### VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



## LAB REPORT on

# Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

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in partial fulfillment for the award of the degree of BACHELOR OF ENGINEERING in COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING
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### **B.M.S.** College of Engineering,

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Department of Computer Science and Engineering



### **CERTIFICATE**

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Aparna Sankar (1BM23CS047)**, who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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Github Link:

 $\underline{https://github.com/1BM23CS047/java-lab}$ 

APARNA SANKAR

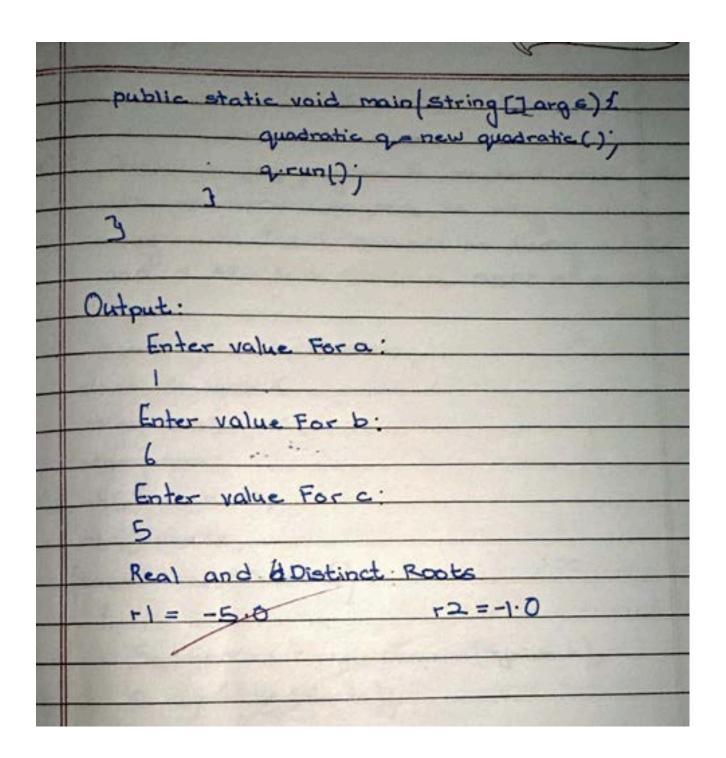
1BM23CS047

Program 1
Implement Quadratic Equation

LAB-1	Program
	0
	1

Program to develop a java program that prints all real solutions to the quadratic equation a=2+bx+c=0 Read in a, b, c and use all quadratic Formula -> import java · util · Scanner; import jova long . Hath; closs quadratic int a,b,c; double b; double 12, 12; System out printly "Gotor value for b:"); void run () Scanner 5 = new Scanner ( System in ); System out printer | "Enter value For a: "); a=5. next Inb(); System out printer ( "Enter value For c: "); C = S · next Int (); 1/(0==6)2 Systemout printin (" Not a quadratic equation")

else & d= b+b-4+a+c if (d==0) 1 r2 = (-b) /(2 ra); System.out.println (" Roots are real and equal) Root: " + 11 + " ("); else if (d>0) & r1 = ((-b) + Math. sqrt (d)) /(2 \*a) 12 = ( (-b) 3 - Math . sqrt(d) / 2+a); System-out println (" Roots are real and distinct in Roote: +1 ="++1+" 14 +2=" +r2 +"\n"); else & rl=(-b)/(2-a); 12 = Matn. sgrt (-d)/(2+a); System-out printle ( "Roots are imaginary la Roots: " trl+ " j + " +r2 + "10"); class week 1 5



code:

import java.util.Scanner;

import java.lang.Math;

```
class Quadratic
{
 int a,c,b;
 double d;
 double r1,r2;
void run ()
 System.out.println("Aparna Sankar 1BM23CS047");
 Scanner S=new Scanner(System.in);
 System.out.println("Enter value for a: ");
 a=S.nextInt();
 System.out.println("Enter value for b: ");
 b=S.nextInt();
 System.out.println("Enter value for c: ");
 c=S.nextInt();
 if(a==0){
  System.out.println("not a quadratic equation");
 }
```

```
else {
     d=b*b-4*a*c:
     if (d==0){
     r1=(-b)/(2*a);
     System.out.println("roots are real and equal \n Root: " +r1+
"\n");
     else if(d>0){
     r1 = ((-b) + Math.sqrt(d))/(2*a);
     r2 = ((-b) - Math.sqrt(d))/(2*a);
     System.out.println("roots are real and distinct \n Roots: r1= "
+r1+ "\t r2=" +r2+ "\n");
     }
else {
     r1=(-b)/(2*a);
   r2=Math.sqrt(-d)/(2*a);
     System.out.println("roots are imaginary \n Roots:" +r1+ "i+"
+r2+ "\n");
```

```
class Week1 {
    public static void main(String[] args) {
        Quadratic q = new Quadratic();
        q.run();
    }
}
```

### Output:

Program 2 sgpa calculator

	Lab-2
(a)	Develop a java program to create a class Student with members usn, name, an array credits and an array marks. Include methods to display details and a method to calculate SGPA OF a student.
	import java.util.Scanner;
	string usn;
	string name;
	int[] credits,
	void accept Details ()
	Scanner mark = new Scanner (System in);
	Scanner (System.in); System but
	System out printin ("Enter usn:");
	usn = mark nextLine ();
	System.out.println ("Enter Name: ");  name = mart nextLine();
	System out printin ("Enter number of subjects:");
	into = mark-nextInt();

credits = new int [n];

```
marks new interior
   For (int 1 =0; iccredits length; i++)
      System out printh ( "Enter oredits and marker)
      credits(i) mark next to b();
    marks[i] = mark next Int();
 void calculat Sapal)
   ink c=0;
   inkm=0;
For (inbi=0; iccredits-length; i++)
    C+= credito[i];
   m+=marke[i];
  System out printing "Total creates; " ta);
  System. out . printin (" Total marks: " +m);
  For (int x=0; i corecite length; i++) &
     s+= [marks[i]/10 *credits[i]);
  double sapa=s/c;
  System.out.printh | "SGPA:" TSqpa)
```

void display 1) 2. System out printin ("USN: " tuen); System out print in ("Name:" + name); For (int i =0; ic credits length; i++) { System.out.prinkln ("Credits For subject "+(i+1) + "is:" + credits(i)); S.O.P ("Marks For subject" + (i+1) + "15: "+ marts [i) + " (h") public static voidmain ( String Args) SOP (" Name: Aparna Santar USN: 18H >35 SCX,74); Scanner Object = new Scanner ( System in); Systemioutipontlo(" entor no of students:"); a = Object nextInt(); For(i=0; iZa; i++) ! student obj = new student(); obj. accept details (); obj · calculate sapal); obj-display );

	4
Output	
Enter number of students:	
1 - I was a sent of Andrew State of	ula in Massa B
Enter USN:	
1BM23CS047	- AND THE PARTY OF
Enter name:	
Aparna	The second second
Enter number of subjects:	15. 3. 20/20/20
2	ent or deposit
Enter credits and marks:	
4 56	100 p 12 12 12 12 12 12 12 12 12 12 12 12 12
Enter credits and marks;	3
3 74	on and and
Total credibs: 7	and Branch
	De 24
Total marks: 132	1670
SGPA: 5.857142857	V

### Program:

```
import java.util.Scanner;
class student
String usn;
String name;
int[] credits;
int[] marks;
void acceptdetails()
{
       Scanner mark = new Scanner(System.in);
       System.out.println("Enter USN: ");
       usn = mark.nextLine();
       System.out.println("Enter name: ");
       name = mark.nextLine();
       System.out.println("Enter number of subjects: ");
       int n = mark.nextInt();
       credits = new int[n];
       marks = new int[n];
       for (int i = 0; i < credits.length; i++)
{
       System.out.println("Enter credits and marks: ");
```

```
credits[i] = mark.nextInt();
       marks[i] = mark.nextInt();
       }
}
       void calculateSgpa()
{
       int c = 0;
       int m = 0;
       for (int i = 0; i < credits.length; i++)
{
       c += credits[i];
       m += marks[i];
       }
       System.out.println("Total credits: " + c);
       System.out.println("Total marks: " + m);
       double s = 0;
       for (int i = 0; i < credits.length; i++) {
       s += (marks[i] / 10 * credits[i]);
       double sgpa = s / c;
       System.out.println("SGPA: " + sgpa);
       }
       void display() {
       System.out.println("USN: " + usn);
```

```
System.out.println("Name: " + name);
       for (int i = 0; i < credits.length; i++) {
       System.out.println("Credits for subject " + (i + 1) + " is: " + credits[i]);
       System.out.println("Marks for subject" + (i + 1) + " is: " + marks[i] + "\n");
       }
       }
       public static void main(String[] Args)
       {
       System.out.println("Name:Aparna Sankar USN: 1BM23CS047");
       int a, i;
       Scanner object = new Scanner(System.in);
       System.out.println("Enter number of students: ");
       a = object.nextInt();
       for (i = 0; i < a; i++) {
       student obj = new student();
       obj.acceptdetails();
       obj.calculateSgpa();
       obj.display();
}import java.util.Scanner;
class student
{
String usn;
```

```
String name;
int[] credits;
int[] marks;
void acceptdetails()
{
       Scanner mark = new Scanner(System.in);
       System.out.println("Enter USN: ");
       usn = mark.nextLine();
       System.out.println("Enter name: ");
       name = mark.nextLine();
       System.out.println("Enter number of subjects: ");
       int n = mark.nextInt();
       credits = new int[n];
       marks = new int[n];
       for (int i = 0; i < credits.length; i++)
{
         System.out.println("Enter credits and marks: ");
       credits[i] = mark.nextInt();
       marks[i] = mark.nextInt();
       }
}
       void calculateSgpa()
{
       int c = 0;
```

```
int m = 0;
       for (int i = 0; i < credits.length; i++)
{
       c += credits[i];
       m += marks[i];
       System.out.println("Total credits: " + c);
       System.out.println("Total marks: " + m);
       double s = 0;
       for (int i = 0; i < credits.length; i++) {
       s += (marks[i] / 10 * credits[i]);
       }
       double sgpa = s / c;
       System.out.println("SGPA: " + sgpa);
       }
       void display() {
       System.out.println("USN:"+usn);\\
       System.out.println("Name: " + name);
       for (int i = 0; i < credits.length; i++) {
       System.out.println("Credits for subject " + (i + 1) + " is: " + credits[i]);
       System.out.println("Marks for subject " + (i + 1) + " is: " + marks[i] + "\n");
       }
       public static void main(String[] Args)
```

```
{
    System.out.println("Name:Aparna Sankar USN: 1BM23CS047");
    int a, i;
    Scanner object = new Scanner(System.in);
    System.out.println("Enter number of students: ");
    a = object.nextInt();
    for (i = 0; i < a; i++) {
        student obj = new student();
        obj.acceptdetails();
        obj.calculateSgpa();
        obj.display();
    }
}
</pre>
```

Output:

```
D:\Java>java student
Name: Aparna Sankar USN: 1BM23CS047
Enter number of students:
Enter USN:
1bm23cs001
Enter name:
ash
Enter number of subjects:
Enter credits and marks:
20
Enter credits and marks:
16
Total credits: 7
Total marks: 36
SGPA: 1.4285714285714286
USN: 1bm23cs001
Name: ash
Credits for subject 1 is: 3
Marks for subject 1 is: 20
Credits for subject 2 is: 4
Marks for subject 2 is: 16
Enter USN:
1bm23cs002
Enter name:
ally
Enter number of subjects:
Enter credits and marks:
4 15
Enter credits and marks:
3 17
Total credits: 7
Total marks: 32
SGPA: 1.0
USN: 1bm23cs002
```

```
Enter USN:
1bm23cs802
Enter name:
ally
Enter number of subjects:
2
Enter credits and marks:
4 15
Enter credits and marks:
3 17
Total credits: 7
Total marks: 32
SGPA: 1.0
USN: 1bm23cs002
Name: ally
Credits for subject 1 is: 4
Marks for subject 1 is: 15
Credits for subject 2 is: 3
Marks for subject 2 is: 17
Enter USN:
1bm23cs003
Enter name:
amit
Enter number of subjects:
1
Enter credits and marks:
30
Total credits: 2
Total marks: 30
SGPA: 3.0
USN: 1bm23cs803
Name: amit
Credits for subject 1 is: 2
Marks for subject 1 is: 30
```

# Program 3 book class

1300	
	∠AB -3
	the state of the secondary restated
0)	Create a class Book which contains four membersinan
	author, price num pages . Include a construct to
	set the values for the members. Themes methods
	to set and get the details of the objects. Inches
	a to String ) method that could display the complet
	details of the book. Develop a Java program to
	create n book objects
	12 Thate time 2 th The Tolland
rogram	Book (String name, String author, int price, int spage)
	1 Admin trees add and trees the
	this name anames
	this author souther;
	this price sprice;
	this npage = npage;
	3
	public String to String()
	£
	String name, author, price, npage;
	hame = "Book name: " + this name + "In";
	author = "Author name: " +this author + "In";
	price = "Price: " +this.price + "In";
A Property like	The state of the s

```
opage = "Number of pages : "This opage + "10";
   return name + author + price inpage;
   class bookryn &
  public static void main (String orgs[]) 1
  Scanner As = new Scanner ( System in);
 String name, author;
int price, ppage;
System out printin ("Enter the number of books");
n = s. next Int();
BOOK D[] = New BOOK [n];
for (inbi=0, ich; it) &
System out printin ("Enter book name");
     name = Sinext())
     System.out.println ("Enter book Author");
     author = s.now();
    System out printly ("Enter book Price");
    price = s.nextInb();
   System out princip ( "Enter the number of Pages in the boot,
   rpage =5 nextInb();
```

Pag
b[i] = new Book (name, author, price, npage);
for (int; = 0; i < n; i++) &
System.out.printin(bci).toString(1);
]
Mademan Fergusters of the first of all the first of the contract of the contra
18074 - 2 June 1979
de la constant de la

Output	
Enter the number of books;	1
1	
Enter book name.	
abc	
Enter book: Author	and the same of th
Enter the number of page	es of the book
Enter book price	
250	C II book
250	of the book
	of the book
Enter the number of pages	of the book
Enter the number of pages 100	of the book
Book name: abc	of the book
Enter the number of pages 100  Book name: abc. tuthor name: xyz.	of the book
Enter the number of pages 100  Book name: abc tuthor name: xyz. Price: 250	of the book
Enter the number of pages 100  Book name: abc. tuthor name: xyz.	of the book
Enter the number of pages 100  Book name: abc tuthor name: xyz. Price: 250	of the book

```
Program:
import java.util.Scanner;
class Book {
       String name, author;
       int price, npage;
       Book(String name, String author, int price, int npage) {
       this.name = name;
       this.author = author;
       this.price = price;
       this.npage = npage;
       }
       public String toString() {
       String name, author, price, npage;
       name = "Book name: " + this.name + "\n";
       author = "Author name: " + this.author + "\n";
       price = "Price: " + this.price + "\n";
    npage = "Number of pages: " + this.npage + "\n";
       return name + author + price + npage;
      }
}
```

```
class bookrun {
      public static void main(String args[]) {
      // Display name and ID at the start
      System.out.println("Aparna Sankar, 1BM23CS047");
      Scanner s = new Scanner(System.in);
      String name, author;
      int price, npage;
      int n;
      System.out.println("Enter the number of books");
      n = s.nextInt();
      Book b[] = new Book[n];
    for (int i = 0; i < n; i++) {
      System.out.println("Enter book name");
      name = s.next();
      System.out.println("Enter book Author");
      author = s.next();
      System.out.println("Enter book price");
           price = s.nextInt();
      System.out.println("Enter the number of pages of the book");
      npage = s.nextInt();
      b[i] = new Book(name, author, price, npage);
      }
```

```
D:\Java>java bookrun
Aparna Sankar, 1BM23CS047
Enter the number of books
Enter book name
Enter book Author
Enter book price
Enter the number of pages of the book
Enter book name
ded
Enter book Author
ded
Enter book price
Enter the number of pages of the book
Book name: dd
Author name: dd
Price: 200
Number of pages: 23
Book name: ded
Author name: ded
Price: 233
Number of pages: 40
```

# Program 4 shape area

	LAB-4
9	Expore tostring method usage in jour
	import java-util-Sconner;
	abstract class Shape &
	double d1, d2;
	Shape (double d 1, double d 2) &
	this-di=dif
	this .d2 = d2;
	3 A A MARIE TO LANGE TO LANGE TO SERVE
	abstract double printarea();
	3 Comment on
	class Rectangle extends Shaped
	Rectanges (doubles, doubleb)
	super(a,b);
	3
	double printaines () &
	System out-println (" Area of Rectangle 15:");
	2 return ditdo;
	3

class Triangle extends shape ! Circle (double a) £ super (a,1) double printarea () 2 System out println ( "Area of Circle is: "); return 3.14 + d1 + d2; class areast public static void main (String args W) { double d1, d2; Scanner Sanew Scanner (System in); System out printin ("Enter the dimensions of the rectange:") di = s. next Inti); d2 - s.nat Intil Rectangue r = new Rectangle (d1, d2); System out printh ("Area is ; " + r. printarea()); System out println (" Enter dimensions of triangle:") di =5. next Int() d2 = s.nextInt(); Triangle 6= new Triangle (d1, d2)

50	
	System. out-print In 1"Area 18!" 76 : printarea (1)
	System. out prioth l'Enter dimensions of Chale
	d1 = s:ngt Int();
	Circle C = new circle(d1);
31	System · aut. println!" Area is: "+G. printarea());
1	1 tonorm contra
	Il tages please from state allere
	9/p
	Enter dimensions of Rectangle
1	20 m manufact 25 man de france de montage
	16
	Enter dimensions of France
	Area of Rectangle is
	Area is: 200-0
-	Enter dimensions of Triunge:
	10
100	201 20 10000000000000000000000000000000
	Area of Triangsis:
	Area is: 100-0
	Enter dimensions of circle:
	30

#### Program:

```
import java.util.Scanner;
abstract class Shape {
double d1,d2;
Shape(double d1,double d2) {
this.d1=d1;
this.d2=d2;
abstract double printarea();
class Rectangle extends Shape {
Rectangle(double a,double b) {
super(a,b);
double printarea() {
System.out.println("Area of the rectangle is: ");
return d1*d2;
class Triangle extends Shape {
Triangle(double a,double b) {
super(a,b);
```

```
}
double printarea() {
System.out.println("Area of the Triangle is: ");
return d1*d2/2;
class Circle extends Shape {
Circle(double a) {
super(a,1);
double printarea() {
System.out.println("Area of the circle is: ");
return 3.14*d1*d2;
class areas {
public static void main(String args[]) {
System.out.println("Aparna Sankar, 1BM23CS047");
double d1,d2;
Scanner s=new Scanner(System.in);
System.out.println("Enter the dimensions of the rectangle:");
d1=s.nextInt();
d2=s.nextInt();
Rectangle r = new Rectangle(d1,d2);
```

```
System.out.println("Area is :"+r.printarea());
System.out.println("Enter the dimensions of the Triangle:");
d1=s.nextInt();
d2=s.nextInt();
Triangle t = new Triangle(d1,d2);
System.out.println("Area is :"+t.printarea());
System.out.println("Enter the dimensions of the Circle:");
d1=s.nextInt();
Circle c = new Circle(d1);
System.out.println("Area is :"+c.printarea());
}
```

**Output:** 

```
D:\Java>java areas
Aparna Sankar, 1BM23CS047
Enter the dimensions of the rectangle:
20
30
Area of the rectangle is:
Area is:600.0
Enter the dimensions of the Triangle:
20
40
Area of the Triangle is:
Area is:400.0
Enter the dimensions of the Circle:
30
Area of the circle is:
Area is:94.2
```

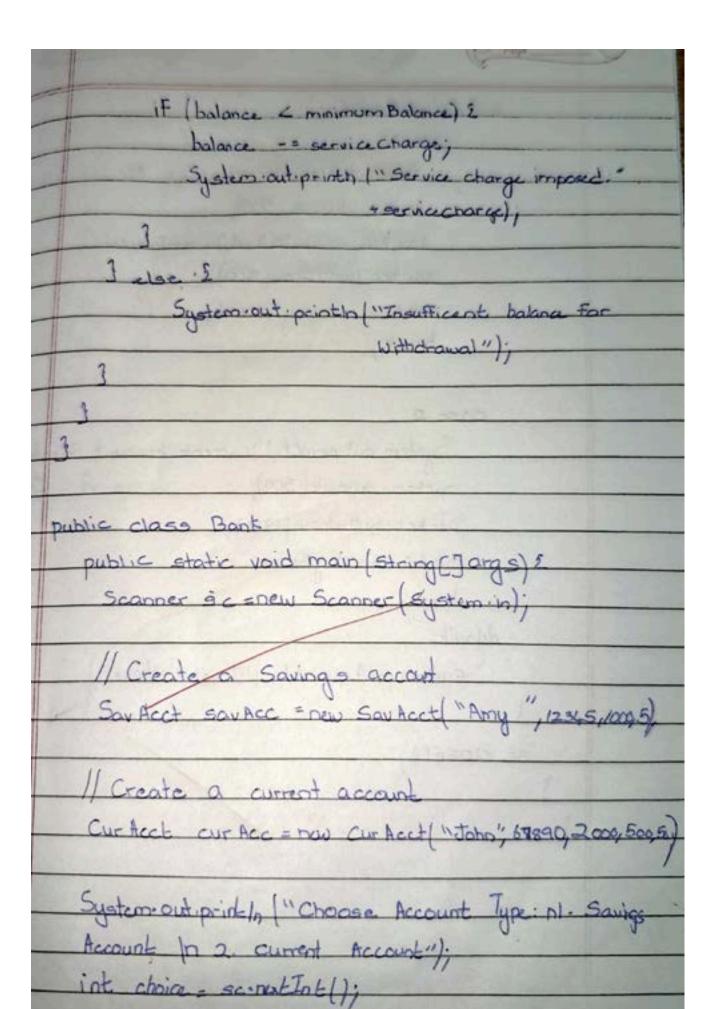
Program 5 bank account

Algorithm:

LAB -5 (3) import java util scanner, Develop a Java progra to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other account current acco The savings account provides compound interest and with drawal Facilities but nocheque facility. The current account provides cheque book facility but no interest. Current account holders sho also maintain a minimum balance and if the balana falls below this level, a service charge is Create a class Account that stores customer Name account number and type of account From this derive the classes Cur-acct and Sou-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the tollowing Accept Deposits from customer and update the Display the balance. Compute and deposit interest Permit withdrawal and update the balance Check For the minimum balance, impose penalty necessary and update the balance

_	class Account E
	protected String customer Name;
	protected int account Number,
	protected double balance,
	public Account (String customer Name, int.
304	account Number, double balance) L
	this customer Name = customer Name;
	this occount Number = account Number;
	this balance = balance;
	3
	public void display Balance () &
	- public yord deposit (double amount) &
	IF (amount 70) 2
	balance + = amount;
	System out printh ("Deposited:" Tomourt)
	3 else 5
	System out printh l'Invalia deposit amounts)
	3

	System out print h ("Balana:" + Balana);
	3
	class SavAcch extends Account [
	private double interest Rate;
3	public SavAcch (String customer Name, int accounted double balance, double interest Role)
	Super (customer Name, int account Number Chable
	suner Customer Name, account Number, balon
	this interest Rate = interest Rate;
	public void compute And Deposit Interest () &  double interest = balance * (interest Rate / los);  balance += interest;
	System-out-println ( winterest added: " + interest);
	public void withdraw (double amount) &  if (amount = balance) &  balance = amount;
	System out, println ("Withdrawn: " ramourt)



switch (choice) L case a Synen out printer : Savings Account sav her depose (500), Sav Acc . compute And Departitoterest! sav Acc . with draw ( 300); Sov Acc : display Bolonce() break, case 2. System out protts I "Current Account Sicely currece deposit ( 500); cur Acc. withdraw (1800); curace dis play Balance dejoulti System out printles ("Invalid choice") sc dose();

Output:
Choose Account Type:

1. Savings Gount Account

2. Current Account

Savings Account Selected

Deposited: 500.0

Interest added: 75.0

Withdrawon: 300.0

Balance: 1275.6

### **Program:**

import java.util.Scanner;

class Account {
 protected String customerName;
 protected int accountNumber;
 protected double balance;

```
public Account(String customerName, int accountNumber, double
balance) {
     this.customerName = customerName;
     this.accountNumber = accountNumber;
     this.balance = balance;
     }
     public void deposit(double amount) {
     if (amount > 0) {
     balance += amount;
     System.out.println("Deposited: " + amount);
     } else {
     System.out.println("Invalid deposit amount");
     }
     public void displayBalance() {
     System.out.println("Balance: " + balance);
     }
```

```
class SavAcct extends Account {
     private double interestRate;
     public SavAcct(String customerName, int accountNumber, double
balance, double interestRate) {
     super(customerName, accountNumber, balance);
     this.interestRate = interestRate;
     }
     public void computeAndDepositInterest() {
     double interest = balance * (interestRate / 100);
     balance += interest;
     System.out.println("Interest added: " + interest);
     }
     public void withdraw(double amount) {
     if (amount <= balance) {
          balance -= amount;
     System.out.println("Withdrawn: " + amount);
     } else {
```

```
System.out.println("Insufficient balance for withdrawal");
class CurAcct extends Account {
    private double minimumBalance;
    private double serviceCharge;
    public CurAcct(String customerName, int accountNumber, double
balance, double minimumBalance, double serviceCharge) {
    super(customerName, accountNumber, balance);
    this.minimumBalance = minimumBalance;
    this.serviceCharge = serviceCharge;
     }
    public void withdraw(double amount) {
    if (amount <= balance) {
    balance -= amount;
     System.out.println("Withdrawn: " + amount);
```

```
if (balance < minimumBalance) {</pre>
          balance -= serviceCharge;
         System.out.println("Service charge imposed: " +
serviceCharge);
     }
     } else {
       System.out.println("Insufficient balance for withdrawal");
public class Bank {
     public static void main(String[] args) {
     System.out.println("Aparna Sankar, 1BM23CS047");
     Scanner sc = new Scanner(System.in);
     // Create a savings account
     SavAcct savAcc = new SavAcct("Alice", 12345, 1000, 5);
     // Create a current account
     CurAcct curAcc = new CurAcct("Bob", 67890, 2000, 500, 50);
```

```
System.out.println("Choose Account Type:\n1. Savings
Account\n2. Current Account");
     int choice = sc.nextInt();
     switch (choice) {
     case 1:
         System.out.println("Savings Account Selected");
          savAcc.deposit(500);
         savAcc.computeAndDepositInterest();
          savAcc.withdraw(300);
        savAcc.displayBalance();
          break;
     case 2:
         System.out.println("Current Account Selected");
          curAcc.deposit(500);
          curAcc.withdraw(1800);
          curAcc.displayBalance();
          break;
```

### **Output:**

```
Aparna Sankar, 1BM23CS047
Choose Account Type:
1. Savings Account
2. Current Account
Savings Account Selected
Deposited: 500.0
Interest added: 75.0
Withdrawn: 300.0
Balance: 1275.0
D:\Java>javac Bank.java
D:\Java>java Bank
Aparna Sankar, 1BM23CS047
Choose Account Type:
1. Savings Account
2. Current Account
Current Account Selected
Deposited: 500.0
Withdrawn: 1800.0
Balance: 700.0
```

Program 6 SEE marks

Algorithm:

Create a package CIE which has two classes

- Student and Internals. The class student has
members like uso, name, sem. The class internals
derived from Student has an array that stores
the internal marks scored in Five courses of
the current semester of the student. Create
another package see which has the class
External which is a derived class of student.
This class has an array that stores the see
marks scored in Five courses of the student
Import the two packages in a file
that declares the final marks of n students in

public string usn;

public string name;

public into sem;

public students

public into sem;

public students string usn, String name, int sem)

£

this name = name;

	pactagecomete
	this sem = sem
	3
	public void displayactals () 2
	System out prottn " USV: " +usn),
	System out-prints ( "Name: "Trans);
	System out printly ("Sem: " + sem);
	3 3
	public class Internals 1
	public int[] internal Marts;
	public Internals (int[] marts)2
OA-SE	if [marks.length !=5]2
	System out protter 5 mots "
	this internal Marks = marks,
	auble word diese T. M. 2005
	public void display I Morta() { Internal marts:")
	or   int =0; 1cg; (++)
	1 1 1 1 1 1
	System out prints (marken" ")
	)
	System out printh();
	2 3
	3

pa	ckagecom. SEE;
	import CIG. Student;
	public class Externals extends students
	public int() External Marks;
	public Externals (String name, String us, inter
	int[] External Morts;
	publicSuper (name, usn, sem)
	If morts length 1=5)2
	System out printly   "enter 5 subjects!"
	this external marts = marts ;
	1 This external mais smalls
-	) · · · · · · · · · · · · · · · · · · ·
out	olic void display E marts ()
	System.out.printly "see mate: ")
	For (int i =0, ic5; i+t)
	-System out printh (marks +")
	System out print h ()
Im	port com.cIG. +;
Im	port com · ses *;
In	port java util Sconner;
pu	blic Clase main!
	public Static void main (String [] args) =
	Scorer sc = new Scarner (System.in);
5	ydem.out.printh "enter no of Students:")
	into=Scanner Int();

	external () students = now external (1);
	Internal [] int morts = new Internal [n],
	for (inti=0; icn; itt) {
	System out printle ("enter nove")
	System and printh ("enter name:")
	String name = sc. nextlinel);
	System out point ("enter semi");
	int som = sc. nextline();
	Statement of the property of the
	System out prints ("enter us");
	String I mart = new int[I]
	For ( int j=0; j=5; j=1)2
	I marts () = sc. nouttht()
	System out printly "enter external marts")
	int emart from int s]
	For (int =0, =<5; k++)2
	G marts [K] = SC: Next intl);
	3
	The state of the s
	The state of the state of
1000	

Int n	marts (i) = new Internals ( I marts );	-3,6;
	students [i] = new external (name, usi	
3	C. Noville To	
	S.O.P "final marts of student)	
	For (inti =0; icn; i++) &	
	Students[i] · display detail	
	int marts (i) display m	arts(),
	Student [i] · display ma	rts();
Syst	em. out. printh(" final marks", for (j=0, j<5; j+t)	);
U	or (j=0, j<5; j+1)	
g.		
	of final=int marks(): Imarks(); SOP [Final F");	) + (Students (i) · Emorts (j))
	SOP (FIRST FIT )	
3	1 10 10 10 10 10 10 10 10 10 10 10 10 10	
	SOP (" /p");	
3		
3		10
1 3		

Page Page
O/P
Enter number of students:2
Enter details For student 1: Enter USN: 1823 CSOG7
Goter Semester: 3
Goter Johannal Marks For 5 Subjects
Subject 1:45 2:49
- 3:42 - 4:48 - 5:46
Enter see Marks for 8 subjects
Subject 2; 49 / 2; 46
" 3: 44 ' 4: 42
" 5; I <sub>4</sub> I

Goter details For Studentzi
Enter USN: 1823 CS 0047
Goter Name: Rahul
Gotor Semester: 4
Enter internal marks For Saubjects:
Subject 2:37
2 . 39
3.41
4:43
1/ 5: 45
Enter SEE morts For 5 subjects:
1:45
" 2:43
" 3 i 30
4: 12
"
The second of the second of the second of
1 1 2 1 contact A substitute of about an appear

# Program:

import java.util.Scanner;

```
class Student {
     public String usn;
     public String name;
     public String sem;
     public Student(String usn, String name, String sem) {
     this.usn = usn;
     this.name = name;
     this.sem = sem;
      }
     public void displayDetails() {
    System.out.println("USN: " + usn);
    System.out.println("Name: " + name);
    System.out.println("Semester: " + sem);
      }
}
class Internals {
     public int[] internalMarks;
```

```
public Internals(int[] marks) {
      if (marks.length != 5) {
       System.out.println("Enter marks for 5 subjects.");
     return;
      }
     this.internalMarks = marks;
      }
     public void displayMarks() {
      System.out.print("Internal Marks: ");
      for (int mark : internalMarks) {
       System.out.print(mark + " ");
      }
     System.out.println();
      }
}
class Externals extends Student {
     public int[] externalMarks;
     public Externals(String usn, String name, String sem, int[] marks) {
     super(usn, name, sem);
```

```
if (marks.length != 5) {
       System.out.println("Enter marks for 5 subjects.");
     return;
      }
    this.externalMarks = marks;
      }
  public void displayMarks() {
    System.out.print("External Marks: ");
     for (int mark : externalMarks) {
       System.out.print(mark + " ");
      }
    System.out.println();
      }
}
public class Main {
     public static void main(String[] args) {
    System.out.print("Aparna Sankar 1BM23CS047");
     Scanner sc = new Scanner(System.in);
    System.out.print("Enter number of students: ");
```

```
int n = sc.nextInt();
sc.nextLine(); // Consume the newline character
Externals[] students = new Externals[n];
Internals[] internalMarks = new Internals[n];
for (int i = 0; i < n; i++) {
 System.out.println("Enter details for student " + (i + 1) + ":");
System.out.print("USN: ");
String usn = sc.nextLine();
 System.out.print("Name: ");
String name = sc.nextLine();
 System.out.print("Semester: ");
String sem = sc.nextLine();
System.out.println("Enter 5 internal marks:");
int[] iMarks = new int[5];
for (int j = 0; j < 5; j++) {
    iMarks[j] = sc.nextInt();
}
```

```
int[] eMarks = new int[5];
      for (int j = 0; j < 5; j++) {
          eMarks[j] = sc.nextInt();
      }
       sc.nextLine(); // Consume the newline character
       internalMarks[i] = new Internals(iMarks);
      students[i] = new Externals(usn, name, sem, eMarks);
      }
     System.out.println("\nFinal Marks of Students:");
      for (int i = 0; i < n; i++) {
       students[i].displayDetails();
       internalMarks[i].displayMarks();
      students[i].displayMarks();
       System.out.print("Final Marks: ");
      for (int j = 0; j < 5; j++) {
            int finalMarks = internalMarks[i].internalMarks[j] +
students[i].externalMarks[j];
          System.out.print(finalMarks + " ");
```

System.out.println("Enter 5 external marks:");

```
System.out.println("\n");
}
sc.close();
}
```

# **Output:**

```
Aparna Sankar 1BM23CS047 Enter number of students: 2
Enter details for student 1:
USN: 1bm23cs001
Name: aparna
Semester: 1
Enter 5 internal marks:
45
46
45
43
Enter 5 external marks:
34
3
36
37
4
Enter details for student 2:
USN: 1bm23cs002
Name: apporva
Semester: 2
Enter 5 internal marks:
30
34
23
45
Enter 5 external marks:
34
2
34
12
23
```

Program 7 father-son age

Algorithm:

	<u> </u>
	Colored State of the Colored S
0)	WAP that demonstrates exception handling in
	inheritance stream create a base class called "Fathe
	and derive class called as "son" which extent
	the base class in Father class implement
	a constructor which
1000	man and a grant of apparellate the last in the last
	(apterior) was
	No mino 131
7	impact java-util-Scanner
	( water part )
	class wrong Age extends Exception &
	public wrong Age (String message) !
	super (message)
10	3
	3
	class Father L
	int age:
201	public Father (int age) throws Wrong Age 1
Bul	if   22 (10) &
	throw new wrong age ("Age cannot be negative)

	this age = age;
	SOP (" Fathor's Age: "+ this age);
	and water and attached to the second
	3 - santa secondo adami mante mante mante
	AND NOTE OF BRIDE BRIDE BUILD
	class Son extends Father 2
	int sonAge;
	public son int FatherAge, int sonAge throws Wrongs
	super (fother age);
	iF (son Acc CO)L
	throw new Wrong Agel" son's age cannot be
	negative")
	3
	if (son Age > = Father Age) &
	thrownew Wrong Agel" Son's Age Connot
	be chreater or Equal to
	Father's age");
Page 1	1
	this son Age = son Age;
	Sor ("son's ag / +this sontp)

	c class Fatherson 2
- 1	public static void main ( string [ ] args) &
	Scanner scanner: new scanner (system.in);
	SOP ("enter Father's Age: ");
3	int Father Age = scanner nextInt();
9	SOP I" Enter son's age: ");
ì	nt son Age = sconner nextInt();
+	ry 1
	Son son = new Son (Father age, son Age);
1	catch ( wrong Age e) 2
	SOF ( "Exception: "+ e get Message ());
3	
S	conner closel);
3	
3	

# **Program:**

```
import java.util.Scanner;
class WrongAge extends Exception {
      public WrongAge(String message) {
    super(message);
      }
}
class Father {
      int age;
      public Father(int age) throws WrongAge {
      if (age < 0) {
      throw new WrongAge("Age Cannot be Negative");
      }
      this.age = age;
    System.out.println("Father's Age: " + this.age);
      }
}
class Son extends Father {
      int sonAge;
```

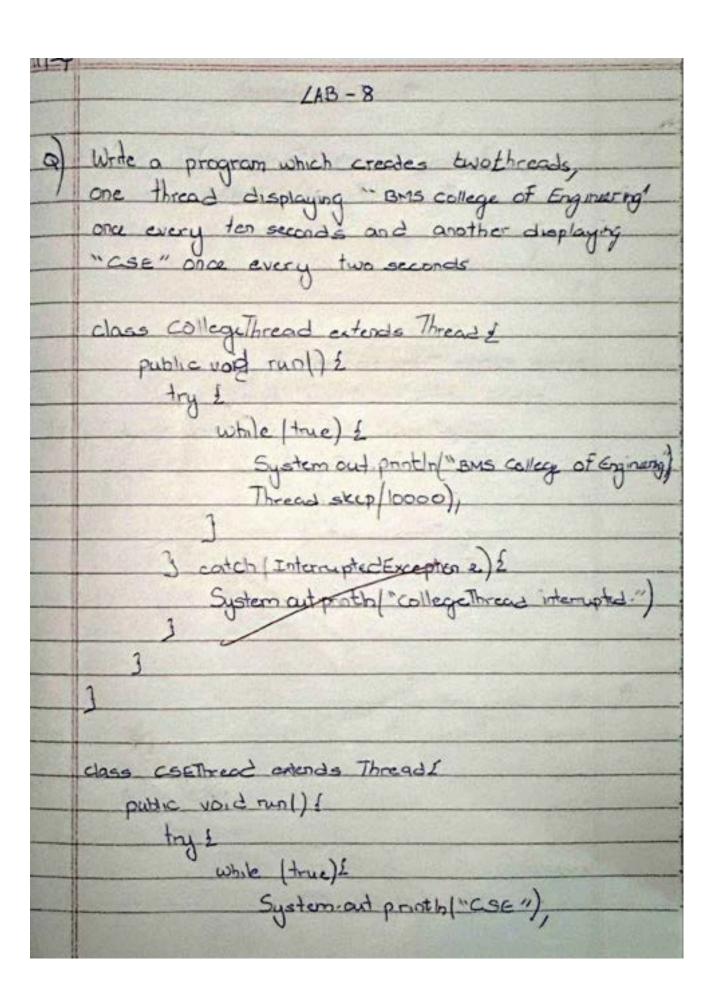
```
public Son(int fatherAge, int sonAge) throws WrongAge {
    super(fatherAge);
      if (sonAge < 0) {
      throw new WrongAge("Son's Age Cannot be Negative");
      }
      if (sonAge >= fatherAge) {
      throw new WrongAge("Son's Age Cannot be Greater than or Equal to Father's Age");
      }
      this.sonAge = sonAge;
    System.out.println("Son's Age: " + this.sonAge);
      }
}
public class FatherSon {
      public static void main(String[] args) {
    System.out.println("Aparna Sankar 1BM23CS047");
      Scanner scanner = new Scanner(System.in);
    System.out.print("Enter Father's Age: ");
      int fatherAge = scanner.nextInt();
    System.out.print("Enter Son's Age: ");
      int sonAge = scanner.nextInt();
```

```
try {
    Son son = new Son(fatherAge, sonAge);
} catch (WrongAge e) {
    System.out.println("Exception: " + e.getMessage());
}
scanner.close();
}
```

```
D:\Java>java FatherSon
Aparna Sankar 1BM23CS047
Enter Father's Age: 45
Enter Son's Age: 12
Father's Age: 45
Son's Age: 12
```

Program 8 Threads

Algorithm:



Thread sleep (2000); I costch [ Interrupted Exception e) [ System out print lo ("CSETharad inter-capte public class Thread Frample & public static void main (String [] args) College Thread college Thread = new College Threa esethread esethread = new coethread ) college Thread start(); coeThroad start(); BMS college of Engineering

#### program:

```
class CollegeThread extends Thread {
      public void run() {
      try {
      for (int i = 0; i < 5; i++) {
         System.out.println("BMS College of Engineering");
         Thread.sleep(10000);
      }
      } catch (InterruptedException e) {
       System.out.println("CollegeThread interrupted.");
      }
}
class CSEThread extends Thread {
      public void run() {
      try {
      for (int i = 0; i < 25; i++) {
            System.out.println("CSE");
         Thread.sleep(2000);
      }
```

```
} catch (InterruptedException e) {
       System.out.println("CSEThread interrupted.");
      }
}
public class ThreadExample {
      public static void main(String[] args) {
    System.out.println("Aparna Sankar 1BM23CS047");
      CollegeThread collegeThread = new CollegeThread();
      CSEThread cseThread = new CSEThread();
    collegeThread.start();
    cseThread.start();
      }
}
```

```
Aparna Sankar 1BM23CS047
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
```

Program 9

user interface

Algorithm:

4	
-	ZAB-9
1	
	import javax swing 4 i
111	import Java awt * i
	import java aut event *
	class string Dems
	2 (6/20)
	JFrame item = New JFrame ("Divider APP");
	jfm. setsize (275, 150);
	j Frm. set 2 ayout (new Flow Layout());
	JFrm. set Default Close Operation
1	(JForme GXIT ON-CLOSE);
1	(Gracing Examples of the Control of
1	Jiabel Jiab = new Jiabel ("Enter divisors
	and Dividend");
	Itestfield adt = new Itestfield(1);
1	Itext Field bits = new Itext Field 18)
1	JBution button = new . Jbutton ("calculate");
1	ODANIES (1995)
1	Jlabel er = now J Labell ();
1	Jabel alab - new Jabel ();
1	Thabter Hab = new o label()
1	
-	Jlabel anslab = new O Jabel ())

	jtm.add(err);
	- (jlab);
	(aHF);
	(bi#);
	(button);
	(a) ab);
	(blab);
	(ans 1 ab);
	(Name of the All March and Compared to the All
	ActionListentoble= L = new Action Listener()
	1 17 H. Land Co.
	public void action performed Action event of
4	2 SOP "Action event from a text Field");
	3
	37 La Caracterial Contract Contract
	Total Land Land
	ait F. Add Action Listona [1]
	bite Add Action Listener (1);
	The state of the s
	button add Action Listener (new Action) Listener () of
	Public void action performed (Action Evenleut)
	2
	1-42
110	

int a - Inter	ger parsent(a) to get
a decidence of the contract of	or parsent ( bitt getText());
int ans = a,	
	£ ("A="+a);
blab set text	
	7 ("Ans = " +ans);
errise + Text (	((12))
cotch (Number	r Format Exception e)
2	MINISTER SAN PROPERTY SAN IN
alab sette	
blab. setText	
	I" Enter only integer!")
2	
catch (Arithm	netic Exceptione)
1	
alab:sch To	ext(11 11);
blab setTo	xt(" ").
Lain Walter House	The state of the s
	A SHALL BOYSE PROGRESS OF THE SHALL BE

Truge Control of the	
ans, 16. settent "")	
err-setText ("B should be non Zers")	5
3	
3	
3);	
j Frm. setvisible (true);	
3	150
PSYM	1
1 SOP: VSN: Name:	
Swing tilites. i wortilater/ new Runnable ()	
1	
public void run()	
¿ new swing Demol);	2
1).	
317	
3	

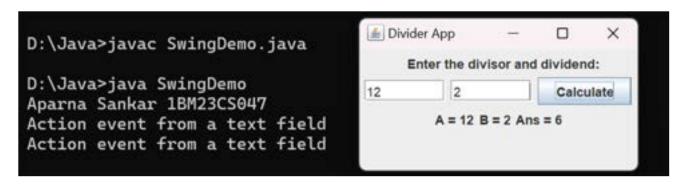
### **Program:**

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
      SwingDemo() {
      JFrame ifrm = new JFrame("Divider App");
    jfrm.setSize(275, 150);
    jfrm.setLayout(new FlowLayout());
      jfrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
      JLabel jlab = new JLabel("Enter the divisor and dividend:");
      JTextField aitf = new JTextField(8);
      JTextField bitf = new JTextField(8);
      JButton button = new JButton("Calculate");
      JLabel err = new JLabel();
      JLabel alab = new JLabel();
      JLabel blab = new JLabel();
```

```
JLabel anslab = new JLabel();
 jfrm.add(err);
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
 ActionListener l = new ActionListener() {
 public void actionPerformed(ActionEvent evt) {
     System.out.println("Action event from a text field");
 }
 };
ajtf.addActionListener(1);
bjtf.addActionListener(1);
button.addActionListener(new ActionListener() {
 public void actionPerformed(ActionEvent evt) {
        try {
```

```
int a = Integer.parseInt(ajtf.getText());
        int b = Integer.parseInt(bjtf.getText());
        int ans = a / b;
        alab.setText("A = " + a);
        blab.setText("B = " + b);
        anslab.setText("Ans = " + ans);
        err.setText("");
        } catch (NumberFormatException e) {
        alab.setText("");
        blab.setText("");
        anslab.setText("");
        err.setText("Enter Only Integers!");
        } catch (ArithmeticException e) {
        alab.setText("");
        blab.setText("");
        anslab.setText("");
        err.setText("B should be NON zero!");
        }
 }
 });
jfrm.setVisible(true);
 }
```

```
public static void main(String[] args) {
System.out.println("Aparna Sankar 1BM23CS047");
SwingUtilities.invokeLater(new Runnable() {
    public void run() {
        new SwingDemo();
    }
});
}
```



Program 10 interprocess communication and deadlock

Algorithm:

LAB 10 class A f synchronized void Foo (B b) String name = Thread: current Thread () get Named SOP ( name + " entered A foo"); Thread sleep 1000) 1 catch (exception e) 2 SOR "A interrupted"); SOP (name + " trying to call B. lat (1"); b. last 1); synchronized void last()!

System out printn "Inside A · lad"); class B & synchronized void bar (A a) [ String name = Thread current Thread () got Name sop name + "entered B.bar"

try 2 Thread sleep (1000) j I cotch (Excaptione) L SOP " B interrupted"); sop | name + " trying to call A · last |)" a. last (); synchronized void last 111 SOP ("Inside B. last"); class Deadlock implements Runnable 2 Aa -newAl); Bb = new B() Deadwck()/ Thread current Thread () set Name ("Main Threat) Thread + = new Thread ( this, "Racing Three i ()trate t a Foodb); SOP I Back in Main thread"

```
public void run [] [
          sor (" Back in other thread")
            new Deadlock ();
Program:
class A {
     synchronized void foo(B b) {
     String name = Thread.currentThread().getName();
   System.out.println(name + " entered A.foo");
     try {
     Thread.sleep(1000);
     } catch (Exception e) {
     System.out.println("A Interrupted");
   System.out.println(name + " trying to call B.last()");
```

```
b.last();
       }
      synchronized void last() {
    System.out.println("Inside A.last");
       }
}
class B {
      synchronized void bar(A a) {
      String name = Thread.currentThread().getName();
     System.out.println(name + " entered B.bar");
      try {
       Thread.sleep(1000);
       } catch (Exception e) {
       System.out.println("B Interrupted");
       }
    System.out.println(name + " trying to call A.last()");
      a.last();
       }
      synchronized void last() {
```

```
System.out.println("Inside B.last");
       }
}
class Deadlock implements Runnable {
      A = new A();
      B b = new B();
      Deadlock() {
    Thread.currentThread().setName("MainThread");
      Thread t = new Thread(this, "RacingThread");
      t.start();
      // Get lock on 'a' in this thread
      a.foo(b);
    System.out.println("Back in main thread");
       }
      public void run() {
      // Get lock on 'b' in other thread
      b.bar(a);
    System.out.println("Back in other thread");
       }
```

```
public static void main(String[] args) {
System.out.println("Aparna Sankar 1BM23CS047");
new Deadlock();
}
```

```
D:\Java>java Deadlock
Aparna Sankar 1BM23CS047
RacingThread entered B.bar
MainThread entered A.foo
MainThread trying to call B.last()
RacingThread trying to call A.last()
```