("Price: "+price);
}
}
class Fiction extends Literature
{
```

```
Fiction()
{
System.out.println("Friction Books");
}
void display()
{
 super.display();
}
public static void main(String args[])
{
int n;
Scanner s=new Scanner(System.in);
System.out.println("Enter the No of literature book: ");
int a=s.nextInt();
Literature L[]=new Literature[a];
for(int i=0;i<a;i++)
{
L[i]=new Literature();
}
System.out.println("Enter the No of Fiction book: ");
int b=s.nextInt();
Fiction F[]=new Fiction[b];
for(int i=0;i<b;i++)
```

```
{
F[i]=new Fiction();
}
int no;
System.out.println("Enter your choice of book");
no=s.nextInt();
int type =no;
switch (no)
{
case 1:
System.out.println(".....Details of literature books");
for(int i=0;i<a;i++)
L[i].display();
break;
case 2:
System.out.println(".....Details of fiction books");
for(int i=0;i<b;i++)
F[i].display();
break;
default:
System.out.println("Wrong input");
}
}}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\08-06-2021>java Fiction
Enter the No of literature book:
1
Enter publisher name
Murali
Enter Title of the book
Arivu
Enter Author's name
Murali
Enter price
250
Literature Books
Enter the No of Fiction book:
```

13. Create classes Student and Sports. Create another class Result inherited from Student and Sports. Display the academic and sports score of a student.

```
interface student
{
void stresullt();
}
interface sports
{
void spresult();
}
class result implements student,sports
{
public void spresult()
{
String hundred="First";
String twohundred="Second";
String fivehundred="First";
String relay="Second";
System.out.println("Sports Result");
System.out.println("Hundred Meter:"+hundred);
System.out.println("Two Hundred Meter:"+twohundred);
System.out.println("Five Hundred Meter:"+fivehundred);
```

```
System.out.println("Relay:"+relay);
}
public void stresullt()
{
int physics=30;
int chemistry=40;
int maths=45;
int english=50;
int computer=50;
System.out.println("Marks");
System.out.println("Physics:"+physics);
System.out.println("Chemistry:"+chemistry);
System.out.println("Mathematics:"+maths);
System.out.println("English:"+english);
System.out.println("Computer:"+computer);
}
public static void main(String[] args)
{
result r = new result();
r.stresullt();
r.spresult();
}}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\15-6-2021>java result
Marks
Physics:30
Chemistry:40
Mathematics:45
English:50
Computer:50
Sports Result
Hundred Meter:First
Two Hundred Meter:Second
Five Hundred Meter:First
Relay:Second
```

14. Create an interface having prototypes of functions area() and perimeter(). Create two classes Circle and Rectangle which implements the above interface. Create a menu driven program to find area and perimeter of objects.

```
import java.util.Scanner;
interface Shape
{
void input();
void area();
void perimeter();
}
class Circle implements Shape
{
int r = 0;
double pi = 3.14, ar = 0,per=0;
public void input()
{       Scanner s = new Scanner(System.in);
System.out.print("Enter radius of circle:");
r= s.nextInt();
}
public void area()
```

```
{
ar = pi * r * r;
System.out.println("Area of circle:"+ar);
}
public void  perimeter()
{
per = 2 * pi * r;
System.out.println("Perimeter of circle:"+per);
}
}
class Rectangle implements Shape
{
int l = 0, b = 0;
double ar,per;
public void input()
{    Scanner s = new Scanner(System.in);
System.out.print("Enter length of rectangle:");
l = s.nextInt();
System.out.print("Enter breadth of rectangle:");
b = s.nextInt();
}
```

```
public void area()
{
ar = l * b;
System.out.println("Area of rectangle:"+ar);
}
public void perimeter()
{
per = 2 * (l + b);
System.out.println("Perimeter of rectangle:"+per);
}
}
public class shapes
{
public static void main(String[] args)
{
int n;
Scanner s = new Scanner(System.in);
Rectangle obj1 = new Rectangle();
Circle obj2 = new Circle();

System.out.println("1.Area of circle");
```

```
System.out.println("2.Perimeter of circle");
System.out.println("3.Area of rectangle");
System.out.println("4.Perimeter of rectangle");
System.out.println("Enter your option:");
n= s.nextInt();
switch(n)
{
case 1:
obj2.input();
obj2.area();
break;
case 2:
obj2.input();
obj2.perimeter();
break;
case 3:
obj2.input();
obj2.area();
break;
case 4:
obj2.input();
```

```
obj2.perimeter();

break;

default:

System.out.println("Invalid option");

}

}

}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\Java>javac shapes.java

D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\Java>java shapes
1.Area of circle
2.Perimeter of circle
3.Area of rectangle
4.Perimeter of rectangle
Enter your option:
1
Enter radius of circle:3
Area of circle:28.259999999999998
```

15. Prepare bill with the given format using calculate method from interface. Order No.

```
interface bill
{
int productdetails();
}
class product1 implements bill
{
int id = 101,quantity= 2,unit=25,total=0;
String name="A";
public int productdetails()
{
total = quantity * unit;
System.out.println("Product Id :"+id);
System.out.println("Name :"+name);
System.out.println("Quantity :"+quantity);
System.out.println("Unit price :"+unit);
System.out.println("Total :"+total);
return(total);
```

```
}
}
class product2 implements bill
{
int id = 102,quantity= 1,unit=100,total=0;
String name="B";
public int productdetails()
{
total = quantity * unit;
System.out.println("Product Id :"+id);
System.out.println("Name :"+name);
System.out.println("Quantity :"+quantity);
System.out.println("Unit price :"+unit);
System.out.println("Total :"+total);
return(total);
}
}
public class productbill
{
public static void main(String[] args)
{
```

```
product1 p1 = new product1();

product2 p2 = new product2();

int t1= p1.productdetails();

int t2= p2.productdetails();

int t3=t1+t2;

System.out.println("Net. Amount :"+t3);

}

}
```

OUTPUT

```
C:\Users\Admin\Documents\oop>javac productbill.java

C:\Users\Admin\Documents\oop>java productbill
Product Id :101
Name :A
Quantity :2
Unit price :25
Total :50
Product Id :102
Name :B
Quantity :1
Unit price :100
Total :100
Net. Amount :150
```

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

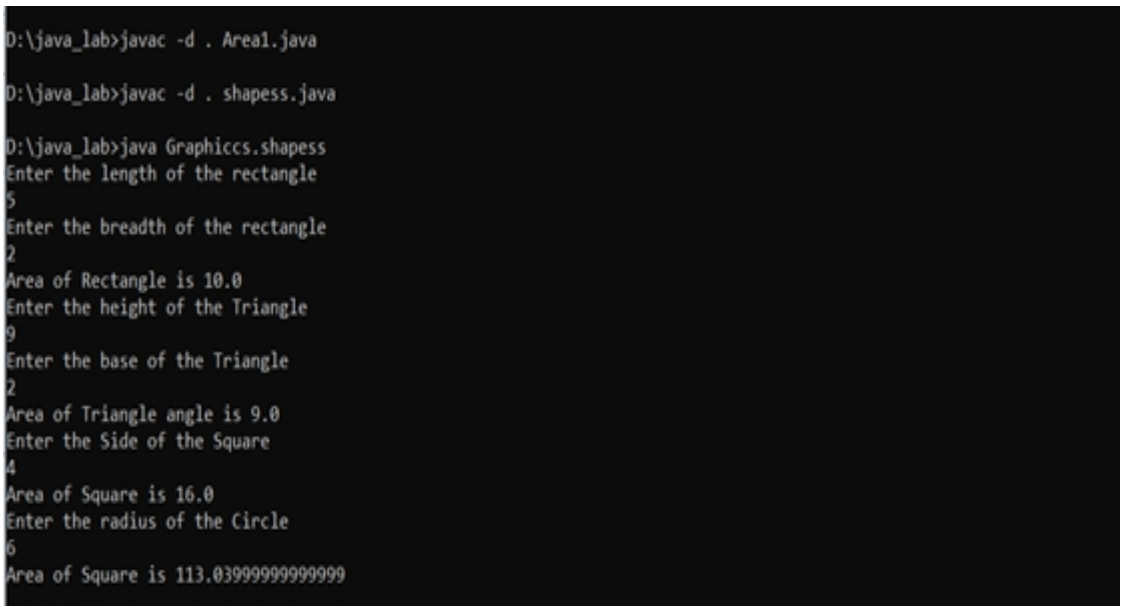
```
Package Graphiccs;
interface Area1
{
public void Rectangle();
public void Triangle();
public void Square();
public void Circle();
public void getRect();
public void getTri();
public void getSqr();
public void getCrl();
}
 //shapes.java
 package
 Graphiccs;
 import
 java.util.*;
 public class shapess implements Area1
```

```
{
double lr,lb,ra,th,tb,ta,saa,sa,cr,cc;
public void getrect()
{
Scanner ab= new Scanner(System.in);
System.out.println("Enter the length of the rectangle");
lr=ab.nextInt();
System.out.println("Enter the breadth of the
rectangle");
lb=ab.nextInt();

}
public void rectangle()
{
ra=lr*lb;
System.out.println("Area of Rectangle is "+ra);
}
public void getTri()
{
Scanner cb= new Scanner(System.in);
System.out.println("Enter the height of the Triangle");
th=cb.nextInt();
System.out.println("Enter the base of the Triangle");
```

```
tb=cb.nextInt();
}
public void Triangle()
{
ta=0.5*th*tb;
System.out.println("Area of Triangle angle is "+ta);
}
public void getSqr()
{
Scanner sq= new Scanner(System.in);
System.out.println("Enter the Side ofthe Square");
sa=sq.nextInt();
}
public void Square()
{
saa=sa*sa;
System.out.println("Area of Square is "+saa);
}

public void getCrl()
{
Scanner sc= new Scanner(System.in);

System.out.println("Enter the radius ofthe Circle");
```

```
cc=sc.nextInt();
}
public void Circle()
{
cr=3.14*cc*cc;
System.out.println("Area of Square is "+cr);
}
public static void main(String[] args)
{
shapess o= new shapess();
o.getrect();
o.rectangle();
o.getTri();
o.Triangle();
o.getSqr();
o.Square();
o.getCrl();
o.Circle();
}
}
```

OUTPUT


D:\java_lab>javac -d . Area1.java
D:\java_lab>javac -d . shapess.java
D:\java_lab>java Graphiccs.shapess
Enter the length of the rectangle
5
Enter the breadth of the rectangle
2
Area of Rectangle is 10.0
Enter the height of the Triangle
9
Enter the base of the Triangle
2
Area of Triangle angle is 9.0
Enter the Side of the Square
4
Area of Square is 16.0
Enter the radius of the Circle
6
Area of Square is 113.03999999999999

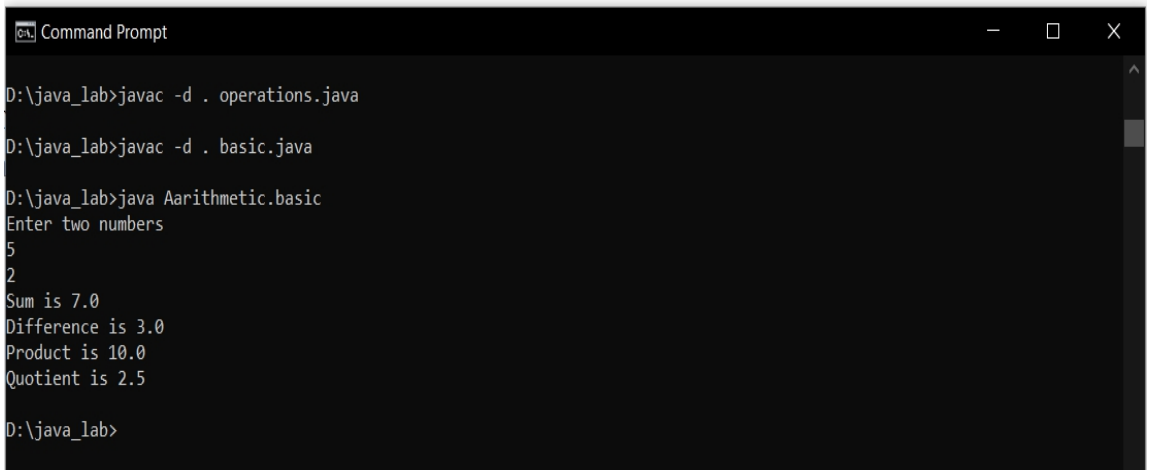
17. Create an Arithmetic package that has classes and interfaces for the 4 basic arithmetic operations. Test the package by implementing all operations ontwo given numbers.

```
package Aarithmetic;

interface operations
{
public void input();
public void add();
public void substract();
public void multiply();
public void division();
}
package Aarithmetic;
import java.util.*;
public class basic implements operations
{
double a,b,ad,dif,mult,div;
public void input()
{
Scanner ab=new Scanner(System.in);
System.out.println("Enter two numbers");
a=ab.nextInt();
b=ab.nextInt();
}
```

```
public void add()
{
ad=a+b;
System.out.println("Sum is "+ad);
}
public void substract()
{

dif=a-b;
System.out.println("Difference is "+dif);
}
public void multiply()
{
mult=a*b;
System.out.println("Product is "+mult);
}
public void division()
{
div=a/b;
System.out.println("Quotient is "+div);
}
public static void main(String[] args)
{
basic o=new basic();
o.input();
o.add();
o.substract();
```

```
o.multiply();
o.division();
}
}
```

OUTPUT



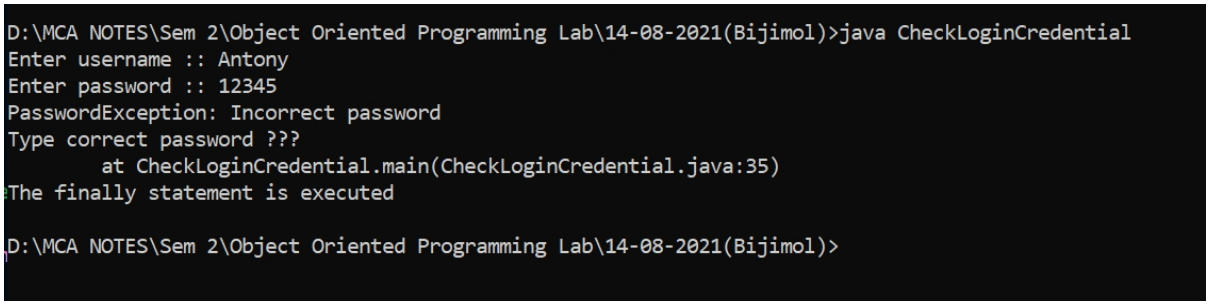
18. Write a user defined exception class to authenticate the user name and password.

```
import java.util.Scanner;
class UsernameException extends Exception
{
 public UsernameException(String msg)
{
super(msg);
}
}
class PasswordException extends Exception
{
 public PasswordException(String msg)
{
super(msg);
}
}
public class CheckLoginCredential
 {
 public static void main(String[] args)
{
Scanner s = new Scanner(System.in);
```

```
String username, password;


System.out.print("Enter username :: ");
username = s.nextLine();
System.out.print("Enter password :: ");
password = s.nextLine();
int length = username.length();
try
{
if(length < 6)
throw new UsernameException("Username must be greater than 6 characters ???");
else if(!password.equals("hello"))
throw new PasswordException("Incorrect password\nType correct password ???");
else
System.out.println("Login Successful !!!");
}
catch (UsernameException u)
{
u.printStackTrace();
}
catch (PasswordException p)
```

```
{
p.printStackTrace();
}
finally
{
System.out.println("The finally statement is executed");
}
}
}
```

OUTPUT



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

```
import java.util.Scanner;
import java.util.InputMismatchException;
public class TestDemo
{
public static void main(String args[])
{
double total = 0, N, userInput;
Scanner input = new Scanner(System.in);
while (true)
{
System.out.print("Enter how many numbers(N) to calculate average:");
userInput = input.nextDouble();
if (userInput > 0)
{
N = userInput;
break;
}
else
System.out.println("N must be positive.");
}
```

```
for (int i = 0; i < N; i++)
{
while (true)
{
System.out.print("Enter number:");
try
{
userInput = input.nextDouble();
total += userInput;
break;
}
catch (InputMismatchException e)
{
input.nextLine();
System.out.println("Input must bea number. Try again");
}
}
}
System.out.println("Average: "+ total / N);
}
}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\14-08-2021(Bijimol)>javac TestDemo.java

D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\14-08-2021(Bijimol)>java TestDemo
Enter how many numbers(N) to calculate average:5
Enter number:2
Enter number:5
Enter number:7
Enter number:14
Enter number:12
Average: 8.0
```

20. Define 2 classes; one for generating multiplication table of 5 and other for displaying first N prime numbers. Implement using threads. (Thread class)

```
import java.util.*;
class ThreadA extends Thread
{
public void run( )
{
int n = 5;
for (int i = 1; i <= 10; ++i)
System.out.println(n + " * " + i +" = " + n * i);
System.out.println("Exiting from Thread A ...");
}
}
class ThreadB extends Thread
{
public void run( )
{
Scanner sc = new Scanner(System.in);
int  i,n,p,count,flag;
System.out.println("Enter the number of prime terms you want!");
n=sc.nextInt();
```

```
System.out.println("First "+n+" prime numbers are :-");


p=2;
i=1;
while(i<=n)
{
flag=1;
for(count=2;count<=p-1;count++)
{
if(p%count==0)
{
flag=0;
break;
}
}
if(flag==1)
{
System.out.print(p+" ") ;
i++;
}
p++;
}
}
```

```
//System.out.println("Exiting from Thread B ...");
}
public class Demonstration_111
{
public static void main(String args[])
{
ThreadA a = new ThreadA();
ThreadB b = new ThreadB();
a.start();
b.start();
System.out.println("... Multithreading is over ");
}
}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\14-08-2021(Bijimol)>java Demonstratio
... Multithreading is over
5 * 1 = 5
5 * 2 = 10
5 * 3 = 15
5 * 4 = 20
5 * 5 = 25
5 * 6 = 30
5 * 7 = 35
5 * 8 = 40
5 * 9 = 45
5 * 10 = 50
Exiting from Thread A ...
Enter the number of prime terms you want!
4
First 4 prime numbers are :-
2 3 5 7
```

21. Define 2 classes; one for generating Fibonacci numbers and other for displaying even numbers in a given range. Implement using threads. (Runnable Interface)

```
public class Mythread
{
public static void main(String[] args)
{
Runnable r = new Runnable1();
Thread t = new Thread(r);
t.start();
Runnable r2 = new Runnable2();
Thread t2 = new Thread(r2);
t2.start();
}
}
class Runnable2 implements Runnable
{
public void run(){
for(int i=0;i<11;i++){
if(i%2 == 1)
System.out.println(i);
}
```

```
}
}
class Runnable1 implements Runnable{
public void run(){
int n1=0,n2=1,n3,i,count=10;
System.out.print(n1+" "+n2);      //printing 0 and 1
for(i=2;i<count;++i)   //loop starts from 2 because 0 and 1 are already printed
{
n3=n1+n2;
System.out.print(" "+n3);
n1=n2;
n2=n3;
}
}
}
```

OUTPUT

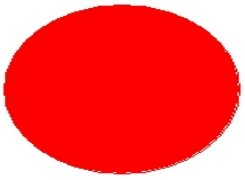
```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\14-08-2021(Bijimol)>javac Mythread.java

D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\14-08-2021(Bijimol)>java Mythread
0 1 1 2 3 5 8 13 211
3
5
7
9
 34
```

22. Program to draw Circle, Rectangle, Line in Applet.

```
import java.awt.*;
import java.applet.*;
public class circle extends Applet
{
public void paint(Graphics g)
{   g.setColor(Color.red);
g.fillOval(80,70,150,150);
g.drawOval(80,70,150,150);
g.setColor(Color.BLACK);
}
}
```

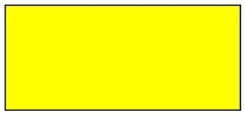
```
<html>
<head>
</head>
<body>
<div align="center">
<applet code="circle.class"width="800"height="500">
```

```
</applet>
</div>
</body>
</html>
```



```
import java.awt.*;
import java.applet.*;
public class rectapplet extends Applet
{
public void paint(Graphics g)
{   g.setColor(Color.YELLOW);
g.fillRect(50,100,180,80);
g.setColor(Color.BLACK);
```

```
g.drawRect(50,100,180,80);
}
}

<html>
<head>
</head>
<body>
<div align="center">
<applet code="rectapplet.class"width="800"height="500">
</applet>
</div>
</body>
</html>
```



23. Program to find maximum of three numbers using AWT.

```
import java.awt.*;
import java.applet.*;
import java.awt.event.*;
public class findlarge extends Applet implements ActionListener
{
TextField t1,t2,t3,t4;
Button b1;
public void init()
{
t1=new TextField(15);
t1.setBounds(100,25,50,20);
t2=new TextField(15);
t2.setBounds(100,25,50,20);
t3=new TextField(15);
t3.setBounds(100,25,50,20);
t4=new TextField("Ans");
t4.setBounds(175,50,50,20);
b1= new Button("Find");
```

```
b1.setBounds(175,65,50,40);
add(t1);
add(t2);
add(t3);
add(t4);
add(b1);
b1.addActionListener(this);
}
public void actionPerformed(ActionEvent e)
{
int i,j,k;
i=Integer.parseInt(t1.getText());
j=Integer.parseInt(t2.getText());
k=Integer.parseInt(t3.getText());
if(i<j)
{
if(j<k)
t4.setText(""+k);
else
t4.setText(""+j);
}
```

```
else
t4.setText(""+i);
}
}


<html>
<head>
</head>
<body>
<div align="center">
<applet code="findlarge.class" width="800" height="500">
</applet>
</div>
</body>
</html>
```

OUTPUT

24. Find the percentage of marks obtained by a student in 5 subjects. Display a happy face if he secures above 50% or a sad face if otherwise.

```
import java.awt.*;
import java.awt.event.*;
import java.applet.*;
public class marks extends Applet implements ActionListener
{
public int per =0;
Label l1 = new Label("enter Marks of Subject 1: ");
 Label l2 = new Label("enter Marks of Subject 2: ");
 Label l3 = new Label("enter Marks of Subject 3: ");
 Label l4 = new Label("enter Marks of Subject 4: ");
 Label l5 = new Label("enter Marks of Subject 5: ");
 Label l6 = new Label("Total Percentage: ");

 TextField t1 = new TextField(10);
 TextField t2 = new TextField(10);
 TextField t3 = new TextField(10);
```

```
TextField t4 = new TextField(10);
TextField t5 = new TextField(10);
TextField t6 = new TextField(10);
Button b1 = new Button("CALCULATE PERCENTAGE");
public marks()
{
l1.setBounds(50, 100, 280, 20);
l2.setBounds(50, 150, 280, 20);
l3.setBounds(50, 200, 280, 20);
l4.setBounds(50, 250, 280, 20);
l5.setBounds(50, 300, 280, 20);
l6.setBounds(50, 350, 280, 20);

t1.setBounds(200, 100, 300, 20);
t2.setBounds(200, 150, 300, 20);
t3.setBounds(200, 200, 300, 20);
t4.setBounds(200, 250, 300, 20);
t5.setBounds(200, 300, 300, 20);
t6.setBounds(200, 350, 300, 20);

b1.setBounds(200,400, 200, 20);
```

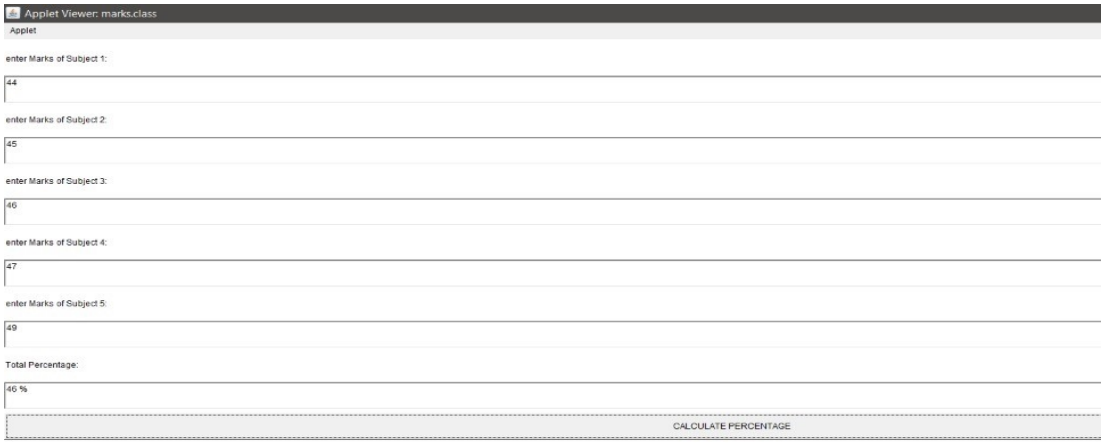
```
GridLayout g1 = new GridLayout(20, 2, 5, 5);
setLayout(g1);
add(l1);
add(t1);
add(l2);
add(t2);
add(l3);
add(t3);
add(l4);
add(t4);
add(l5);
add(t5);
add(l6);
add(t6);
add(b1);
b1.addActionListener(this);
}
@Override
public void actionPerformed(ActionEvent e)
{
// TODO Auto-generated method stub
```

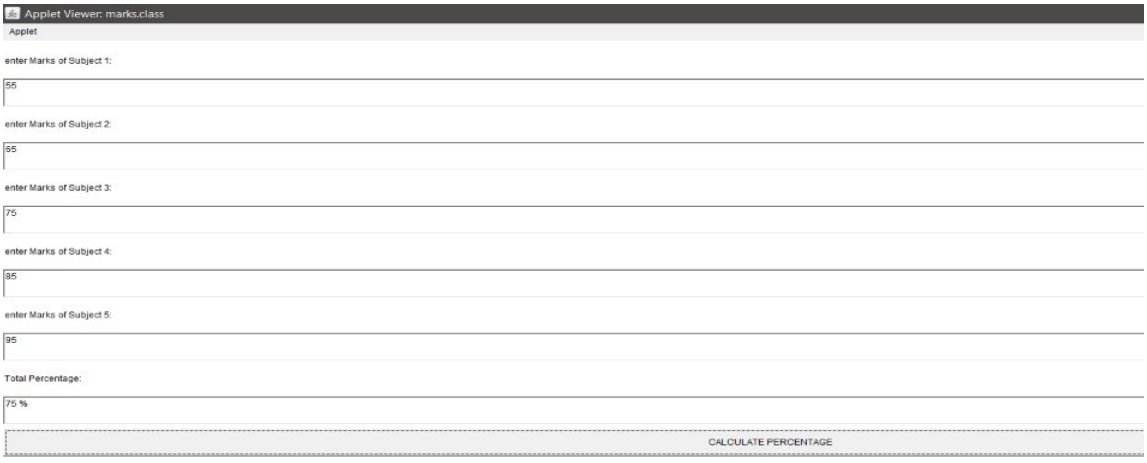
```
int m1 = Integer.parseInt(t1.getText());
 int m2= Integer.parseInt(t2.getText());
 int m3= Integer.parseInt(t3.getText());
 int m4= Integer.parseInt(t4.getText());
 int m5= Integer.parseInt(t5.getText());
 if(e.getSource()==b1)
{
 int add=m1+m2+m3+m4+m5;
 per=add/5;
 t6.setText(String.valueOf(per)+" %");
 repaint();
}
}
public void paint(Graphics g)
{
if(per>=50)
{
g.setColor(Color.yellow);
g.drawOval(100, 700, 150, 150);
g.fillOval(100, 700, 150, 150);
g.setColor(Color.BLACK);
```

```
g.fillOval(120, 740, 15, 15);
g.fillOval(170, 740, 15, 15);
g.drawArc(130, 800, 50, 20, 180, 180);
}
else if(per>0 && per<50)
{
g.setColor(Color.yellow);
g.drawOval(100, 700, 150, 150);
g.fillOval(100, 700, 150, 150);
 g.setColor(Color.BLACK);
 g.fillOval(120, 740, 15, 15);
 g.fillOval(170, 740, 15, 15);
g.drawArc(130,820,50,20,0,180);
}
}
public static void main(String args[])
{
 new marks();
}
}
```

```
<html><head>
</head>
<body><div align="center">
<applet code="marks.class"width="1000"height="1000">
</applet></div>
</body></html>
```

OUTPUT


Applet Viewer: marks.class
Applet
enter Marks of Subject 1:
44
enter Marks of Subject 2:
45
enter Marks of Subject 3:
46
enter Marks of Subject 4:
47
enter Marks of Subject 5:
49
Total Percentage:
46 %
CALCULATE PERCENTAGE


Applet Viewer: marks.class
Applet
enter Marks of Subject 1:
55
enter Marks of Subject 2:
65
enter Marks of Subject 3:
75
enter Marks of Subject 4:
85
enter Marks of Subject 5:
95
Total Percentage:
75 %
CALCULATE PERCENTAGE

25. Using 2D graphics commands in an Applet, construct a house. On mouse click event, change the color of the door from blue to red.

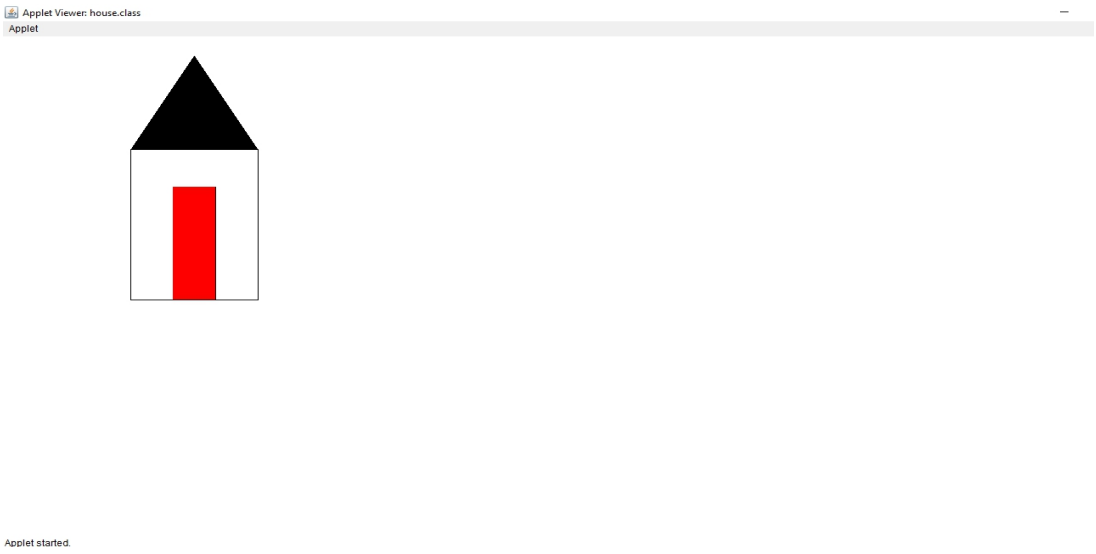
```
import java.applet.*;
import java.awt.*;
import java.util.*;
import java.awt.event.*;
public class house extends  Applet implements MouseListener,Runnable
{
private Color textColor = Color.BLUE;
public void paint(Graphics g)
{ int [] x = {150, 300, 225};
int [] y = {150, 150, 25};
g.drawRect(150, 150, 150, 200); //House
g.drawRect(200, 200, 50, 150);
g.setColor(Color.blue);
g.setColor(textColor);
g.fillRect(200, 200, 50, 150); // Door
g.setColor(Color.black);
```

```
g.fillPolygon(x, y, 3); // Roof
}
public void init()
{
this.setSize(200,200);
addMouseListener(this);
}
public void run()
{
while(true)
{
repaint();
try
{
Thread.sleep(17);
}
catch (InterruptedException e)
{
e.printStackTrace();
}
}
```

```
}
public void mouseClicked(MouseEvent e)
{
int x=e.getX(),y=e.getY();
if(x>=60 && x<=120 && y>=80 && y<=95)
textColor=Color.BLUE;
else
textColor=Color.RED;
repaint();
System.out.println("Mouse Position: X= "+x+"Y"+y);
}
public void mousePressed(MouseEvent e){}
public void mouseReleased(MouseEvent e){}
public void mouseEntered(MouseEvent e){}
public void mouseExited(MouseEvent e){}
}
```

```
<html><head></head>
<body><div align="center">
<applet code="house.class"width="800"height="500">
</applet></div>
</body></html>
```

OUTPUT



26. Implement a simple calculator using AWT components.

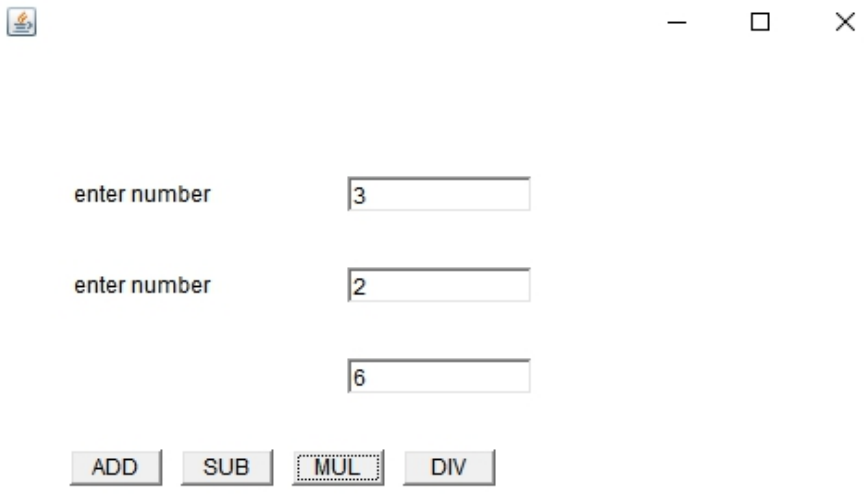
```
import java.awt.*;
import java.awt.event.*;
class calc implements ActionListener
{
Frame f=new Frame();
Label l1=new Label("enter number ");
Label l2=new Label("enter number ");
Label l3=new Label("result");
TextField t1=new TextField();
TextField t2=new TextField();
TextField t3=new TextField();
Button b1=new Button("ADD");
Button b2=new Button("SUB");
Button b3=new Button("MUL");
Button b4=new Button("DIV");
calc()
{
```

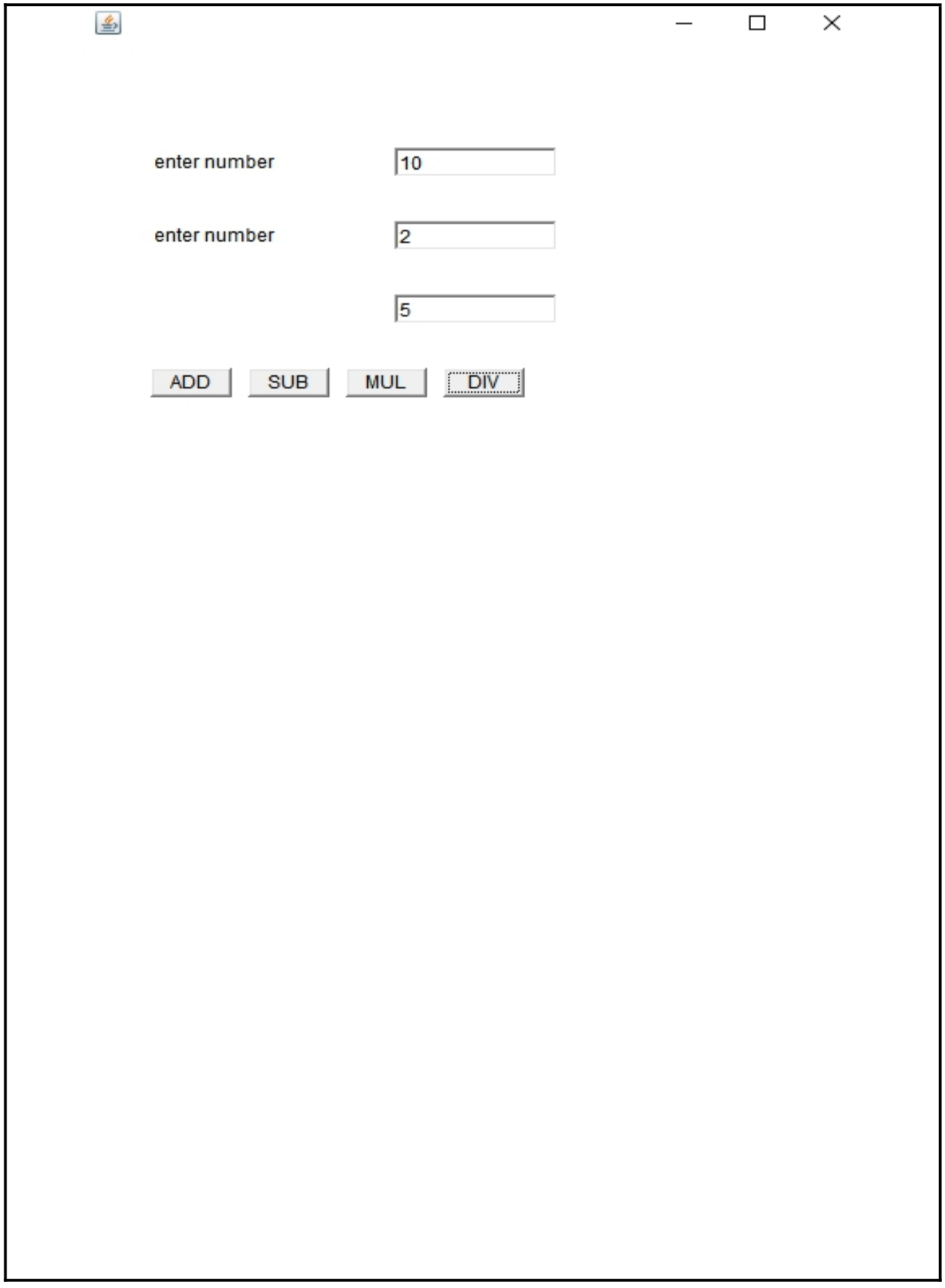
```
l1.setBounds(50,100,100,20);
l2.setBounds(50,150,100,20);
l3.setBounds(50,200,100,20);
t1.setBounds(200,100,100,20);
t2.setBounds(200,150,100,20);
t3.setBounds(200,200,100,20);
b1.setBounds(50,250,50,20);
b2.setBounds(110,250,50,20);
b3.setBounds(170,250,50,20);
b4.setBounds(230,250,50,20);
f.add(l1);
f.add(l2);
f.add(t1);
f.add(t2);
f.add(t3);
f.add(b1);
f.add(b2);
f.add(b3);
f.add(b4);
b1.addActionListener(this);
b2.addActionListener(this);
```

```
b3.addActionListener(this);
b4.addActionListener(this);
f.setLayout(null);
f.setVisible(true);
f.setSize(500,500);
}
public void actionPerformed(ActionEvent e)
{
int i=Integer.parseInt(t1.getText());
int j=Integer.parseInt(t2.getText());
if(e.getSource()==b1)
{
t3.setText(String.valueOf(i+j));
}
if(e.getSource()==b2)
{
t3.setText(String.valueOf(i-j));
}
if(e.getSource()==b3)
{
t3.setText(String.valueOf(i*j));
```

```
}
if(e.getSource()==b4)
{
t3.setText(String.valueOf(i/j));
}
}
public static void main(String args[])
{
new calc();
}
}
```

OUTPUT




enter number
10
enter number
2
5
ADD
SUB
MUL
DIV

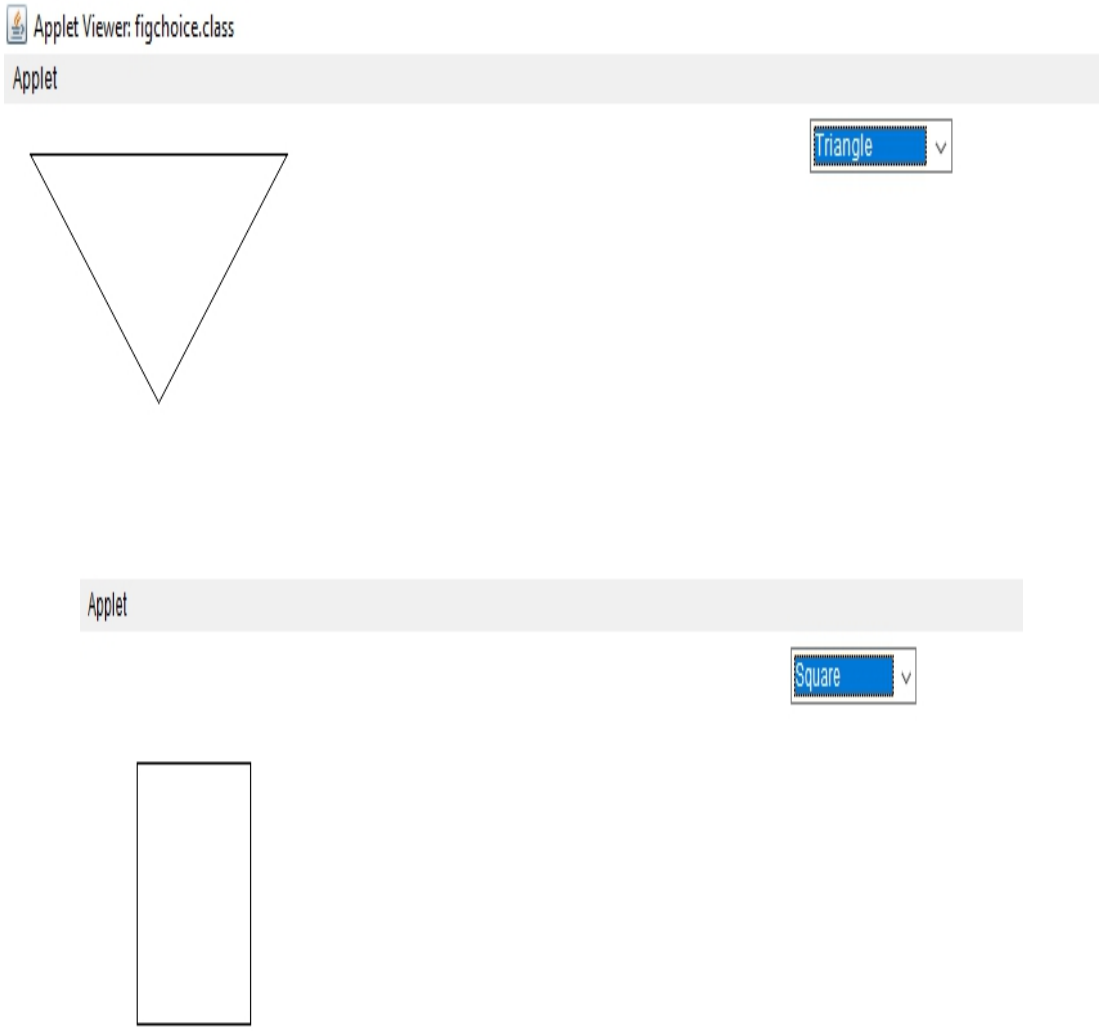
27. Develop a program that has a Choice component which contains the names of shapes such as rectangle, triangle, square and circle. Draw the corresponding shapes for given parameters as per user's choice.

```
import java.applet.*;
import java.awt.*;
import java.awt.Graphics;
import java.awt.event.*;
public class figchoice extends Applet implements ItemListener
{
Choice ch;
 int x1[]= {50,120,220,20};
int y1[]= {50,120,20,20};
int n=4;
 int Selection;
 public void init()
{
ch = new Choice();
ch.addItem("Select a Shape");
ch.addItem("Rectangle");
ch.addItem("Triangle");
```

```
ch.addItem("Square");
ch.addItem("Circle");
add(ch);
ch.addItemListener(this);
}
public void itemStateChanged (ItemEvent e)
{
Selection = ch.getSelectedIndex();
repaint();
}
public void paint(Graphics g)
{
super.paint(g);
if (Selection == 1)
{
g.drawRect(50,50,100,150);
}
if (Selection == 2)
{
g.drawPolygon(x1,y1,n);
}
```

```
if (Selection == 3)
{
g.drawRect(50,50,100,100);
}
if (Selection == 4)
{
 g.drawOval(70,30,100,100);
}
}
}



<html><head>
</head>
<body>
<div align="center">
<applet code="figchoice.class"width="800"height="500">
</applet>
</div>
</body>
</html>
```

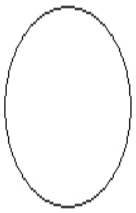
OUTPUT


Applet Viewer: figchoice.class
Applet
Triangle
Applet
Square

Applet Viewer: figchoice.class

Applet

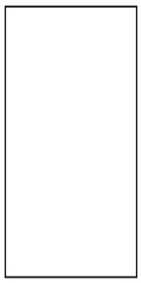
Circle



Applet Viewer: figchoice.class

Applet

Rectangle

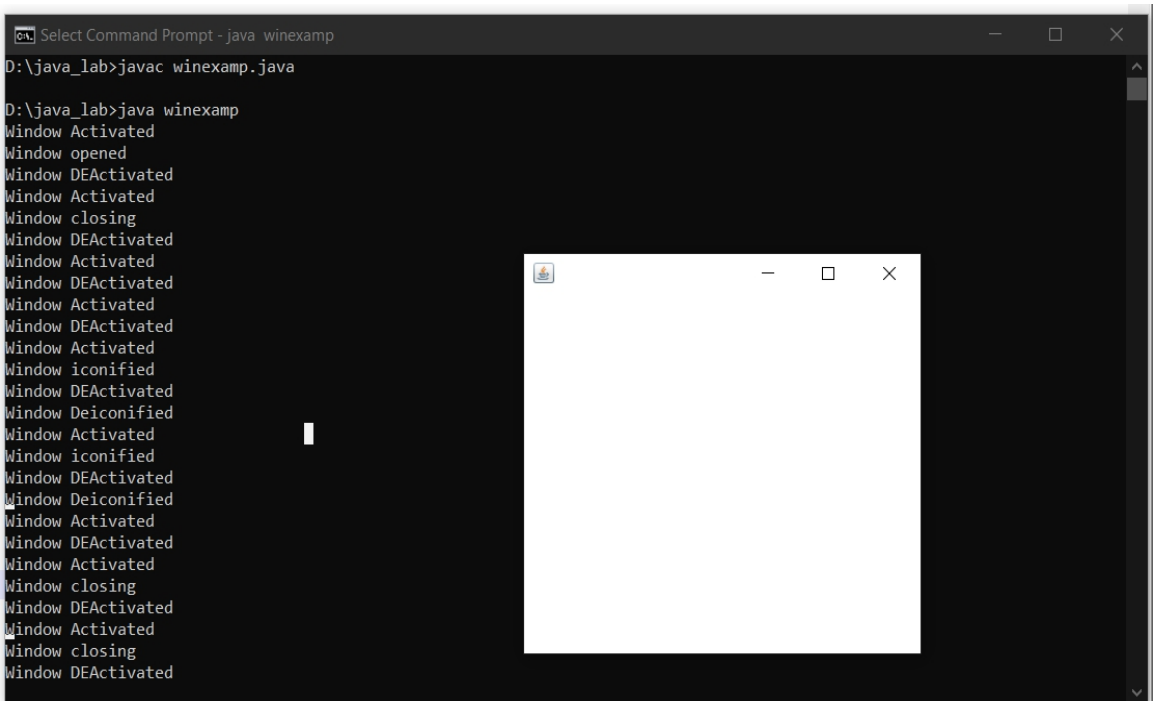


28. Develop a program to handle all window events

```
import java.awt.*;
import java.awt.event.WindowEvent;
import java.awt.event.WindowListener;
public class winexamp extends Frame implements WindowListener
{
winexamp()
{
addWindowListener(this);
setSize(400,400);
setLayout(null);
setVisible(true);
}
public static void main(String args[])
{
new winexamp();
}
public void windowActivated(WindowEvent arg0)
{
System.out.println("Window Activated");
}
public void windowClosed(WindowEvent args0)
{
System.out.println("Window closed");
}
public void windowClosing(WindowEvent arg0)
{
System.out.println("Window closing");
}
public void windowDeactivated(WindowEvent arg0)
{
System.out.println("Window DEActivated");
}
```

```
public void windowDeiconified(WindowEvent arg0)
{
System.out.println("Window Deiconified");
}
public void windowIconified(WindowEvent arg0)
{
System.out.println("Window iconified");
}
public void windowOpened(WindowEvent arg0)
{
System.out.println("Window opened");
}
}
```

OUTPUT

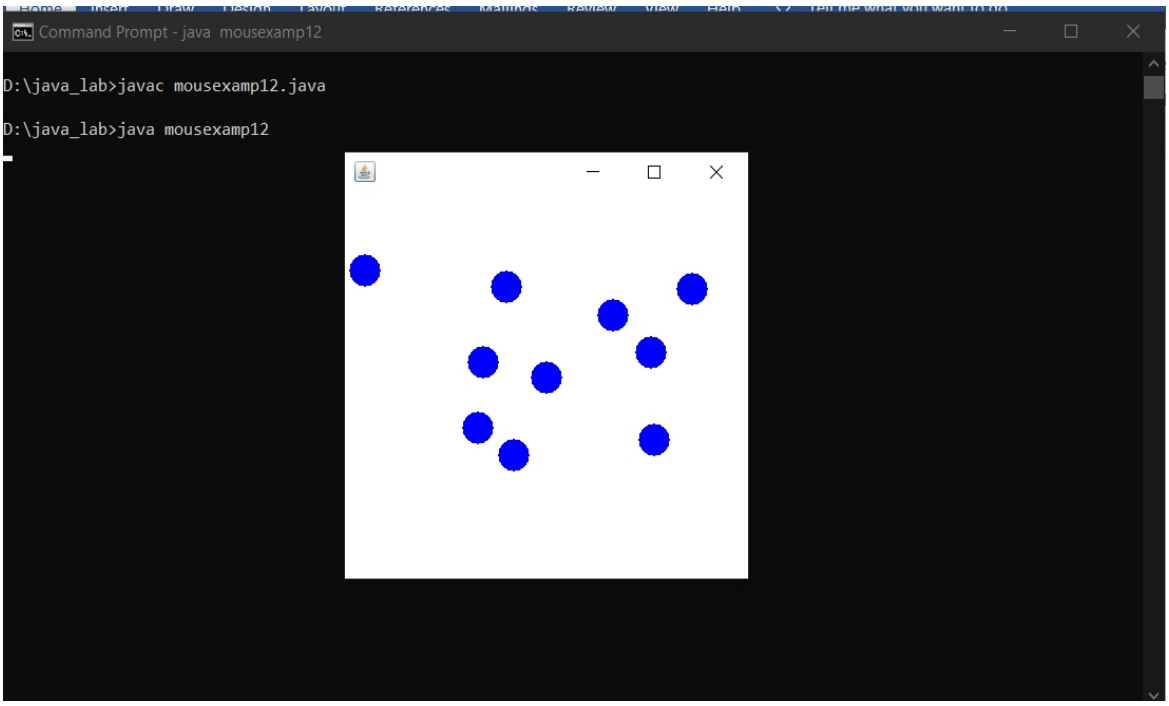


29. Develop a program to handle all mouse events

```
import java.awt.*;
import java.awt.event.*;
public class mousexamp12 extends Frame implements MouseListener
{
mousexamp12()
{
addMouseListener(this);
setSize(400,400);
setLayout(null);
setVisible(true);
}
public void mouseClicked(MouseEvent e)
{
Graphics g=getGraphics();
g.setColor(Color.blue);
g.fillOval(e.getX(),e.getY(),30,30);
}
public void mouseEntered(MouseEvent e)
{
}
public void mouseExited(MouseEvent e)
{
```

```
}
public void mousePressed(MouseEvent e)
{
}
public void mouseReleased(MouseEvent e){
}
public static void main(String args[])
{
new mousexamp12();
}
}
```

OUTPUT

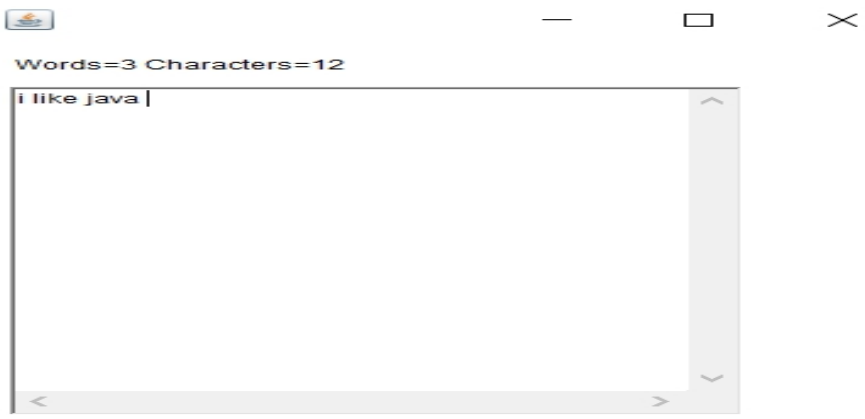


30. Develop a program to handle Key events.

```
import java.awt.*;
import java.awt.event.*;
public class keyexamp extends Frame implements KeyListener
{
Label l;
TextArea a;
keyexamp()
{
l=new Label();
l.setBounds(20,50,200,20);
a=new TextArea();
a.setBounds(20,80,300,300);
a.addKeyListener(this);
add(l);
add(a);
setSize(400,400);
setLayout(null);
setVisible(true);
}
public void keyPressed(KeyEvent e)
{
}
```

```
public void keyReleased(KeyEvent e)
{
String t=a.getText();
String w[]=t.split("\\s");
l.setText("Words="+w.length+" Characters="+t.length());
}
public void keyTyped(KeyEvent e)
{}
public static void main(String args[])
{
new keyexamp();
}
}
```

OUTPUT



31. Producer/Consumer using ITC

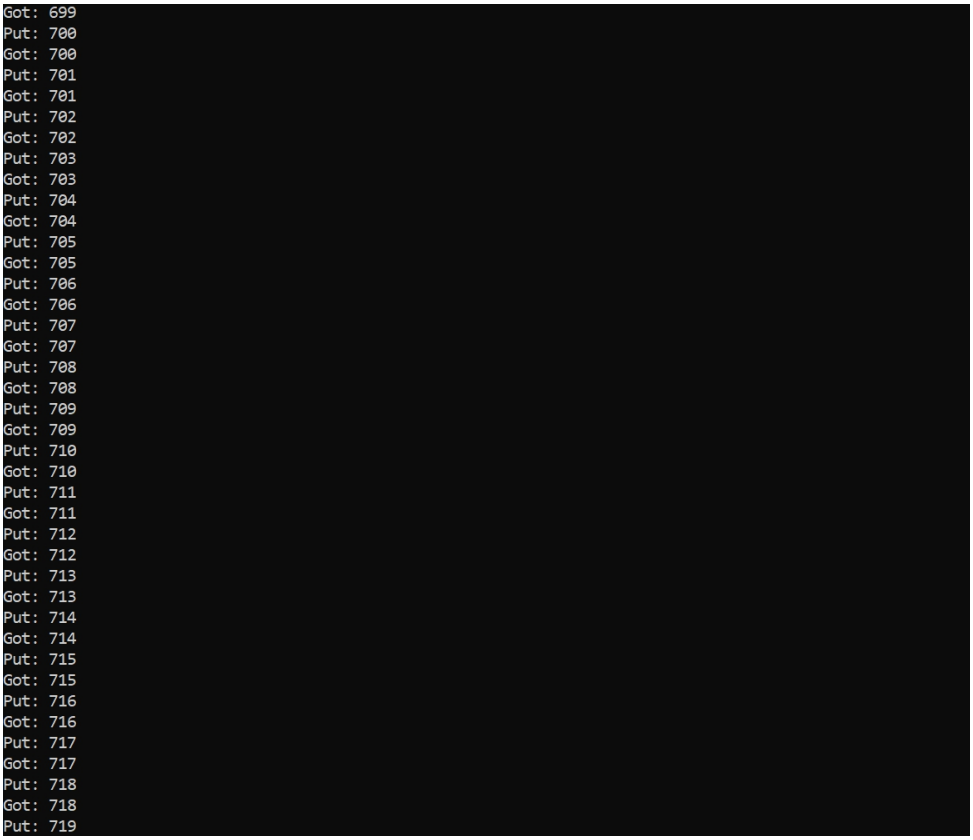
```
import java.util.*;
class Q
{
int n;
boolean statusFlag=false;
synchronized void put(int n)
{
try
{
while(statusFlag)
{
wait();
}
}
catch(InterruptedException e)
{
}
this.n=n;
System.out.println("Put :"+n);
```

```
statusFlag=true;
notify();
}
synchronized int get()
{
try
{
while(!statusFlag)
{
wait();
}
}
catch(InterruptedException e)
{}
statusFlag=false;
System.out.println("Got :"+n);
notify();
return n;
}
}
class Producer implements Runnable
```

```
{
Q q;
Producer(Q q)
{
this.q=q;
new Thread(this, "Producer").start();
}
public void run()
{
int i=0;
while(true)
{
q.put(i++);
}
}
}
class Consumer implements Runnable
{
Q q;
Consumer(Q q)
{
```

```
this.q=q;
new Thread(this,"Consumer").start();
}
public void run()
{
while(true)
{
q.get();
}
}
}
public class D
{
public static void main(String[] args)
{
Q q=new Q();
Producer p=new Producer(q);
Consumer c=new Consumer(q);
}
}
```

OUTPUT


Got: 699
Put: 700
Got: 700
Put: 701
Got: 701
Put: 702
Got: 702
Put: 703
Got: 703
Put: 704
Got: 704
Put: 705
Got: 705
Put: 706
Got: 706
Put: 707
Got: 707
Put: 708
Got: 708
Put: 709
Got: 709
Put: 710
Got: 710
Put: 711
Got: 711
Put: 712
Got: 712
Put: 713
Got: 713
Put: 714
Got: 714
Put: 715
Got: 715
Put: 716
Got: 716
Put: 717
Got: 717
Put: 718
Got: 718
Put: 719

32. Program to create a generic stack and do the Push and Pop operations.

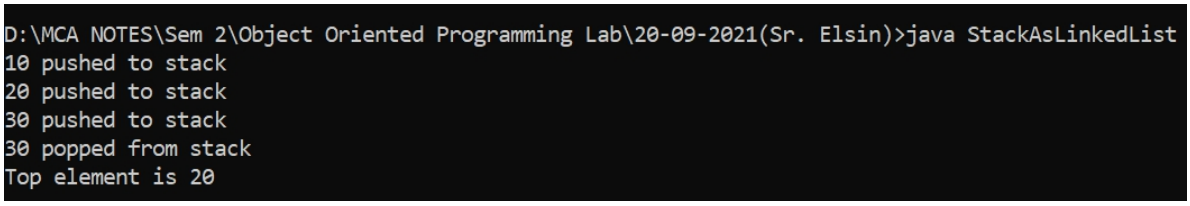
```
public class StackAsLinkedList
{
StackNode root;
static class StackNode
{
int data;
StackNode next;
StackNode(int data)
{
this.data = data;
}
}
public boolean isEmpty()
{
if (root == null) {
return true;
}
```

```
else
return false;
}
public void push(int data)
{
StackNode newNode = new StackNode(data);
if (root == null) {
root = newNode;
}
Else
{
StackNode temp = root;
root = newNode;
newNode.next = temp;
}
System.out.println(data + " pushed to stack");
}
public int pop()
{
int popped = Integer.MIN_VALUE;
if (root == null)
```

```
{
System.out.println("Stack is Empty");
}
else
{
popped = root.data;
root = root.next;
}
return popped;
}
 public int peek()
{
if (root == null)
{
System.out.println("Stack is empty");
return Integer.MIN_VALUE;
}
Else
{
return root.data;
}
```

```
}


// Driver code
public static void main(String[] args)
{
StackAsLinkedList sll = new StackAsLinkedList();
sll.push(10);
sll.push(20);
sll.push(30);
System.out.println(sll.pop()+ " popped from stack");
System.out.println("Top element is " + sll.peek());
}
}
```

OUTPUT



33. Using generic method perform Bubble sort.

```
public class BubbleSort
{
static void bubbleSort(int[] arr)
{
int n = arr.length;
int temp = 0;
for(int i = 0; i < n; i++)
{
for(int j=1; j < (n-i); j++)
{
if(arr[j-1] > arr[j])
{
temp = arr[j-1];
arr[j-1] = arr[j];
arr[j] = temp;
}
}
}
```

```
}
public static void main(String[] args)
{
int arr[] = { 1, 6, -2, 6, -4, 8, 5, -7, -9, 4 };
System.out.println("Array Before Bubble Sort");
for(int i = 0; i < arr.length; i++) {
System.out.print(arr[i] + " ");
}
System.out.println();
bubbleSort(arr);
System.out.println("Array After Bubble Sort");
for(int i = 0; i < arr.length; i++) {
System.out.print(arr[i] + " ");
}
}
}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>javac BubbleSort.java

D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>java BubbleSort
Sorted array
11 12 22 25 34 64 90
```

34. Program to demonstrate the creation of queue object using the PriorityQueue class

```
import java.util.*;
class PriorityQueue1
{
public static void main(String args[])
{
PriorityQueue<String> queue=new PriorityQueue<String>();
queue.add("Amit");
queue.add("Vijay");
queue.add("Karan");
queue.add("Jai");
queue.add("Rahul");
System.out.println("head:"+queue.element());
System.out.println("head:"+queue.peek());
System.out.println("iterating the queue elements:");
Iterator itr=queue.iterator();
while(itr.hasNext())
{
```

```
System.out.println(itr.next());
}
queue.remove();
queue.poll();
System.out.println("after removing two elements:");
Iterator<String> itr2=queue.iterator();
while(itr2.hasNext())
{
System.out.println(itr2.next());
}
}
}
```

OUTPUT

```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>java PriorityQueue1
head:Amit
head:Amit
iterating the queue elements:
Amit
Jai
Karan
Vijay
Rahul
after removing two elements:
Karan
Rahul
Vijay
```

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

```
import java.util.*;
public class removelink
{
public static void main(String[] args)
{
    // create an empty linked list
 LinkedList<String> l_list = new LinkedList<String>();


   // use add() method to add values in the linked list
 l_list.add("violet");
l_list.add("Green");
l_list.add("Black");
l_list.add("Pink");
l_list.add("blue");
     // print the list
System.out.println("The Original linked list: " + l_list);
```

```
  // Removing all the elements from the linked list
l_list.clear();
System.out.println("The New linked list: " + l_list);
}
}
```

OUTPUT

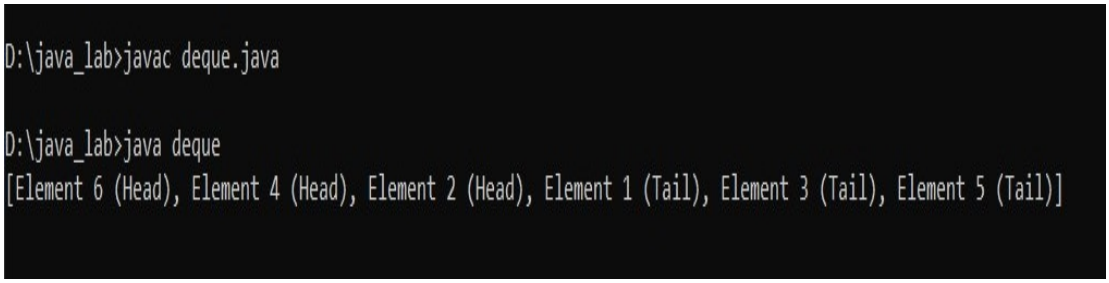
```
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>javac removelink.java

D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>java removelink
The Original linked list: [violet, Green, Black, Pink, blue]
The New linked list: []
```

36. program to demonstrate the addition and deletion of elements in dequeue

```
import java.util.*;
 public class deque
{
public static void main(String[] args)
 {
 Deque<String> deque = new LinkedList<String>();
 // We can add elements to the queue
// in various ways
// Add at the last
deque.add("Element 1 (Tail)");
// Add at the first
deque.addFirst("Element 2 (Head)");
// Add at the last
 deque.addLast("Element 3 (Tail)");
// Add at the first
deque.push("Element 4 (Head)");
 // Add at the last
```

```
deque.offer("Element 5 (Tail)");
// Add at the first
 deque.offerFirst("Element 6 (Head)");
 System.out.println(deque + "\n");
 // We can remove the first element
 // or the lastelement.
 deque.removeFirst();
deque.removeLast();
System.out.println("Deque after removing " + "first and last: " + deque);
 }
 }
```

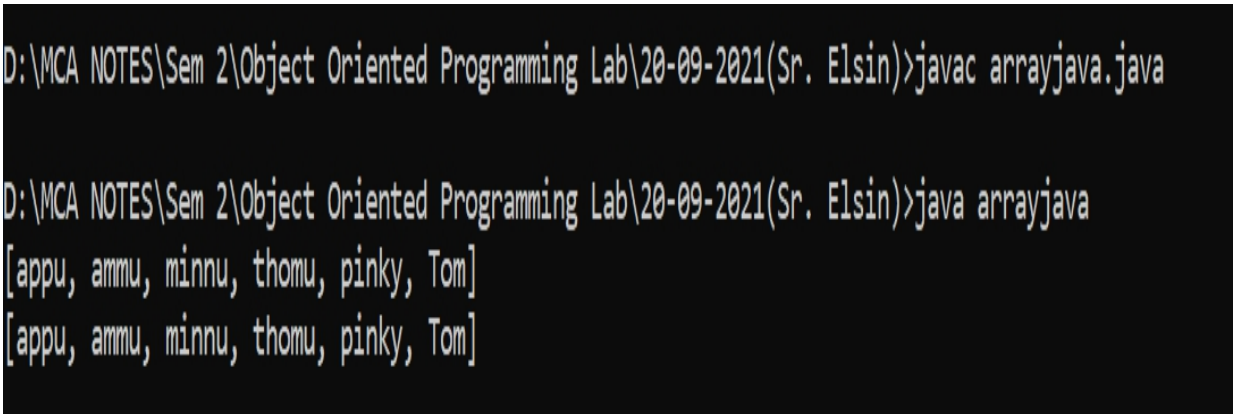
OUTPUT



37. Maintain a list of Strings using ArrayList from collection framework, perform built-in operations.

```
import java.util.*;
class arrayjava
{
public static void main(String args[])
{
ArrayList<String> alist=new ArrayList<String>();
alist.add("appu");
alist.add("ammu");
alist.add("minnu");
alist.add("thomu");
alist.add("pinky");
alist.add("Tom");
//displaying elements
 System.out.println(alist);
//Adding "appu" at the fourth position alist.add(3, "appu");
 //displaying elements
 System.out.println(alist);
} }
```

OUTPUT


D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>javac arrayjava.java
D:\MCA NOTES\Sem 2\Object Oriented Programming Lab\20-09-2021(Sr. Elsin)>java arrayjava
[appu, ammu, minnu, thomu, pinky, Tom]
[appu, ammu, minnu, thomu, pinky, Tom]

38. program to demonstrate the working of map interface by adding ,removing,changing.

```
import java.util.*;
class HashMapDemo
{
public static void main(String args[])
{
Map<String, Integer> hm = new HashMap<String, Integer>();
hm.put("Anu", new Integer(1));
hm.put("sinu", new Integer(2));
hm.put("Jinu", new Integer(3));
  // Traversing through the map
for (Map.Entry<String, Integer> me : hm.entrySet()
 {
System.out.print(me.getKey() + ":");
System.out.println(me.getValue());
}
}
}
```

OUTPUT

```
D:\java_lab>javac hashmap.java

D:\java_lab>java hashmap
Jinu : 3
Anu  : 1
sinu : 2
```

39. program to convert hash map to tree map.

```
import java.util.*;
import java.util.stream.*;
public class HT
{
public static void main(String args[])
{
Map<String, String> map = new HashMap<>();
map.put("1", "One");
map.put("2", "Two");
map.put("3", "Three");
 map.put("4", "Four");
map.put("5", "Five");
map.put("6", "Six");

map.put("7", "Seven");
map.put("8", "Eight");
map.put("9", "Nine");
System.out.println("HashMap = " + map);
```

```
Map<String, String> treeMap = new TreeMap<>();

treeMap.putAll(map);

System.out.println("TreeMap (HashMap to TreeMap) " + treeMap);

}

}
```

OUTPUT