# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

# Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

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in partial fulfilment for the award of the degree of BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING



#### BENGALURU-560019 Sep-2024 to Jan-2025

#### **B.M.S.** College of Engineering,

Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)

Department of Computer Science and Engineering



#### **CERTIFICATE**

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Ruqaiyya Mahreen** (**1BM23EE044**), who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment 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.

Lab Faculty In Charge: Dr Prasad GR	Dr. Jyothi S Nayak
Professor	Professor & HOD
Department of CSE, BMSCE	Department of CSE, BMSCE

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#### GitHub Link:

https://github.com/RuqaiyyaMahreen/JavaLab

<u>Program 1</u> Implement Quadratic Equation



NAME: RUGALYYA M STD.: SEC.: ROLL NO.: SUB.: JAVA OBS Teacher's Page No. Sign / Remarks 23/10/24 Week 1-Quadratic 15 -23/10/24 Week 2-SGPA 8 30/10/24 Week 3 - Book 13 30/10/24 Week 4-xrea 16 13/11/24 Week 5-Bank 20 13/11/24 Week 6 - CIE and SEE 20/11/24 Week 7 - Exceptions 27/11/24 Week 8- Threads 27 33 37 32111134 27/11/24 Week 9- Interface 39 27/11/24 Week 10- IPC and Leadbox 43

	classmate
	classmate
trola.	Page 9
23/10/24	WEEK 1
	· · · · · · · · · · · · · · · · · · ·
	import gara util scanner;
	import java util scanner; import java lang Math;
	class of
	1
	public static void main (Stringarge (3))
	Scanner of = new Scanner (System in);
	System.out. printly ("Exter coefficient a:"),
	double a = in nextDouble ();
	System aut println ("Enter coefficient 6:"
	abuble b = in next Double (); "
	system out printly ("Enter coefficient c: ");
	double c=in. next Double();
	double d= b*b-4*a*c;
	if (d>0){
	double 21 = (-b+ Math sgrt (d) /(2*a);
	double 82 = (-b-Math sgrt (d)/(2*a);
	System out println ("The roots are
	real and different.");
	system out println ("Root 1: "+ 12);
	System out prixtln ("Root 2: "+ +2);
	7
	else if (d==0) f
	donote r=-b1(2*a):
	System out println ("The roots are
	System out println ("The roots are real and the same");
	System out println ("Root: "+ r).
	7
	System.out. println ("Root: "+r);

	Date Page
	else §
	System out println ("The roots a
	complex ");
	double realpart = -b/(2 * a);
	double imaginarypant = Math. sgpt (2*a);
	System.out. println ( * Root 1: "+realp
	inegrayport +
	System out println ("Root 2: " + realya
	+ imaginarypart + "i
	3
	Scanner close ();
	System out println ("Rugaiyya Mahr
	1BM23EE044");
_	3
_	J
-	Output:
	Enter coefficient a: 2
1	Enter coefficient b: 4
1	Enter coefficient c: 8
+	The roots are complex
+	Root 1: -1.0+ 1.73205080 i
+	Root 2: -1.0+1.73205080 i
	Rugaiyya Mahreen 18M23EE044
	Enter coefficient a: 1 Enter coefficient b:-7 Enter coefficient c:10
	Enter coefficient 6:-7
	Enter coelección c. 10

```
The roots are real and different
Code:
import java.util.*;
class Quadratic {
  int a, b, c;
  double r1, r2, d;
  void getd(Scanner in) {
     System.out.println("Enter the coefficients of a, b, c");
     a = in.nextInt();
     b = in.nextInt();
     c = in.nextInt();
  }
  void compute() {
     while (a == 0) {
        System.out.println("Not a quadratic equation");
        System.out.println("Enter a non-zero value for a:");
        Scanner in = new Scanner(System.in);
        a = in.nextInt();
     d = b * b - 4 * a * c;
     if (d == 0) {
        r1 = (-b) / (2.0 * a);
        System.out.println("Roots are real and equal");
        System.out.println("Root1 = Root2 = " + r1);
     } else if (d > 0) {
        r1 = (-b + Math.sqrt(d)) / (2.0 * a);
        r2 = (-b - Math.sqrt(d)) / (2.0 * a);
```

```
System.out.println("Roots are real and distinct");
        System.out.println("Root1 = " + r1 + ", Root2 = " + r2);
     } else {
        System.out.println("Roots are imaginary");
        r1 = (-b) / (2.0 * a);
        r2 = Math.sqrt(-d) / (2.0 * a);
        System.out.println("Root1 = " + r1 + " + i" + r2);
        System.out.println("Root2 = " + r1 + " - i" + r2);
     }
  }
}
class QuadraticMain {
  public static void main(String args[]) {
     Scanner in = new Scanner(System.in);
     Quadratic q = new Quadratic();
     q.getd(in);
     q.compute();
     in.close();
        System.out.println("1BM23EE044");
       System.out.println("Ruqaiyya Mahreen");
  }
}
```

```
Command Prompt
Microsoft Windows [Version 10.0.22000.2538]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Admin>D:
D:\>cd 1BM23EE044
D:\1BM23EE044>javac QuadraticMain.java
D:\1BM23EE044>java QuadraticMain
Enter the coefficients of a, b, c
4
8
Roots are imaginary
Root1 = -1.0 + i1.7320508075688772
Root2 = -1.0 - i1.7320508075688772
1BM23EE044
Ruqaiyya Mahreen
D:\1BM23EE044>java QuadraticMain
Enter the coefficients of a, b, c
1
-7
10
Roots are real and distinct
Root1 = 5.0, Root2 = 2.0
1BM23EE044
Ruqaiyya Mahreen
D:\1BM23EE044>java QuadraticMain
Enter the coefficients of a, b, c
2
4
2
Roots are real and equal
Root1 = Root2 = -1.0
1BM23EE044
Ruqaiyya Mahreen
```

### Program 2

#### Student SGPA Calculation

\$/10/24	WEEK 2
_	Develop a gava program to create a cla student with members uses, name, an
	array credits and an array marks
	Include method to accept and display
	details and a method to calculate SGPA
	of a student.
	import java. util. *
	class student {
	string usn;
	string name;
	Int redits ();
	int marks [];
	public Student (int num subjects)
	\$
	(redits = new int[numsubjects];
	redits = new int[numsubjects]; marks = new int[numsubject];
	void acceptdetails()
	5
	scanner in = new Scanner (System.in);
	System.out. println ("Enter usn");
	uon = in. nextline();
c	System out println ("Enter name");
	name = in nextline ();
	System out println ("Enter credits and marks for each subject");
	marks for each subject");

elicemite Dole Page
for (int i=0; i < credits. length; i++) [ System out println (" credits for  Subject "+ credit & i);  credits [i] = in next Int();  System out println (" Marks for subject  +(i+1);
System out mintly (" Gredits for
Subject "+ cooled site).
credity [i] = in next Tut().
Sutem out reintly ("Marke for rubiect
+(1+1):
marks[i] = sc. nextInt();
7
13
wid dienlandstails ()
void displaydetails ()
Sustan out relietly ("1100." + 100)
System.out. println ("Usn:"+usn); System.out. println ("Name: "+name); for (int i=0; i < credits. length; i++)
Ineliat i - 0: is seed its level is
s continue =0, 12 colons. conjin; 1+7)
System. out. println ("Subject "+(i+1)+ " credits: "+ credits [i]+ "Marks:"+
marker [1] ?
System.out.println("SGPA:1.2f /n", calculate SGPA());
Califact SGFA());
1. Ola calculatescopa () S
double calculatesGPA(){
double total credits=0;
double total points = 0;
 for (int i=0; i < credits length; i++) {     double gradepoint = calculate Gradepoint (
of DUNE gradeborn = Calculate Gradebout
1 (2)

```
total points & + = grade point * credits[
total credits + = credits [i];
   return total credits > 03 total points, total credits: 0
  double calculateGradepoint (int mais
          if (mark == 70)
   else if (mark >= 50)
  seturn 6;
 else if (mark >= 40)
   return 0;
public class Student SGPA calculator
```

	Classmate Dete
	public static void main (string args [])
_	Scanner in = new Scanner (System is)
	Scanner in = new Scanner (System.in)  System.out. println ("Enter the no. of  subjects");  int numoubjects = \$2. next Int();  in. next Ine ();
_	int numoubjects = sp. next Int(); in next line ();
	student student = new student (numsubjects) student accept details ();
	student displaydetails ().
	&c close();
	9
	3
	output:
	Enter the number of subjects: 4
	Enter the number of subjects: 4 Enter usn: 1BM23EE044
	Enter name Rugaryya
	Enter name: Rugaryya Enter credits and marks for each
	subject:
	Gedits for subject 1:4
	Marks: 95
	Credits for subject 2: 3
	Marke = 98
	Gedits for subject 3:4
	redits for subject 3:4 Marks = 88
	credits for subject 4: 2
	marks = 85

```
USN: 18423EE044

Name: Rugariya Mahreen

Subject 1- credits: 4, marks = 95

Subject 2-credits: 3, marks = 98

Subject 3- credits: 4, marks = 88

Subject 4- credits: 2, marks - 85

SGPA = 9.54
```

```
Code:
import java.util.*;
class Subject {
                    int subjectMarks;
                    int credits;
                    int grade;
class Student
                    Subject subject[];
                    String name;
                    String usn;
                    double SGPA;
                     Scanner s;
                     Student()
                      int i;
                      subject=new Subject[9];
                      for(i=0;i<9;i++)
```

```
subject[i]=new Subject();
                      s=new Scanner(System.in);
                    void getStudentDetails(){
                      System.out.print("Enter your name: ");
                      name=s.next();
                      System.out.println("Enter your USN: ");
                      usn=s.next();
                    void getMarks()
                      for(int i=0;i<9;i++)
                              System.out.print("Enter marks for subject "+(i+1)+": ");
                              subject[i].subjectMarks=s.nextInt();
                              System.out.print("Enter credits for subject "+(i+1)+": ");
                              subject[i].credits=s.nextInt();
                              subject[i].grade=(subject[i].subjectMarks/10)+1;
                             if(subject[i].grade==11)
                                     subject[i].grade=10;
                             if(subject[i].grade<=4)</pre>
                                     subject[i].grade=0;
                    void computeSGPA()
                      int effectiveScore=0;
                      int totalCredits=0;
                      for(int i=0;i<9;i++)
                             effectiveScore+=(subject[i].grade*subject[i].credits);
                             totalCredits+=subject[i].credits;
                      SGPA=(double)effectiveScore/(double)totalCredits;
class Main
                    public static void main(String args[]){
                      Student s1=new Student();
                      s1.getStudentDetails();
```

```
s1.getMarks();
s1.computeSGPA();
System.out.println("Name: "+s1.name);
System.out.println("USN: "+s1.usn);
System.out.println("SGPA: "+s1.SGPA);
}
```

```
Command Prompt
D:\1BM23EE044>javac Main.java
D:\1BM23EE044>java Main
Enter your name: Ruqaiyya
Enter your USN:
1BM23EE044
Enter marks for subject 1: 95
Enter credits for subject 1: 4
Enter marks for subject 2: 98
Enter credits for subject 2: 3
Enter marks for subject 3: 88
Enter credits for subject 3: 4
Enter marks for subject 4: 85
Enter credits for subject 4: 2
Enter marks for subject 5: 78
Enter credits for subject 5: 1
Enter marks for subject 6: 84
Enter credits for subject 6: 4
Enter marks for subject 7: 12
Enter credits for subject 7: 3
Enter marks for subject 8: 99
Enter credits for subject 8: 2
Enter marks for subject 9: 83
Enter credits for subject 9: 3
Name: Rugaiyya
USN: 1BM23EE044
SGPA: 8.26923076923077
```

#### Program 3

**Book Details** 

3/10/24	Proge_13
03.107	week 3-
	Create a class Book which contains 4
	members: name, author, price, num pages. Include a constructor to set the values
	for the members Include methods to set
	and get the details of the objects. Include a toString() method that could display
	the complete details of the book Develop
	a gava program to create n book objects.
	import java util Scanner;
_	class Books
	string name;
	string author; int price; numbages;
	Books (string name, string author, int price,
	ent num Pages) {
	this name = name;
	this author = author;
	this.price = price;
	this num Pages = num Pages;
	sullis String to String (15
	String name = "Book name"+ this name
	public String to String () { String name = "Book name" + this name "\n".
	String author = "Author nane: "this author + "\n";
	+ \n',

	Cafe
	Stains Mice - "Price: " + this paire + "/n":
	String price = "Price: " + this price + "/n"; String numbages = "Number of Pages: "+
	this was Pages + "\m"
	return name + author+ price + num Page;
	4
	4
n	ublic class Main {
T	public static word main (String aras)
	public static void main (String args ( Scanner s = new Scanner (System in
	System out println ("Enter the number
	of books: ");
	int n=s.nextInt();
	Books b[] = new Books[n];
	for(int i=0; i <n; i++){<="" td=""></n;>
	System out println ("Enter the
	details for book "+ (i+1)+ ": ");
	System.out.print("Name: ");
	String name = s. next();
	System.out. print ("Author: ");
	String author = s. next();
	System.out.print ("Price: ");
	int price = S. next Int ();
	b[i]= new Books (name, author,
	price, numpages);
	7
\$	system.out. println ("In Book Details"
	System.out.println("\n BookDetails", for (int i=0; i <n; i++){<="" td=""></n;>
	System.out.println(b[i].toStrin

	12	Page
4		
S.close ()	:	
3 S.close ()		
3		
Output:		
Enter the ne	unber of books:	
Name: The		
Author: May		
Price: 230		
No of pages:	200	
Enter detail	ls for book 2:	
Name: The	Vightripale	
Author: Krist	in Hannah	
Price: 400		
No of pages:	300	7
Book details		
	The Book Thief	
	: Markero zušak	
Price: 230		
No of pages: 2	0.0	
Book name: 7	he Nightingale Kristin Hannah	
Author name:	Kristin Hannah	
Price: 400		
no of pages: 3	300	

#### Code:

import java.util.Scanner;

class Books {
 String name;
 String author;
 int price;

```
int numPages;
  Books(String name, String author, int price, int numPages) {
     this.name = name;
    this.author = author;
    this.price = price;
    this.numPages = numPages;
  }
  public String toString() {
     String name = "Book name: " + this.name + "\n";
     String author = "Author name: " + this.author + "\n";
    String price = "Price: " + this.price + "\n";
    String numPages = "Number of pages: " + this.numPages + "\n";
    return name + author + price + numPages;
  }
}
public class Mains {
  public static void main(String args[]) {
     Scanner s = new Scanner(System.in);
    System.out.print("Enter the number of books: ");
    int n = s.nextInt();
    Books b[] = \text{new Books}[n];
    for (int i = 0; i < n; i++) {
       System.out.println("Enter details for book " + (i + 1) + ":");
       System.out.print("Name: ");
       String name = s.next();
       System.out.print("Author: ");
       String author = s.next();
       System.out.print("Price: ");
       int price = s.nextInt();
       System.out.print("Number of pages: ");
       int numPages = s.nextInt();
       b[i] = new Books(name, author, price, numPages);
     System.out.println("\nBook Details:");
```

```
for (int i = 0; i < n; i++) \{ \\ System.out.println(b[i].toString()); \\ \} \\ System.out.println("Ruqaiyya Mahreen 1BM23EE044"); \\ s.close(); \\ \} \\ \}
```

```
Command Prompt
D:\1BM23EE044>javac Mains.java
D:\1BM23EE044>java Mains
Enter the number of books: 3
Enter details for book 1:
Name: XYZ
Author: RuskinBond
Price: 340
Number of pages: 200
Enter details for book 2:
Name: ABC
Author: GillianFlynn
Price: 200
Number of pages: 340
Enter details for book 3:
Name: PQR
Author: DaphneDuMaurier
Price: 260
Number of pages: 190
Book Details:
Book name: XYZ
Author name: RuskinBond
Price: 340
Number of pages: 200
Book name: ABC
Author name: GillianFlynn
Price: 200
Number of pages: 340
Book name: PQR
Author name: DaphneDuMaurier
Price: 260
Number of pages: 190
Ruqaiyya Mahreen 1BM23EE044
```

### Program 4

Shape Area Calculation

<b>3</b> /14/24	Week 4
	Develop a gava program to create an
	abstract class named shape that
	contains 2 integers and an empty method
	named printArea (). Provide three classes
	named Rectangle, Triangle and Circle such that each one of the classes extend
	the class shape Each one of the classes
	contain only the method print Area () that
	prints the area of the given shape.
	Export java util Scanner;
	String name;
	strong author;
	int namages
	import java util scanner;
	class InputScanner 1
	scanner SC = new Scanner (System. in).
	int get Int() {     return sc next Int();
	3
	3
	abstract class shape extends Inputscaunif
	int dimension 1; dimension 2;
	abstract void printArea();
	J

	Page
_	00.4.0.
	class Rectaugle extends shape { Rectangle() {
	System out, printly ("Enter length of
	rectangle");
	Sustant out with the City
	dinension 1 = get Int ();  System.out. println ("Enter breadth of rectangle: ");  dimension 2 = get Int ();
	dimension 2 = getInt();
	3
	void print Area () {  double area = dimension 1 * dimension  System out println ("Area of  Actangle: "+ area);  }
	Sustem out rejutly ("Area of
	sectangle: + area);
	3
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	class Triangle extends Shape {     Triangle! X         system.out.println("Enter base of
	system out printly ("Enter base of
	him into act to the
1	System out printly ("Enter height of
	Friangle !");
	dimension 2 = get Int ();
_	amid withher OS
	void printArea () { double area = 0.5 * divension 1 * dimension 1 * dime
	System out wintly ("Area of triangle
	7 4.001:
	33

	Date Foge
	class circle extends shape { Circle(){ Circle () { Cir
	class (incle extends shape {     Circle() {         System out println ("Enter rade
	Sustem out mintly ("Enter rade
	ciscle: ").
	discovering 1 = act Tut();
	l: wdm 3 = 0:
	Z
	and withour () f
	void print Area () {     double area = Math. PI * dimension
	anure area = 10 mm. 12 · contestion
	dimension 21;
	System out printly ("Alea of circle
	area);
	7
	31. 0
	public class Main t
	public static void main string ange
	shape nect = new Rectangles,
-	shape the = new Grangle ();
-	shape on = new aicle();
	rect. printArea();
-	tri printArea ();
-	cir.psintArea();
_	3
-	}
6	lutput:
1	inter length of rectangle: 4 inter breadth of rectangle: 3 inter base of triangle: 6
E	inter breadth of rectangle: 3
	to been at the pool

```
Code:
import java.util.Scanner;
class InputScanner {
  Scanner scanner = new Scanner(System.in);
  int getInt() {
     return scanner.nextInt();
  }
}
abstract class Shape extends InputScanner {
  int dimension1;
  int dimension2;
  abstract void printArea();
}
class Rectangle extends Shape {
  Rectangle() {
     System.out.print("Enter length of Rectangle: ");
     dimension1 = getInt();
    System.out.print("Enter width of Rectangle: ");
```

```
dimension2 = getInt();
  }
  void printArea() {
     double area = dimension1 * dimension2;
    System.out.println("Area of Rectangle: " + area);
}
class Triangle extends Shape {
  Triangle() {
     System.out.print("Enter base of Triangle: ");
     dimension1 = getInt();
     System.out.print("Enter height of Triangle: ");
     dimension2 = getInt();
  }
  void printArea() {
     double area = 0.5 * dimension1 * dimension2;
     System.out.println("Area of Triangle: " + area);
class Circle extends Shape {
  Circle() {
     System.out.print("Enter radius of Circle: ");
     dimension1 = getInt();
     dimension 2 = 0;
  }
  void printArea() {
     double area = Math.PI * dimension1 * dimension1;
     System.out.println("Area of Circle: " + area);
}
public class Area {
  public static void main(String[] args) {
     Shape rectangle = new Rectangle();
     Shape triangle = new Triangle();
     Shape circle = new Circle();
```

```
rectangle.printArea();
  triangle.printArea();
  circle.printArea();
  System.out.println("Ruqaiyya Mahreen 1BM23EE044");
}
```

```
D:\1BM23EE044>javac Area.java

D:\1BM23EE044>java Area

Enter length of Rectangle: 20

Enter width of Rectangle: 10

Enter base of Triangle: 12

Enter height of Triangle: 3

Enter radius of Circle: 7

Area of Rectangle: 200.0

Area of Circle: 18.0

Area of Circle: 153.93804002589985

Ruqaiyya Mahreen 1BM23EE044
```

Program 5
Bank Account Management

13/11/24	Week 5
10/11/24	week 5
	Develop a gava program to create a
	class Bank that maintains 2 kinds of
	accounts of for its customers, one called
	savings accounts and the other current
	account. The savings account provides
	compound interest and withdrawal facilities
	but no cheque book facility. The current
	account provides cheque book facility
	but no interest current account holders
	should also maintain a minimum
	balance and if the balance falls below
	this level, a service charge is imposed.
	import java. util. *;
	class Account?
	String austomer Name;
	int accountNumber;
	String account Type; double balance;
	something;
	Account ( string customers lance, int
	account Number, string account yes
	this customer Name = customer Name;
	this account Number = acount Number;
	this account Type = account Type,
	this. balance = 0.0;
	3
	1550

1	Page
	void deposit (double amount) {
	balance + = amount:
	System out winter ("Amount
	balance + = amount; System out printin ("Amount deposited: "+ amount);
ŀ	3
1	void displayBalance () { System.out.println ("automer name"
	System out mirtly ("automer name
	customer Nance);
	System out println ("Account number:
	account Number
	System out mintly ("Types of account
	+ account Type + "account").
	System out printly ("Types of account to account Type + "account");  System out printly ("Balance = "+ balance")
,	1
9	lass SavAcct exclends Accounts
L	Sav Acct (String customer Name, int
L	Saw Acct (String customer Name, int account Number) [
	super(customerName, accountNumbe
L	"Savings");
	6
	void compute Interest (double rate, int
	time) {
Г	balance += balance * math now (1+ rate
Г	balance + = balance * Math.pow (1+ rate time) - balance;
-	The state of the s

orid withdraw (double amount) {  if (balance = amount) {  balance = amount;  system out println ("Amount :  tamount);  } else {  System out println ("Insuff balance }  3  3  3  Cur Acctor extends Account {  etatic final double PENALTY = 50 c  Cur Acct (String customer Name, int {  Super (customer Name, account Nu "arrent");  3  Void withdraw (double amount) {  if (balance any ount = HIN &		Pogs
balance = amount;  balance = amount;  system out println ("Amount;  tamount);  I else f  System out println ("Insuff balance  3  3  3  3  ass curacctor extends Account?  etatic final double MIN_BALANG static final double PENALTY=50 c  Curacct (String customer Name, int  Super (customer Name, account Nu "arrent");  3  Void withdraw (double amount) {	roid withdraw	(double amount) {
system out println ("Amount;  system out println ("Amount;  famount);  I else f  System out println ("Insuff  balance  3  3  3  3  ass curacctore extends Account?  etatic final double MIN BALANI  static final double PENALTY=50 c  Curacct (String customerName, int  Super (customerName, accountNu  "Current");  3  Void withdraw (double amount) {	it (balance >	= amount){
System out println ("Insuff funcions);  I else f System out println ("Insuff balance 3 3 3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4	balance -	= ampust:
System out pritter ("Insuff balance  3 3 3 3 3 ass CurAcctor extends Account? etatic final double MIN BALANG static final double PENALTY=50.0 CurAcct(String customerName, int  Super (customerName, accountNu "arrent"); 3 void withdraw (double amount)?	Luturante	+ is interest and
System out pritter ("Insuff balance  3 3 3 3 3 ass CurAcctor extends Account? etatic final double MIN BALANG static final double PENALTY=50.0 CurAcct(String customerName, int  Super (customerName, accountNu "arrent"); 3 void withdraw (double amount)?	system on	promote the
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3 3 3 3 3 3 ass CurAccton extends Account?  etatic final double MIN_BALANO static final double PENALTY=50 c  CurAcct(String customerName, int  { Super (customerName, accountNu "arrent");  3 Void withdraw (double amount) {	- Jusez	L. O. A. Manuellia
3 3 3 3 3 3 ass CurAccton extends Account?  etatic final double MIN_BALANO static final double PENALTY=50 c  CurAcct(String customerName, int  { Super (customerName, accountNu "arrent");  3 Void withdraw (double amount) {	syctem.o	but pruting marghe
3 3 3 3 3 3 ass CurAccton extends Account?  etatic final double MIN_BALANO static final double PENALTY=50 c  CurAcct(String customerName, int  { Super (customerName, accountNu "arrent");  3 Void withdraw (double amount) {	•	balance
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {	2	
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {		
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {	<u> </u>	
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {	3	
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {	lass curacities o	atends Accounts
CurAcct (String customer Name, int  Super (customer Name, account Nu "arrent");  3 Void withdraw (double amount) {	etatic livel of	Poulle MINI BALANCE
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Super (austomerName, accountNu "aurrent"); 3 Void withdraw (double amount) {	CurAcct (String a	ustomer Name, int ac
void withdraw (double amount) {	1	
void withdraw (double amount) {	super (custom	rename, accountnum
void withdraw (double amount) {	"arre	nt ").
void withdraw (double amount) {	3	
if (balance = an mont == Min) &	void withdrawl	dayble amount) 5
	it (balance -	doublest Z= MINI BAL
if (balance - amount >= MIN_B,	halanca	= 0 +
balance = amount;	e tour	+ with Illa
System out printle ("Amoure" + amount);	system or	w. printer ( Amount
2 Tamount);	2 Tanu	amit);

	else E
	system.out. printly ("min balance
	system out printly ("Min balance requirement not met. Cannot withdraw,
	3
	3
	void check Minimum Balance () {
	if (balance < MIN-BALANCE) {
	balance - = PENALTY;
	System out-printly ("Penalty of "+
	System out printly ("Penalty of "+ PENALTY + "imposed due to insufficient balance");
	balance");
	~3
	2
	J
	public class Banks
	public static void main (String angs ()) { scanner sc = new Scanner (System in);
	Account [] accounts as Account []
~	Accounts [] accounts = new Account (10);
	urt count = 0;
	rohile (true) {
	System out println ("Enter customer name");
	mans "):
	Hair water was Name = 50 next ()
	luctions out so with 1" Feter account
	string customerName = sc. next(); System. out printly ("Enter account number"):
	7)
	int account Number = sc. next Int ();

	C. rolls
	System.out. println ("Enter the type account (1 for Savings, 2 for Cury int type = sc. next Int ();
	account (1 for Savings, 2 for Cur
	int type = sc. next Int ();
	4 (Myses = = 1)1
	accounts [count] = new SarAcct
_	Customer Name, account Number
-	J .
_	elses
	accounts [count] - new Curs Acct (
	austomer Name, accountition
_	7
	Count++;
-	0.0
_	while (true) {
	System out println ("Enter customes n
	String automerName or next ance 3:
	System out printle ("Enter account
	number ");
1	int accountNumber = sc. nextInty);
+	System out printle (" Enter MENU "):
+	System out printle (1 Deposit 2 Withdra
-	3. Compute Interest for Savings 4. Display account details
1	4. Display account details
+	5. Exit");
+	System out println ("Ender your chice"
1	int choice = sc next Int();
	if (choice = 5) {
	break;
1	

Date
switch (choice)
case 1:
System out printler ("Enter the deposit amount");
double SaporitAmount - or next Double
double depositAmount - sc. nextDouble ( accounts [count - 1]. deposit(depositAmount
break;
case 2:
System out printly ("Enter the withdran amount: ");
double withdraw smount = sc. nextboubl
if (lappe = = 1){ withdrawton
((Sav Acct) accounts [count - 1). withdraw (
3 Asel
((CunAcct) accounts [count - 1] withdraw (withdraw
((currAcct) accounts [count-1]. check Minimumbala
3 break;
case 3:
if (types == 1) hime");
System out println ("Enter the interest rate as
andle rate = x next Double ();
int time = &c. nextInt();
((SavAcct) accounts [count - 1]). compute Interest (m) System out printles "Interest computed and to
added to balance ");
Felse S
butous out wintly (" at interest
ogacon our primer No minest
System out printle ("No interest computation for current Account
3 break;

	case 4:
	accounts [count - 1] displaybalance (),
	lireak;
	3
_	3
	Output:
-	Enter austomer name:
_	ABC
	Enter account us:
_	123
1	1. Deposit 2. Withdraw 3. Compute In 4. Display account details 5. Exit Enter your choice:
	Enter deposit amount: 5000
3	Deposit 2. Mithdraw 3. Conjute Interest
-	4. Display account details 5. Exit
^	nter your choice: 4
	extorus name: ABC
-	Cc no: 123
7	ype of Account Savings
7	Mance = 5630.

#### Code:

import java.util.Scanner;

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

```
Account(String customerName, int accountNumber, String accountType) {
    this.customerName = customerName;
    this.accountNumber = accountNumber:
    this.accountType = accountType;
    this.balance = 0.0;
  }
  void deposit(double amount) {
    balance += amount;
    System.out.println("Amount deposited: " + amount);
  void displayBalance() {
    System.out.println("Customer name: " + customerName);
    System.out.println("Account number: " + accountNumber);
    System.out.println("Type of Account: " + accountType + " account");
    System.out.println("Balance = " + balance);
  }
}
class SavAcct extends Account {
  SavAcct(String customerName, int accountNumber) {
    super(customerName, accountNumber, "Savings");
  void computeInterest(double rate, int time) {
    balance += balance * Math.pow(1 + rate / 100, time) - balance;
  }
  void withdraw(double amount) {
    if (balance >= amount) {
      balance -= amount;
       System.out.println("Amount withdrawn: " + amount);
    } else {
      System.out.println("Insufficient balance.");
class CurAcct extends Account {
  static final double MIN_BALANCE = 500.0;
  static final double PENALTY = 50.0;
  CurAcct(String customerName, int accountNumber) {
    super(customerName, accountNumber, "Current");
  }
```

```
void withdraw(double amount) {
    if (balance - amount >= MIN BALANCE) {
       balance -= amount:
       System.out.println("Amount withdrawn: " + amount);
     } else {
       System.out.println("Minimum balance requirement not met. Cannot withdraw.");
  }
  void checkMinimumBalance() {
    if (balance < MIN_BALANCE) {
       balance -= PENALTY;
       System.out.println("Penalty of " + PENALTY + " imposed due to insufficient balance.");
  }
public class Bank {
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
       System.out.println("Ruqaiyya Mahreen 1BM23EE044");
    Account[] accounts = new Account[10];
    int count = 0;
    while (true) {
       System.out.println("Enter customer name: ");
       String customerName = sc.next();
       System.out.println("Enter account Number: ");
       int accountNumber = sc.nextInt();
       System.out.println("Enter the type of account (1 for Savings, 2 for Current): ");
       int type = sc.nextInt();
       if (type == 1) {
         accounts[count] = new SavAcct(customerName, accountNumber);
       } else {
         accounts[count] = new CurAcct(customerName, accountNumber);
       count++;
       while (true) {
         System.out.println("----MENU-----");
         System.out.println("1. Deposit\n2. Withdraw\n3. Compute interest for SavingsAccount\n4.
Display account details\n5. Exit");
         System.out.println("Enter your choice: ");
         int choice = sc.nextInt();
         if (choice == 5) break;
```

```
switch (choice) {
            case 1:
              System.out.println("Enter the deposit amount: ");
              double depositAmount = sc.nextDouble();
              accounts[count - 1].deposit(depositAmount);
              break:
            case 2:
              System.out.println("Enter the withdrawal amount: ");
              double withdrawAmount = sc.nextDouble();
              if (type == 1) {
                 ((SavAcct) accounts[count - 1]).withdraw(withdrawAmount);
              } else {
                 ((CurAcet) accounts[count - 1]).withdraw(withdrawAmount);
                 ((CurAcct) accounts[count - 1]).checkMinimumBalance();
              break;
            case 3:
              if (type == 1) {
                 System.out.println("Enter the interest rate and time in years: ");
                 double rate = sc.nextDouble();
                 int time = sc.nextInt();
                 ((SavAcct) accounts[count - 1]).computeInterest(rate, time);
                 System.out.println("Interest computed and added to balance.");
                 System.out.println("No interest computation for Current Account.");
              break;
            case 4:
              accounts[count - 1].displayBalance();
              break;
         }
       }
       System.out.println("Do you want to add another account? (yes/no): ");
       String response = sc.next();
       if (response.equalsIgnoreCase("no")) break;
     }
    sc.close();
  }
}
Output:
```

```
D:\1BM23EE044>javac Bank.java
D:\1BM23EE044>java Bank
Enter customer name:
ABC
Enter account Number:
123
Enter the type of account (1 for Savings, 2 for Current):
----MENU----

    Deposit

2. Withdraw
Compute interest for SavingsAccount

    Display account details

Exit
Enter your choice:
Enter the deposit amount:
Amount deposited: 5000.0
----MENU----

    Deposit

2. Withdraw
3. Compute interest for SavingsAccount

    Display account details

5. Exit
Enter your choice:
Enter the interest rate and time in years:
Interest computed and added to balance.
----MENU----

    Deposit

2. Withdraw
Compute interest for SavingsAccount

    Display account details

5. Exit
Enter your choice:
Customer name: ABC
Account number: 123
Type of Account: Savings account
Balance = 5630.81209632
----MENU----

    Deposit

2. Withdraw
Compute interest for SavingsAccount

    Display account details

5. Exit
Enter your choice:
Do you want to add another account? (yes/no):
yes
Enter customer name:
Ruqaiyya
Enter account Number:
456
Enter the type of account (1 for Savings, 2 for Current):
----MENU-----

    Deposit
```

```
----MENU-----

    Deposit

2. Withdraw
Compute interest for SavingsAccount
Display account details
5. Exit
Enter your choice:
Enter the deposit amount:
10000
Amount deposited: 10000.0
----MENU-----

    Deposit

2. Withdraw
Compute interest for SavingsAccount

    Display account details

5. Exit
Enter your choice:
Enter the withdrawal amount:
200
Amount withdrawn: 200.0
----MENU----

    Deposit

2. Withdraw
Compute interest for SavingsAccount
Display account details
5. Exit
Enter your choice:
No interest computation for Current Account.
----MENU----

    Deposit

2. Withdraw
3. Compute interest for SavingsAccount

    Display account details

Exit
Enter your choice:
Customer name: Rugaiyya
Account number: 456
Type of Account: Current account
Balance = 9800.0
----MENU----

    Deposit

Withdraw
Compute interest for SavingsAccount
Display account details
5. Exit
Enter your choice:
Do you want to add another account? (yes/no):
```

Program 6
CIE and SEE Marks

	Date Page
13/11/24	Week 6
	Create a package CIE which has 2 classes
	Student and Internals. The class
	Student has members like usu, name,
	sem The class Internals derived from
	student has an array that stores the
	intuition makes in 5 courses of the
50 	ament 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 current semester of the student Import the 2 packages in a file that declares the final marks of
	student Import the 2 packages in a
	file that Leclares the final marks of
	In students in all 5 courses.
	CIE/student.java
	package CIE;
	T d
	public class student (
	protected string usn;
	protected string name;
	protected int sem;
	public Student ( String up, string name,
	int sem)?
	this, us = usn;
	this name = name;
	this sem = sem; ?

public void display & student Info () {
System out printles ("USN:"+ usn; "Name: " + name + "Servester" + sem), CIE/onternals java package CIE; public class Internals? private int[] internal Marks = new inter public Internals (int[] marks) System out arraycopy (marks, 0, internal Marks, O, 5) public int[] getInternal Marks () { setuin internal Marks SEE/External. java package SEE; import CIE Student; public class External extends student private int[] see Marks = new int[5]

public Exten	nal (string usn string na
int sem,	nal (String usn, string na int() seeMarks){
super(um	, name, sem);
4 see Mark	25
System	arraycopy (seeMarks, O,
this see	.arraycopy (seeMarks, 0, eMarks, 0, 5);
The second secon	
public intil	getseemarks ()
2 Metines	getseeMarks (){ seeMarks;
7	
9	
Main java in	Same root
import CIE. *	,
import SEE. *	;
import java	cutil*;
public class.	main f
public sta	tic void main ( string args
Scanner	in = new Scanner ( system in
system 6	tric void main ( string args in = new Scanner ( system in out printly ("Enter the no. o a");
The second second second	
14 D 4 C	se in next Int();
student	[] & students = new student[ [] internals Marks = new In
0 4 - 0 -	

	for(int i=0; i <n; i++){<="" td=""></n;>
- 1	in nextline ();
-	System out print ("Enter USN");
-	String um = in nextline ();
-	System out print ("Enter name");
-	String name = in nextline ();
+	System out print ("Enter semester
-	int sem = in next Int();
-	System out print ("Enter 5 internal
-	marks").
	int[] internal Marks = new int[5]
	for(int j=0; j<5; j++){ internalMarks[j]=in.nextInt]
	internal Marks [ ] = in next Int
-	3
	internal Marke [i] = new Internals
-	Onternal
-	System. out. print ("Enter 5 SEE ma int[] see Marks = new int [5];
-	int[] see Marks = new int [5];
4	tutem out print
1	for (int j=0; j<5; j++){  see Marks tj] = ocanner. nextIn 3
-	see Marks ti] = Scanner. next In
	3
1	externalsMarks[i]=new External
-	(won, name, sem
1	see Marks);
	7

	Page
+	ystem out. println("In Final Marks of
	14- 1 - VA - T1
	for(int i=0; i <n; i++){<="" td=""></n;>
T	students[i] = externalsMarks[i].
l	standents [i). displaystudent Tuto():
T	for (int i = 0; i < n; i++) {  Students [i] = externals Marke [i];  Students [i] · display Student Info();  int [] intural = intunals Marke [i] · zet
I	Internal garks ();
-	int[] external = externalsMarks[i].get
İ	System. Out. print ("Final Marks in 5 cours for (int j=0; j<5; j++)[ ant final Mark = internal [j] + externa System. Out. print (final Mark + ");
L	fox(int j=0; j<5; j++)[
L	ant final Mark = internal (j) + externa
L	System. out. print (final Mark + ");
L	3 '
L	System out paintler ();
L	
L	in.close();
	}
	utput:
E	inter us. of students: 1
6	iter USN:56
6	ter name: Rugaippa 8
F	ter name: Rugaijya &
	nter 5 internal marks:
	10
1	32

```
28
12
10
Enter 5 SEE malks:
90
80
76
65
54
Jinal marks of students:
USN: 12, Name, Rugariyya,
Semester: 2
Final marks in 5 courses: 85 72 66 44 37
```

```
CIE/Student.java
package CIE;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public Student(String usn, String name, int sem) {
    this.usn = usn;
    this.name = name;
    this.sem = sem;
  public void displayStudentInfo() {
    System.out.println("USN: " + usn + ", Name: " + name + ", Semester: " + sem);
}
CIE/Internals.java
package CIE;
public class Internals {
```

```
private int[] internalMarks = new int[5];
  public Internals(int[] marks) {
    if (marks.length == 5) {
       System.arraycopy(marks, 0, internalMarks, 0, 5);
       throw new IllegalArgumentException("Exactly 5 internal marks are required.");
  }
  public int[] getInternalMarks() {
    return internalMarks;
SEE/External.java
package SEE;
import CIE.Student;
public class External extends Student {
  private int[] seeMarks = new int[5];
  public External(String usn, String name, int sem, int[] seeMarks) {
    super(usn, name, sem);
    if (seeMarks.length == 5) {
       System.arraycopy(seeMarks, 0, this.seeMarks, 0, 5);
     } else {
       throw new IllegalArgumentException("Exactly 5 SEE marks are required.");
  }
  public int[] getSeeMarks() {
    return seeMarks;
  }
}
import CIE.*;
import SEE.*;
import java.util.Scanner;
Main.java
public class Main {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
       System.out.println("Rugaiyya Mahreen 1BM23EE044");
    System.out.print("Enter the number of students: ");
```

```
int n = scanner.nextInt();
Student[] students = new Student[n];
Internals[] internalsMarks = new Internals[n];
External[] externalsMarks = new External[n];
for (int i = 0; i < n; i++) {
  scanner.nextLine(); // Consume the newline character
  System.out.print("Enter USN: ");
  String usn = scanner.nextLine();
  System.out.print("Enter Name: ");
  String name = scanner.nextLine();
  System.out.print("Enter Semester: ");
  int sem = scanner.nextInt();
  System.out.print("Enter 5 internal marks: ");
  int[] internalMarks = new int[5];
  for (int j = 0; j < 5; j++) {
     internalMarks[j] = scanner.nextInt();
  internalsMarks[i] = new Internals(internalMarks);
  System.out.print("Enter 5 SEE marks: ");
  int[] seeMarks = new int[5];
  for (int j = 0; j < 5; j++) {
     seeMarks[i] = scanner.nextInt();
  externalsMarks[i] = new External(usn, name, sem, seeMarks);
System.out.println("\nFinal Marks of Students:");
for (int i = 0; i < n; i++) {
  students[i] = externalsMarks[i]; // Since External is a subclass of Student
  students[i].displayStudentInfo();
  int[] internal = internalsMarks[i].getInternalMarks();
  int[] external = externalsMarks[i].getSeeMarks();
  System.out.print("Final Marks in 5 Courses: ");
  for (int i = 0; i < 5; i++) {
     int finalMark = internal[j] + (external[j] / 2); // SEE marks are divided by 2
     System.out.print(finalMark + " ");
  System.out.println();
```

```
scanner.close();
}
```

```
D:\1BM23EE044>javac Main.java
D:\1BM23EE044>java Main
Ruqaiyya Mahreen 1BM23EE044
Enter the number of students: 1
Enter USN: 56
Enter Name: Ruqaiyya
Enter Semester: 3
Enter 5 internal marks: 34
23
21
40
36
Enter 5 SEE marks: 80
78
67
75
54
Final Marks of Students:
USN: 56, Name: Ruqaiyya, Semester: 3
Final Marks in 5 Courses: 74 62 54 77 63
D:\1BM23EE044>javac Main.java
D:\1BM23EE044>java Main
Ruqaiyya Mahreen 1BM23EE044
Enter the number of students: 2
Enter USN: 12
Enter Name: Ruqaiyya
Enter Semester: 2
Enter 5 internal marks: 40
32
28
12
10
Enter 5 SEE marks: 90
80
76
65
54
Enter USN: 87
Enter Name: Shraddha
Enter Semester: 3
Enter 5 internal marks: 4
40
39
10
12
Enter 5 SEE marks: 76
72
74
78
65
Final Marks of Students:
USN: 12, Name: Ruqaiyya, Semester: 2
Final Marks in 5 Courses: 85 72 66 44 37
USN: 87, Name: Shraddha, Semester: 3
Final Marks in 5 Courses: 42 76 76 49 44
```

Program 7
Exception Handling

Algori	thm:
	Page 33
20/11/24	11. A 7
	Week 7
	Write a prof that demonstrates
	handling of exceptions in inheritance
	string tree create a base class called
	"Father" and a derived class called
	"Son" which extends the base class.
	In Father class implement a constructor
	which takes the age and throws the
	age is less than zero In Son class
	age is less than zero in Son class
	implement a constructor that uses
	boths father and son's age and
	throws an exception if son's age is
	throws an exception if son's age is greater than or equal to father's age.
	import java util Scanner;
	class whong Age extends Exception?
	class wkong Age extends Exception { public wrong Age (string message) {     super (message); }
	3
	3
	class Father (
	int age:
	millie Father int age) through
	Whona Azer
	public father (int age) throws Wrong Age (  if (age < 0);
	throw new Whome Age ("Forthers's
	age cannot be negatively). ?
	throw new Wrong Age ("Father's age cannot be negative!"); } this age = age; } }
	The type, JJ

class son extends Father { int sonAge thiows New new helong Age ("Sor equal to Father's age this son Age = son Age; public class Age ? public static void main (String any Scanner in = new scanner (system) System out print ("Enter father's son Age = in next Int( f = new Father (father Ag Son s= new Son (father Age, son Ag

s sige "Error: " + e-getMent System out println ("Enter integers sea in close (); Enter father's age: 23 Enter son's age: 46 Enter father's age: -9 Father's age cannot be negative Enter father's age 45 Enter son's age 26

```
Code:
import java.util.Scanner;
class WrongAgeException extends Exception {
  public WrongAgeException(String message) {
    super(message);
class Father {
  int age;
  public Father(int age) throws WrongAgeException {
    if (age < 0) {
       throw new WrongAgeException("Father's age cannot be negative.");
    this.age = age;
class Son extends Father {
  int sonAge;
  public Son(int fatherAge, int sonAge) throws WrongAgeException {
    super(fatherAge);
    if (sonAge < 0) {
```

```
throw new WrongAgeException("Son's age cannot be negative.");
    if (sonAge >= fatherAge) {
       throw new WrongAgeException("Son's age cannot be greater than or equal to Father's age.");
    this.sonAge = sonAge;
public class Age{
  public static void main(String[] args) {
    Scanner in = new Scanner(System.in);
       System.out.println("Ruqaiyya Mahreen 1BM23EE044");
    try {
       System.out.print("Enter Father's age: ");
       int fatherAge = in.nextInt();
       System.out.print("Enter Son's age: ");
       int sonAge = in.nextInt();
       Father father = new Father(fatherAge);
       Son son = new Son(fatherAge, sonAge);
       System.out.println("Father's age: " + father.age);
       System.out.println("Son's age: " + son.sonAge);
     } catch (WrongAgeException e) {
       System.out.println("Error: " + e.getMessage());
     } finally {
       in.close();
```

```
PS D:\1BM23EE044> java Age
Ruqaiyya Mahreen 1BM23EE044
Enter Father's age: 12
Enter Son's age: 23
Error: Son's age cannot be greater than or equal to Father's age.
PS D:\1BM23EE044> java Age
Rugaiyya Mahreen 1BM23EE044
Enter Father's age: -9
Enter Son's age: 12
Error: Father's age cannot be negative.
PS D:\1BM23EE044> java Age
Rugaiyya Mahreen 1BM23EE044
Enter Father's age: 32
Enter Son's age: -9
Error: Son's age cannot be negative.
PS D:\1BM23EE044> java Age
Rugaiyya Mahreen 1BM23EE044
Enter Father's age: 31
Enter Son's age: 31
Error: Son's age cannot be greater than or equal to Father's age.
PS D:\1BM23EE044> java Age
Rugaiyya Mahreen 1BM23EE044
Enter Father's age: 43
Enter Son's age: 18
Father's age: 43
Son's age: 18
```

Program 8
Thread Based Message Display

Algorit	hm:
	Week 8
	WAP which creates two threads one
	WAP which creates two threads, one thread displaying "BMS college of Engineering once every ten seconds and another
	once every ten seconds and another
	displaying "CSE" once every two seconds
	class College Thread extends Thread [
	public void hun() {
	truy
	while (!io Interrupted ()) {
	System out printly ("BMS College of
	Engineering "); Thread. sleep (10000);
	Thread sleep (10000):
	3
	Tcatch (Interrupted Exception e) {
	System out println ("College thread
I	System out println ("College thread interpupted");
	3
	3
	<u>}</u>
	clase CSEThread extends Thread [
	public void run() [
	trus
	notale (! is Interrupted ()) [
	System.out. pirtln("CS€");
1	Thread alsep (2000):
T	Thread sleep (2000);
	Jeatch (Interrupted Exception e) {
1	System. out println ("CSE shread interrupted");
	interrupted);

```
CSE
CSE
CSE
CSE
```

```
class CollegeThread extends Thread {
  public void run() {
    try {
      while (!isInterrupted()) {
         System.out.println("BMS College of Engineering");
         Thread.sleep(10000); // 10 seconds
      }
  } catch (InterruptedException e) {
```

```
System.out.println("College Thread interrupted");
    }
  }
class CSEThread extends Thread {
  public void run() {
    try {
       while (!isInterrupted()) {
         System.out.println("CSE");
         Thread.sleep(2000);
       }
     } catch (InterruptedException e) {
       System.out.println("CSE Thread interrupted");
  }
}
public class BMSCE {
  public static void main(String[] args) {
    CollegeThread collegeThread = new CollegeThread();
    CSEThread cseThread = new CSEThread();
       System.out.println("Ruqaiyya Mahreen 1BM23EE044");
    collegeThread.start();
    cseThread.start();
    try {
       Thread.sleep(10000);
     } catch (InterruptedException e) {
       e.printStackTrace();
    collegeThread.interrupt();
    cseThread.interrupt();
}
```

Program 9
Integer Division User Interface

	- Dage
Week 9	
WAP th	at creates a user interface to perfoun
integer	livisions. The user inters two numbers
in the	text fields, Num1 and Num2. The
division	of Num1 and Num2 is displayed
in the h	exult filled when the divide button
is chicke	d If Number Num2 were not an
Integer,	the program would throw a Number
Tomat	Exception of Nume were zero, the
program	would throw an Arithmetic Exception
Dispury	the exception in a nessage dialog box
impart	javax. suring. *;
import ;	owa ant . *;
import	java aut event *;
	wing Demo {
Suri	Jemo ()
JFr	ame jfrm = new JFrame (" Divider App");
ifty	m. set Size (275, 150);
jje	m. setlayout (new Flowlayout ());
- 78-11	n set Layout (new Flowlayout ()); n set Default Close Operation ( I fram EXIT ON_CLOSE);
Jak	el jlab = new Ilabel ("Finter the
	divides and dividend");
JTe	xtfield aitf = new JTextField(B).
JJex	tField bytf = new WextField (8); uttom button = new JButton ("Calculate
TB	Home Cotton - war Thutton ("Calculate

	Jlabel er = new Jlabel ().
	Itabel alab = new Itabel ().
	I Label blab = new Trabel ().
	Itabel andlab = new Itabel().
-	I add in order
-	jfrm.ald (en);
4	yrun add (jiab);
4	jfrm add (ajtf); yfrm add (bjtf);
+	yfun add (bjtf);
+	gfrm. add (button);
+	jfrm. add (alab);
+	yrm. add(blab);
+	illrue add (auchat).
1	Actionlistener l= new Action listener)
-	public void action Performed (Action Even
-	
1	System out println ("Action event println ("A
	a text field");
	3
	3;
	ajtf. add ActionListener (1);
	bitf. add Action Listener (1);
	button, add Action listener (new
	Actionlisteney
	public void action Performed (Actions, evt)
	2
	try l
	ANT IN- IMMENT PROSECULA

	A sale
int a = Integer, pars	seInt(aitf getText());
int b = Integer pars	seInt(ajtf getText()); wInt(bjtf.getText());
7100 1100	196 30
alab setText ("\nA	(= '+a);
blab setText ("\nB anslab. setText ("):	= "+6);
anslab. setText (")	n Ans = "+ ans);
catch (NumberForma	
alab.setText ("	");
blab.setText("	1);
anslab. setText	(" ");
ex.setText ('E	inter only integers!");
catch (Arithmetic Es	(ception e){
alab setText (	
blab set Text ("	
anslab setText	(" ");
ers. setText("E	should be non zero!"
3	
3	
3);	
jfrm. set Visible (tru	e);
7 00	×
public static void	main (othing ango []) { invoke Later (new
Swine Utilities i	invoke Later (new
J	Runnable) {
pullic word	mm () {
public void	nice Deuro ().
227 22	9,

```
Output:

Enter the divider and dividend:

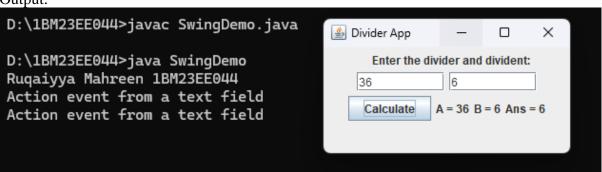
[36]

Colculate A=36 B=6 Ans=6
```

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo{
SwingDemo(){
// create jframe container
JFrame jfrm = new JFrame("Divider App");
jfrm.setSize(275, 150);
jfrm.setLayout(new FlowLayout());
// to terminate on close
jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
// text label
JLabel jlab = new JLabel("Enter the divider and divident:");
// add text field for both numbers
JTextField aitf = new JTextField(8);
JTextField bjtf = new JTextField(8);
// calc button
JButton button = new JButton("Calculate");
// labels
JLabel err = new JLabel();
JLabel alab = new JLabel();
JLabel blab = new JLabel();
JLabel anslab = new JLabel();
// add in order :)
jfrm.add(err); // to display error bois
ifrm.add(jlab);
ifrm.add(ajtf);
jfrm.add(bjtf);
ifrm.add(button);
```

```
ifrm.add(alab);
jfrm.add(blab);
ifrm.add(anslab);
ActionListener l = new ActionListener() {
public void actionPerformed(ActionEvent evt) {
System.out.println("Action event from a text field");
};
ajtf.addActionListener(l);
bitf.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("\nA = " + a);
blab.setText("\nB = " + b);
anslab.setText("\nAns = "+ ans);
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!");
}
});
// display frame
jfrm.setVisible(true);
public static void main(String args[]){
System.out.println("Rugaiyya Mahreen 1BM23EE044");
// create frame on event dispatching thread
SwingUtilities.invokeLater(new Runnable(){
public void run(){
new SwingDemo();
});
```

}



Program 10

Interprocess Communication and Deadlock

Algorithm:

Week 10

Interprocess Communication and deadlock.

Interprocess Communication

class of f

int n;

boolean value Set = folse;

synchronised int get () f

while (! volue Set)

try f

System out. println (" yn Consumer Waibing");

mait ();

I catch (Interspted Exception e) f

System out. println ("Interspted Exception

caught")

System out. println ("Got: " + n);

value Set = folse;

System out. println ("In Intimate Producer (n"))

synchronised void put (int n) {
 while (value Set)
 try {
 System out println ("In froducer waiting )")
 wait ();

return n;

catro 1	9 to be at 1 Except in 25
Surto	Interrupted Exception e) [ m. out printler ("Interrupted
93.00	Exception
	caught").
3	my or
this.	n= YL;
	eset = true;
Susta	me out mintly ("Put: " )
System	m.out. printle ("Put: "+n) m.out. printle ("In Indinate
92.	Consumer ")
notify	():
3	<i>V</i>
70	14.11
class	Producer implements Russa
i Qa	Number of the second
	ucer (g, g) {
	is. 9=9;
ν	his Thread (this "Produce )
	us Thread (this, "Produces) start ().
3	,
- mullic	void run(){
in	t i=0;
4.7	hile(i < 15) §
0	put(i++);
3	View Cially
3	
2	

	class consumer implements Runnable ?
	99;
	Consume (Q, q) {
	this a - a:
	new Thread (this, "Consumer"), start ()
	3
	public roid & run () [
	int i = 0:
	while (i < 15) {
1	int r=q.get();
4	System out printles (" Consumed:" + r),
	14+;
4	3
1	3
1	3
	class PCFixed {
	public static void main ( String args [ ) ?
	g g = new g();
L	new Producer (9).
	new Consumer (g).
	System out wintly ("Preas control C to
	System out printly ("Press control C to stop");
	4
	2
	J

		6
	Subjut:	
	Pus Control-C to stop	
	Put: 0	
	Intimate Consumer	
	Producer vaiting	
	Got: 0	
	Intimate producer	
	Put: 1	
_	Intimate Consumer	
	Processor waiting	
	consumed:0	
_	Got: 1	
	Intimate producer	
_	Consumed: 1	
_	Put: 2	
	Intimate consumer	
	Produces waiting	
	Got: 2	
-	Intimate Producer	
-	consumed: 2	
	Put 3	
	Intimate Consumer	
10	Producer waiting	
0	jot: 3	
1	50	
1		

1	Deadlock -	
(	lass A[ synchronized roid for (8b) [ string name = Inead current The getName();	
H	synchronized void for (86) [	
	String name = Thread current This	(ad)
-	getName();	
	System out printin ("name + "enter try { Thread sleep (1000); I catch (Exception e) { System out println ("A Interrupte 3 System out println ("name + "tryin call B-last (); I cold last () {	edA
	Thread sleep (1000);	
	I catch (Exception e) ?	
	System out println ("A Interruptes	(1)
	3 '	
	System out printly ("name + "tryin	1 to
	call B-last C	)),
_	b. last ();	
	7	
1	rod last Of	
	void last () { System out println ( Inside A last 3	t ");
т		
d	lass 85	
	synchronized void bar (Aa) {	
	lass B {  synchronized void ban (A a) {  string name = Thread current I  get N	hrea
	getN	ame
	system. out. printly ( name +	eute

	try {
	Thu ad oleep (1000);  3 catch (Exception e)?  6 System out printle (B Inters
	3 catch (Exception e) ?
	cat System out printer ( B Intern
	3
	System out printly (name + "try); to call A last ()"); a last ();
	to call A. last () ").
_	a.last();
	5
-	void last (){
	System out Printle ("Inside A la
	void last () {
	3
1	class Deadlock implements Runna
1	
1	A a = new A().
1	Bb= ven B(); Deadlock() {
1	
	Thursd. current Thread () sot No
	Thread t = new Thread (this
	"Raci. Tu. 10
	+ Start ();
1	
1	a foo(b);
1	System.out. println ("Back in main thread");
	3

```
public void run () {
```

# //Inter process communication

```
class Q {
int n;
boolean valueSet = false;
synchronized int get() {
  while(!valueSet)
  try {
    System.out.println("\nConsumer waiting\n");
    wait();
  } catch(InterruptedException e) {
    System.out.println("InterruptedException caught");
  }
    System.out.println("Got: " + n);
    valueSet = false;
    System.out.println("\nIntimate Producer\n");
```

```
notify();
return n;
synchronized void put(int n) {
while(valueSet)
System.out.println("\nProducer waiting\n");
wait();
} catch(InterruptedException e) {
System.out.println("InterruptedException caught");
this.n = n;
valueSet = true;
System.out.println("Put: " + n);
System.out.println("\nIntimate Consumer\n");
notify();
}
class Producer implements Runnable {
Qq;
Producer(Q q) {
this.q = q;
new Thread(this, "Producer").start();
public void run() {
int i = 0;
while(i<15) {
q.put(i++);
class Consumer implements Runnable {
Qq;
Consumer(Q q) {
this.q = q;
new Thread(this, "Consumer").start();
public void run() {
int i=0;
while(i<15) {
int r=q.get();
System.out.println("consumed:"+r);
i++;
}
class PCFixed {
```

```
public static void main(String args[]) {
  Q q = new Q();
  new Producer(q);
  new Consumer(q);
  System.out.println("Press Control-C to stop.");
  }
}
Output:
```

D:\1BM23EE044>javac PCFixed.java D:\1BM23EE044>java PCFixed Press Control-C to stop. Put: 0 Intimate Consumer Producer waiting Got: 0 Intimate Producer Put: 1 Intimate Consumer Producer waiting consumed:0 Got: 1 Intimate Producer consumed:1 Put: 2 Intimate Consumer Producer waiting Got: 2 Intimate Producer consumed:2 Put: 3 Intimate Consumer Producer waiting Got: 3

Intimate Producer

```
//Deadlock
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();
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();
void last() {
System.out.println("Inside A.last");
class Deadlock implements Runnable
A a = \text{new } A();
B b = new B();
Deadlock() {
Thread.currentThread().setName("MainThread");
Thread t = new Thread(this, "RacingThread");
t.start();
a.foo(b); // get lock on a in thisthread.
System.out.println("Back in main thread");
public void run() {
b.bar(a); // get lock on b in other thread.
System.out.println("Back in other thread");
```

```
}
public static void main(String args[]) {
new Deadlock();
}
}
```

```
D:\1BM23EE044>javac Deadlock.java

D:\1BM23EE044>java Deadlock
RacingThread entered B.bar
MainThread entered A.foo
MainThread trying to call B.last()
Inside A.last
RacingThread trying to call A.last()
Inside A.last
Back in other thread
Back in main thread
```