VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming (23CS3PCOOJ)

Submitted by
Kratish Porwal(1BM23CS157)

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



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
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 Kratish Porwal (1BM23CS157), 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.

Dr. Jyothi S Nayak
Professor & HOD
Department of CSE, BMSCE

Index

Sl. No.	Date	Experiment Title	Page No.
1	30/09/2024	Quadratic Equation	4
2	08/10/2024	SGPA Calculator	9
3	14/10/2024	Books	15
4	21/10/2024	Shape	20
5	28/10/2024	Bank	26
6	11/11/2024	Package	37
7	28/10/2024	Wrong Age Exception	46
8	28/10/2024	Multithreading	52
9	28/10/2024	Integer Division	56
10	28/10/2024	Deadlock and IPS	62

Program 1: Develop a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula. If the discriminate b^2-4ac is negative, display a message stating that there are no real solutions.

GitHubLink: https://github.com/KratishPorwal/JAVA-LAB-PROGRAMS/blob/main/quadratic%20equation.docx

```
20/09/24
        LAB program 1
       Develop a Jana program that printe all real solution
      to the quadratic equation an 2+ bn +c=0. Read in
      a, b, c and wethe quadratic formula. If the discriminate b'-hac is negative, display a message stating that their are no real salutions
     import static java lang. Moth eget;
import java util Scanner;
      class Quadratic &
       int a, b, c;
        double v1, r2, d;
      Void input () {
          Scarner & = new Scarner (System in);
          System out point ("Enter value of a:");
          a = Sc. neut Int ();
       while (a == 0) {
              System out print by ("Enter a non zero number");
         a = & newt Int ();
         System. out. print (" Enter value of 6: ");
          b = Sc. nen Int ();
         System and print (" tuter value of (: ");
(= Sc. new Tut ();
       d= b*b-4*a*c;
```

	clissoute
	Date
	output:
	Enter value of a: 0
tu	Enter a non-zero number for a:
16	Enter a non-zono number for a:
0534	Enter value of 6:2
1 day	Entry value of C: 4
	Hoote are iniaginary
	[1 = -1.0+ 1.732050 mi
	12= -1.0-1 .7320.01
-	F Kehatt a stoke at day
	Thing shows, there's
	Entry value of a: 1
	Enter value of b: -7
	Enter value of (: 10
	loate are real and different
- 4	11=5.0, 12=2.8
100	1 30/a/2h
	Country I down to make to drawn
	A ALOIS TO A

```
import java.util.Scanner;
public class Quadratic
public static void main(String[] args)
{
int a;
int b;
int c;
Scanner sc = new Scanner(System.in);
System.out.print("Enter 'a' value: ");
a = sc.nextInt();
System.out.print("Enter 'b' value: ");
b=sc.nextInt();
System.out.print("Enter 'c' value: ");
c=sc.nextInt();
float disc = ((b*b)-4*a*c);
System.out.println(disc);
if (a==0)
System.out.println("Not Quadratic");
}
else
{
if (disc<0)
```

```
{
System.out.println("No real roots ");
}
else if (disc>0)
{
double root1 = (-b + Math.sqrt(disc))/(2*a);
double root2= (-b - Math.sqrt(disc))/(2*a);
System.out.println("Real roots");
System.out.println("Root-1: "+root1);
System.out.println("Root-2: "+root2);
}
else
{
double root1=(-b)/(2*a);
System.out.println("Real and equal");
System.out.println("Root-1: "+root1);
System.out.println("Root-2: "+root1);
}
System.out.println("Karan");
System.out.println("1BM23CS139");
}
}
```

```
D:\1BM23CS157>java Quadratic.java
Enter value of a: 0
Enter a non-zero number for a:
Enter value of b: 2
Enter value of c: 4
Roots are imaginary
r1 = -1.0 + 1.7320508075688772i
r2 = -1.0 - 1.7320508075688772i
Kratish Porwal: 1BM23CS157
D:\1BM23CS157>java Quadratic.java
Enter value of a: 3
Enter value of b: 5
Enter value of c: 7
Roots are imaginary
r1 = -0.8333333333333334 + 1.2801909579781012i
r2 = -0.8333333333333334 - 1.2801909579781012i
Kratish Porwal: 1BM23CS157
D:\1BM23CS157>java Quadratic.java
Enter value of a: 1
Enter value of b: -7
Enter value of c: 10
Roots are real and different
r1 = 5.0, r2 = 2.0
D:\1BM23CS157>
```

Program 2: Develop a Java program to create a class Student with members usn, name, an array credits and an array mark. Include methods to accept and display details and a method to calculate SGPA of a student.

GithubLink: https://github.com/KratishPorwal/JAVA-LAB-PROGRAMS/blob/main/SGPA

100	
	Dos Page
74	
	(40.00 - 4 - 2
	CAB PROGRAM 2
	create a close student
	Develop a sona program to create a clase student with numbers use , name , on array credits and a
	array marks Include methods to accept & display
Ten A	ditails & a nutted to calculate SGPA of a study
	curans & a minima to
	import java util . Scanner;
	the first section of the section of
	public class Student &
	public close Student & String worn, usn;
	double >67PA,
	int [] marks = new int (4); int [] credit = new int (4);
	int () credit = new int (4);
1000	double [] grade points = here double [4];
	double total =0, credittotal=0;
	Scanner Scanner (System in);
	Void at Student Petails () {
	Void get Student Details () { System-part. printly ("truta name:"); name = Sc. nentline ();
un 13/	name=sc. nentline();
AT	Systement, pointly ("Ender Very");
	usy ×82. nentline();
	ž ,
180	void get Marks () {
	for (int s=0; s = 4; s++) {
	beyetin aw printly (Gutis - (J+11 - Rusjew Por
	marks (j) = sc-nent Int ();
-	and paint (i) - (with) +1
	grade painte (j) = (marks (j)/10) +1)

```
if (grade points [j] >10) {

quade points [j] >10) {

quade points [j] >10;

}

Void (conquite SGPA() {

for (int j=0; j=1; j+1) {

total += quade points [j] * (redits [j]);

gradelitatal += credits [j]

SGPA=total (creditlotal;

Void display () {

Septim and print In ("name: "+ mans),

septim and print In ("name: "+ mans),

septim and prints In ("SGPA");

Jack State prints In ("SGPA");

Stunt () = rem Gholut();

Slight Standard Potail ();

Slight Standard Datail ();

Slight Gapley ();
```

```
out put Enter name :
    Kratich
    Enter USN
    1B423 CS157
   Enta I Subject Marks!
    Guter Credite for Subject 1:
    Enter 2 Subject marks:
    67
    Enter credite for Subject 2:
    Enter 3 Subject marks:
    Enter credita for subject 3:
    Enter & subject roule
    Euter ou dets for subject ":
    Starre: Kratiel
    USN: 1BAZ365157
SGPA: 8.09009
A 7/10/24
```

```
import java.util.Scanner;
public class studentsgpa {
public static void main(String[] args) {
Scanner sc = new Scanner(System.in);
System.out.print("Enter the number of students: ");
int numStudents = sc.nextInt();
sc.nextLine();
String[] names = new String[numStudents];
String[] usns = new String[numStudents];
int[][] creditsArray = new int[numStudents][];
int[][] marksArray = new int[numStudents][];
double[] sgpas = new double[numStudents];
for (int s = 0; s < numStudents; s++) {
System.out.println("Enter details for student " + (s + 1) + ":");
System.out.print("Enter your name: ");
names[s] = sc.nextLine();
System.out.print("Enter your USN: ");
usns[s] = sc.nextLine();
System.out.print("Enter the number of subjects: ");
int numSubjects = sc.nextInt();
```

```
int[] credits = new int[numSubjects];
System.out.println("Enter the credits for each subject:");
for (int i = 0; i < numSubjects; i++) {
credits[i] = sc.nextInt();
creditsArray[s] = credits;
int[] marks = new int[numSubjects];
System.out.println("Enter the marks for each subject out of 100:");
for (int i = 0; i < numSubjects; i++) {
marks[i] = sc.nextInt();
}
marksArray[s] = marks;
int[] gradePoints = new int[numSubjects];
int[] resultArray = new int[numSubjects];
for (int i = 0; i < numSubjects; i++) {
gradePoints[i] = (marks[i] / 10) + 1;
resultArray[i] = credits[i] * gradePoints[i];
}
int totalCredits = sum(credits);
int totalResult = sum(resultArray);
if (totalCredits > 0) {
sgpas[s] = (double) totalResult / totalCredits;
```

```
} else {
sgpas[s] = 0.0;
}
}
System.out.println("\n--- Results ---");
for (int s = 0; s < numStudents; s++) {
System.out.println("Student" + (s + 1) + " (" + names[s] + ", " + usns[s] + "):");\\
System.out.print("Credits: ");
for (int credit : creditsArray[s]) {
System.out.print(credit + " ");
System.out.println();
System.out.print("Marks: ");
for (int mark : marksArray[s]) {
System.out.print(mark + " ");
System.out.println();
System.out.println("SGPA: " + sgpas[s]);
System.out.println();
}}
static int sum(int[] array) {
int sum = 0;
for (int value : array) {
sum += value;
}
```

return sum;

```
Enter the number of students: 2
Enter details for student 1:
Enter your name: karan
Enter your USN: 139
Enter the number of subjects: 3
Enter the credits for each subject:
4
3
3
Enter the marks for each subject out of 100:
88
82
91
Enter details for student 2:
Enter your name: Enter your USN: vinod 132
Enter the number of subjects: 3
```

```
Enter details for student 2:
Enter your name: Enter your USN: vinod 132
Enter the number of subjects: 3
Enter the credits for each subject:
3
Enter the marks for each subject out of 100:
78
98
73
--- Results ---
Student 1 (karan, 139):
Credits: 4 3 3
Marks: 88 82 91
SGPA: 9.3
Student 2 (, vinod 132):
Credits: 4 3 3
Marks: 78 98 73
SGPA: 8.6
```

Program 3: Create a class Book which contains four 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 Java program to create n book objects.

GithubLink: https://github.com/KratishPorwal/JAVA-LAB-PROGRAMS/tree/main/Books

4/10/	Clasemate Days Days
	LAB Perogram 3
03)	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 a get the details of the object. Include a to Storing (1) method that could display the complete addite of the Book. Develop a Sera program to vecade a book objects.
	Smpart java . Wil. Scarner; Class Books E String name; String author; int price; int rumPages;
(and	The first of the state of the s
- Aug	Books Estring name, String author, int price, intrumlages This name = name; this author = author;
100	this author = author; this price = price; this num Pages = num Pages; 3 Public String to String ()
-	String name, author, price, num Pages; name = "Book name:" + this name + "&\ n"; author = "Author name: " + this author + "\n"; price = "Price:" + this. price + "\n"); numPages = "Number of pages;" + this. numbages + "\n";

return have + author + price + muns leges; public Static Void Main (String args (2)) Scener st = new Scarner (System. in); jut n; string name; String author; int price; int num Pages System. out light in ("Enter the number of books")
n= 8c. next Int (); Baoks b[]; 5 = new Books [n] ;
System. out. printler (" Enter book details") for Oution; icn; it+) System-out. printles (enter the book "+ (i+1) + "name" name = 8c. nent (); System out print In ("cuter the boot "+(i-1)+" out author = Sc. nent () System, out. paint ln ("enter the book" + (+1) + "prile" price = & nent Int (); System out printle ("enter the book" (i-1) + "pages" num Pages = St. New Int (); b Ei] a new Books (name, author, grice, num lage for lint i=0 ;ien ;i++) b(i) to String (); System. out printly (66));

Enter the number of books Enter Book details enter the Book I name harry cutis the book I author howling cuts the Book 1 price 699 enter the Book 1 pages Enter the Book 2 name Dylorno Enter the Book 2 author Brown Enter the Book 2 price 899 Enter the Book 2 pages 189 Book name: harry Author name: housing Price: 699 Number of pages: 777 Book name: inferno Author nam: Brown Price : 899 Number of Pages : 789

```
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, author, price, numPages;
 name="Book name:"+this.name+"\n";
 author = "Author name: "+this.author+"\n";
 price ="Price:"+this.price+"\n";
 numPages="Number of pages:"+this.numPages+"\n";
 return name+author+price+numPages;
}
 public static void main(String args[])
```

```
{
  Scanner sc=new Scanner(System.in);
  int n;
  String name;
  String author;
  int price;
  int numPages;
  System.out.println("enter the number of book");
  n=sc.nextInt();
  Books b[];
  b=new Books[n];
  System.out.println("Enter book details");
  for (int i=0;i<n;i++)
  {
    System.out.println("enter the book"+(i+1)+"name");
    name=sc.next();
    System.out.println("enter the book"+(i+1)+"author");
    author=sc.next();
    System.out.println("enter the book"+(i+1)+"price");
    price=sc.nextInt();
    System.out.println("enter the book"+(i+1)+"pages");
    numPages=sc.nextInt();
    b[i]=new Books(name,author,price,numPages);
  }
  for(int i=0;i<n;i++)
  {
```

```
b[i].toString();
   System.out.println(b[i]);
  }
}
}
D:\1BM23CS157>java Books.java
enter the number of book
Enter book details
enter the book1name
harry
enter the book1author
rowling
enter the book1price
699
enter the book1pages
enter the book2name
inferno
enter the book2author
enter the book2price
enter the book2pages
789
Book name:harry
Author name:rowling
Price:699
Number of pages:777
Book name:inferno
Author name:brown
Price:899
Number of pages:789
D:\1BM23CS157>
```

Program 4: Develop a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.

GithubLink: https://github.com/KratishPorwal/JAVA-LAB-PROGRAMS/tree/main/Shapes

	Car
	Can
2012/20	
21/0/24	The state of the s
	UB Brogram 4
	to create an abstract
	named Shape that contains two integers a an entrained shape that contains two integers a an entrained shape
	named shape that was (). Proude three Case,
	maked Shape that Contains the Charle Should lave Care method named print Area (). Prairie such that care haved Rectargle, triangle & circle such that care haved Rectargle, triangle to the class & Laple Con
TO SHARE	named included, the class & Laple F.
	one of the classes contain only the ruthod one of the classes contain only the ruthod
A SET	on of the classet contains the circa of the fine
W 9-11	prosped ()
THE TANK	
	insposet in undil Scanner;
	imposit java while Scanner; abstract clase Shape &
S. F. HARRIS	protected int dimension!
WYTH	
9	
	abstract void print Area ();
	3 Mary E Sand Market
5 LL V/25 BY	
15-1-17-18	public Rectangle and autom,
100	
500	thie -dimension 2 = height,
	this dimension 2 = height, 3 Quaride Void print Area () {
	e aurice
	int orea = direction 1 * direction 2
779	Sustain out raintly ("Ages of hestando" + area
NI WA	System out printly ("Area of hectargle: + area)
	3 A County sony out of
	class Towards entends Shape of
	class triangle cultures Shape { Public triangle (int base, int height) { this direction = base;
	this dimension 1 = base;

this dimension 2 = height; @ ourride void point Area () { double asea = 0.5 dimerción 1 dimerción 2; System out print la ("Area of Triangle: "+ area); class wide extends shape & public circle (int gradius) { this diversion 1 = gradius; @ awride Soid print Area () { double area = Math. P.I & dimension 1 & dimension 1; System out printle ("Area of circle" + area); 3 Public class Shapes { public Static void main (String [] orgs) { System out printly ("cuter the direccions of the rectangle: (lugdh & breadth);") Stanner Sc = new Scanner (System in); int 1 = sc. neut Int (); intbl = SC. nent Int () Shape rectargle = new Rectargle (61, 51); rectangle . print Area () System out point los (" enter dimensions of the triangle (base a height): intb2 = Sc. neut Int () jut h 1 = Sc. neut Int ()

Shape triangle = new truingle (b2, m1);

triangle : Print Area ()

System and print the carle (radher): ");

int 1 = 50. new I Int ();

Shape ciscle - new circle (r.);

Circle . print Area ();

3

Output

Enter the dimensions of the rectangle: (longth a breadle)

8

Area of Rectangle: 48

Enter the dimensions of their gele: (base a height):

8

12

Area of Triangle: 48: 0

Butte the dimensions of the circle (radher):

New of Circle: 153.93.80

```
import java.util.Scanner;
abstract class Shape {
  protected int dimension1;
  protected int dimension2;
 abstract void printArea();
}
class Rectangle extends Shape {
  public Rectangle(int width, int height) {
   this.dimension1 = width;
   this.dimension2 = height;
 }
  @Override
 void printArea() {
   int area = dimension1 * dimension2; // Area = width * height
   System.out.println("Area of Rectangle: " + area);
 }
}
class Triangle extends Shape {
  public Triangle(int base, int height) {
   this.dimension1 = base;
   this.dimension2 = height;
 }
```

```
@Override
 void printArea() {
    double area = 0.5 * dimension1 * dimension2;
   System.out.println("Area of Triangle: " + area);
 }
}
class Circle extends Shape {
  public Circle(int radius) {
   this.dimension1 = radius; // Radius
 }
  @Override
 void printArea() {
    double area = Math.PI * dimension1 * dimension1;
   System.out.println("Area of Circle: " + area);
 }
}
public class Shapes {
  public static void main(String[] args) {
    System.out.println("enter the dimensions of the rectangle:(length and breadth):");
   Scanner sc = new Scanner(System.in);
   int l1=sc.nextInt();
   int b1=sc.nextInt();
```

```
Shape rectangle = new Rectangle(l1, b1);
    rectangle.printArea();
    System.out.println("enter the dimensions of the traingle:(base and height):");
   int b2 = sc.nextInt();
   int h1=sc.nextInt();
   Shape triangle = new Triangle(b2, h1);
   triangle.printArea();
   System.out.println("enter the dimensions of the circle:(radius):");
   int r1=sc.nextInt();
   Shape circle = new Circle(r1);
    circle.printArea();
 }
}
D:\1BM23CS157>javac Shapes.java
D:\1BM23CS157>java Shapes
enter the dimensions of the rectangle:(length and breadth):
Area of Rectangle: 48
enter the dimensions of the traingle:(base and height):
12
Area of Triangle: 48.0
enter the dimensions of the circle:(radius):
Area of Circle: 153.93804002589985
```

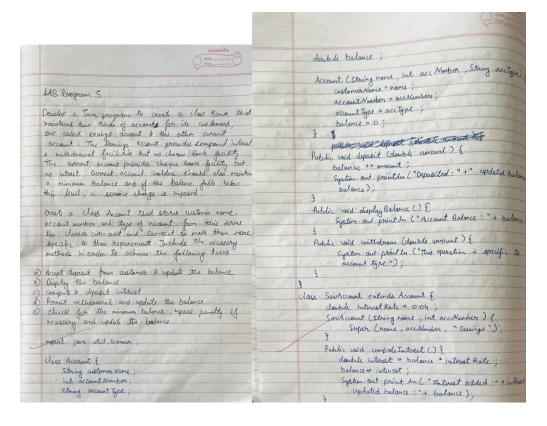
D:\1BM23CS157>

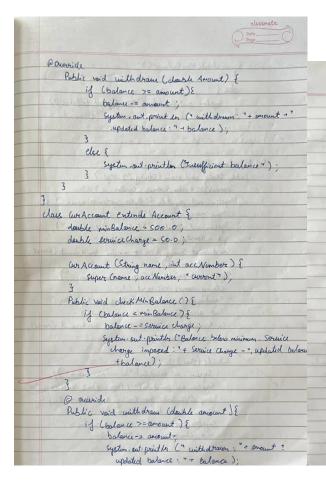
Program 5: Develop a Java program to create a class Bank that maintains two kinds of

account for its customers, one called savings account 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. Create a class Account that stores customer name, account number and type of account. From this derive the classes Cur-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

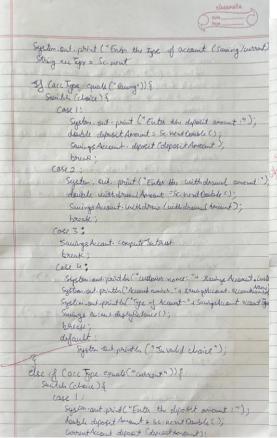
- a) Accept deposit from customer and update the balance.
- b) Display the balance.
- c) Compute and deposit interest
- d) Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance

GithubLink: https://github.com/KratishPorwal/JAVALABPROGRAMS/tree/main/Bank%20 program





check Min Balance (); dec { System. and Printle ("Twenficiant balance") Public class Bank & public Static vaid main (String [7 args) { Scanner se = new Scanner (System in); System. out privally ("Enter customer name") String name = screent (); System out print la (" Enter account menter: ") ; int account Number = screent But (); San Account Surings Account = new San Account (Mance account munice of); System and print he (" Enter customer Mone ") String name = St nent (); Sycken out printly ("Enter account number i) fut accountmember 1= sc next Jute); Cur Account current Account = new Cur Account (name) account number 1); While (true) { System . out pointle ("In -- Mene -- "); System out point la (" 1 Deposit \n2 Withdraw" Compate Intrust for sawings recount her Display Account Details his text "), System out point (" Enter your chaire: "))
That Chaire: So wort Int ();



	classoute
	Phys 9
	Enter account number;
	orstant to a shippy of the golden & Barrer
	tidute and thought the door takent
1	TO MENU TO THE WAY AND
ì	1 Denne Land Paris and branch day the
	2 with draw and a sale last
	3. compute Interest for Sawigs Account
	M. Airola, Account Actalde
	V. Display Account Details
	day to took game or and wall out
ľ	Guter your choice !
	to the first and are the Court Discourse to Source
i	Enter by type of account (saming lument): Saming Enter the deposit amount: 8000
	enus de disposit anount 2000
	Deposited \$000 0 updated balance: 8000 0
	- Manual Control of the Control of t
	MENU
	2 withdraw
	3 Compute Settred for Savings account
	4 Diepley Accord Octably
	5 Exit
	La green with their post 2) this will state
	Commission of the grant of the state of the
	PRINCE TO STAND AND MAN OF THE PARTY OF THE
	The state of the s

breat; System. and printly!" Enter the withdrawed amount cale >: double withdraw Amount - Sc. next Double () current Acoust with drow (will would Arount) hereall Case 3 System out pointly I werent account do not carried bredly Casely ! System out printles (" waterus name". " + awarent becaut as System out-printly ("Account number, " - current Account account System out prixtle ("Type of Account "gaveret Account on Correct Account display Balance(); Break; Case 5 Sychn. Exit (0) Brook " default: System out post in (" traded chaire"); 1/2 Supetim aid printly ("Threalist Account Type") Output Enter customer Name: Keratish Enter Account number; Enty cultomer name!

```
import java.util.Scanner;
class Account {
 String customerName;
 int accountNumber;
 String accountType;
 double balance;
 Account(String name, int accNumber, String accType) {
   customerName = name;
   accountNumber = accNumber;
   accountType = accType;
   balance = 0;
 }
 public void deposit(double amount) {
   balance += amount;
   System.out.println("Deposited: " + amount + ". Updated balance: " + balance);
 }
 public void displayBalance() {
   System.out.println("Account Balance: " + balance);
 }
```

```
public void withdraw(double amount) {
   System.out.println("This operation is specific to account type.");
 }
}
class SavAccount extends Account {
  double interestRate = 0.04; // 4% annual interest rate
  SavAccount(String name, int accNumber) {
   super(name, accNumber, "Savings");
 }
  public void computeInterest() {
    double interest = balance * interestRate;
    balance += interest;
   System.out.println("Interest added: " + interest + ". Updated balance: " + balance);
 }
  @Override
  public void withdraw(double amount) {
   if (balance >= amount) {
     balance -= amount;
     System.out.println("Withdrawn: " + amount + ". Updated balance: " + balance);
   } else {
     System.out.println("Insufficient balance.");
   }
```

```
}
}
class CurAccount extends Account {
 double minBalance = 500.0;
 double serviceCharge = 50.0;
 CurAccount(String name, int accNumber) {
   super(name, accNumber, "Current");
 }
 public void checkMinBalance() {
   if (balance < minBalance) {</pre>
     balance -= serviceCharge;
     System.out.println("Balance below minimum. Service charge imposed: " +
serviceCharge + ". Updated balance: " + balance);
   }
 }
  @Override
  public void withdraw(double amount) {
   if (balance >= amount) {
     balance -= amount;
     System.out.println("Withdrawn: " + amount + ". Updated balance: " + balance);
     checkMinBalance();
   } else {
     System.out.println("Insufficient balance.");
```

```
}
 }
}
public class Bank {
  public static void main(String[] args) {
   Scanner sc = new Scanner(System.in);
   System.out.println("Enter customer name:");
   String name=sc.next();
   System.out.println("Enter account number:");
   int accountnumber=sc.nextInt();
   SavAccount savingsAccount = new SavAccount(name, accountnumber);
System.out.println("Enter customer name:");
   String name1=sc.next();
   System.out.println("Enter account number:");
   int accountnumber1=sc.nextInt();
   CurAccount currentAccount = new CurAccount(name1, accountnumber1);
   while (true) {
     System.out.println("\n----MENU-----");
     System.out.println("1. Deposit\n2. Withdraw\n3. Compute Interest for Savings
Account\n4. Display Account Details\n5. Exit");
     System.out.print("Enter your choice: ");
     int choice = sc.nextInt();
     System.out.print("Enter the type of account (saving/current): ");
```

```
String accType = sc.next();
if (accType.equals("saving")) {
 switch (choice) {
   case 1:
     System.out.print("Enter the deposit amount: ");
     double depositAmount = sc.nextDouble();
     savingsAccount.deposit(depositAmount);
     break;
   case 2:
     System.out.print("Enter the withdrawal amount: ");
     double withdrawalAmount = sc.nextDouble();
     savingsAccount.withdraw(withdrawalAmount);
     break;
   case 3:
     savingsAccount.computeInterest();
     break;
   case 4:
     System.out.println("Customer name: " + savingsAccount.customerName);
     System.out.println("Account number: " + savingsAccount.accountNumber);
     System.out.println("Type of Account: " + savingsAccount.accountType);
     savingsAccount.displayBalance();
     break;
   case 5:
     System.exit(0);
     break;
```

```
default:
     System.out.println("Invalid choice.");
 }
} else if (accType.equals("current")) {
 switch (choice) {
   case 1:
     System.out.print("Enter the deposit amount: ");
     double depositAmount = sc.nextDouble();
     currentAccount.deposit(depositAmount);
     break;
   case 2:
     System.out.print("Enter the withdrawal amount: ");
     double withdrawalAmount = sc.nextDouble();
     currentAccount.withdraw(withdrawalAmount);
     break;
   case 3:
     System.out.println("Current accounts do not earn interest.");
     break;
   case 4:
     System.out.println("Customer name: " + currentAccount.customerName);
     System.out.println("Account number: " + currentAccount.accountNumber);
     System.out.println("Type of Account: " + currentAccount.accountType);
     currentAccount.displayBalance();
     break;
   case 5:
     System.exit(0);
```

```
break;
            default:
               System.out.println("Invalid choice.");
         }
       } else {
          System.out.println("Invalid account type.");
       }
    }
  }
}
D:\1BM23CS157>java Bank
Enter customer name:
kratish
Enter account number:
157
Enter customer name:
kratish
Enter account number:
1571
    --MENU-
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account

    Display Account Details
    Exit

Enter your choice: 1
Enter the type of account (saving/current): saving
Enter the deposit amount: 8000
Deposited: 8000.0. Updated balance: 8000.0
    --MENU-
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 1
Enter the type of account (saving/current): current
Enter the deposit amount: 8000
Deposited: 8000.0. Updated balance: 8000.0
    --MENU-
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 3
Enter the type of account (saving/current): saving
Interest added: 320.0. Updated balance: 8320.0
```

```
-MENU-
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 3
Enter the type of account (saving/current): current
Current accounts do not earn interest.
 ----MENU-----
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 4
Enter the type of account (saving/current): saving Customer name: kratish
Account number: 157
Type of Account: Savings
Account Balance: 8320.0
    --MENU--
1. Deposit
2. Withdraw
3. Compute Interest for Savings Account
4. Display Account Details
5. Exit
Enter your choice: 2
Enter the type of account (saving/current): current
Enter the withdrawal amount: 7800
Withdrawn: 7800.0. Updated balance: 200.0
Balance below minimum. Service charge imposed: 50.0. Updated balance: 150.0
```

Program 6: Create a package CIE which has two classes- Student and Internals. The class Personal has members like usn, name, sem. The class internals have 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 current semester of the student. Import the two packages in a file that declares the final marks of n students in all five courses.

GithubLink: https://github.com/KratishPorwal/JAVA-LAB-PROGRAMS/tree/main/bmsce

```
Create a pockage CIE which has true Classes
Shedut and Jutimach. The class student has
- Lab Perogram 6
    numbers like USN, name, sem. The class
   intervals defined from student has an array that stares the interval narrhs scared to find that stares the interval requester of the student laws of the student
    create another package SEE which has the
    Enternal which is a desired class of ste
    This class has an array that stars the
months scared in fine course of the current
    generater of the student. Support the time of in a file that declares the final works of in
     students in all fine courses.
    Package CIE
    public Class student &
        pratected string usn;
        protected string Name;
          public Student Cetting user, String name, int som
                 this usy = usa;
                Hur usn = nand;
              this . Sem = Sem;
          public String getush () {
              return vin;
           Public String get Name C) {
return Name;
```

public ist get Con () {

Package CIK

Public class Internals entends student &

private ist () internal reaster;

problic Internal Marks) &

Super Cuen, manner, stems;

public tot () get Juternal Marks () &

Public tot () get Juternal Marks () &

Section Internal Marks;

}

Package SEE;

Impart LIE. Student;

Public class Enternal culturale Students (

product of C) enternal Marks;

Public totunal (esting UCN: String Name, the Sem,

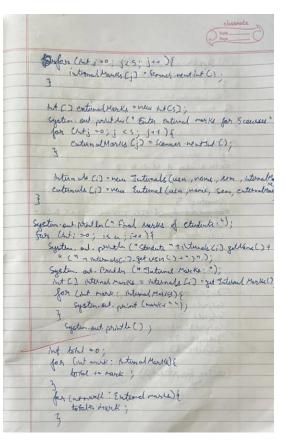
pt () enternal Marks) &

Super (con, manner, sees);

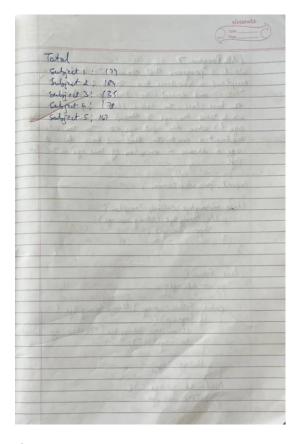
this cultural Marks;

}

Public int (2) get Enternal Marello () { return enternalMarks; impart CIF. Internals Import SEE. Enternals Impart Town while Scarning Public class main & public etatic void main (etting () angs) {
Scanner Scanner oreus scanner (Experimen); System out print ("Enter number of etudente") At n = Scanner neut But (); Internals () internals = new Buternals [n] Enternal () critisach = neu Enternal (n); for (intiso; in; i++){ System and print la l'Enter delails per stradut " (i+1)+11:>); Cystem. out. print ("USN: "); String usn= scanner . Went () Sychen our print ("None: "); String name - Scarney north) System, out point ("servette"); that sen . scanner - new trut (); int C] internal Marks = new Cold 10, System. out plintle ("Enter internal warks for 5 courses);



System out pointly ("Table Marks;" + tolal) system out prutler (); Scarner close (); output: Enter Number of Studente: 2 Name: Kratz Semester: 3 Enter details for al Enter CIE north for S subjects Subject 1: 79 Subject 2 : 35 Suly cot 3:76 Subject 4:81 Embrect 5:71 Enter SEE Marks for Seubjects: Subject 1:81 Subject 2: 73 Subject 3: 45 Subject 4: 77 Subject 5: 83 (Shilar for student 2)



}

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 String getUsn() {
   return usn;
 }
 public String getName() {
   return name;
 }
 public int getSem() {
   return sem;
 }
}
package CIE;
public class Internals extends Student {
 private int[] internalMarks;
 public Internals(String usn, String name, int sem, int[] internalMarks) {
    super(usn, name, sem);
   this.internalMarks = internalMarks;
 }
 public int[] getInternalMarks() {
   return internalMarks;
 }
```

```
}
package SEE;
import CIE.Student;
public class External extends Student {
  private int[] externalMarks;
  public External(String usn, String name, int sem, int[] externalMarks) {
   super(usn, name, sem);
   this.externalMarks = externalMarks;
 }
 public int[] getExternalMarks() {
   return externalMarks;
 }
}
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
public class Main {
 public static void main(String[] args) {
   Scanner scanner = new Scanner(System.in);
   System.out.print("Enter the number of students: ");
```

```
int n = scanner.nextInt();
Internals[] internals = new Internals[n];
External[] externals = new External[n];
for (int i = 0; i < n; i++) {
  System.out.println("Enter details for Student " + (i + 1) + ":");
  System.out.print("USN: ");
  String usn = scanner.next();
  System.out.print("Name: ");
  String name = scanner.next();
  System.out.print("Semester: ");
  int sem = scanner.nextInt();
  int[] internalMarks = new int[5];
  System.out.println("Enter internal marks for 5 courses:");
 for (int j = 0; j < 5; j++) {
    internalMarks[j] = scanner.nextInt();
 }
  int[] externalMarks = new int[5];
  System.out.println("Enter external marks for 5 courses:");
 for (int j = 0; j < 5; j++) {
    externalMarks[j] = scanner.nextInt();
 }
  internals[i] = new Internals(usn, name, sem, internalMarks);
  externals[i] = new External(usn, name, sem, externalMarks);
```

```
}
   System.out.println("\nFinal Marks of Students:");
   for (int i = 0; i < n; i++) {
     System.out.println("Student: " + internals[i].getName() + " (" + internals[i].getUsn() +
")");
     System.out.println("Internal Marks: ");
     int[] internalMarks = internals[i].getInternalMarks();
     for (int mark : internalMarks) {
        System.out.print(mark + " ");
     }
      System.out.println();
      System.out.println("External Marks: ");
      int[] externalMarks = externals[i].getExternalMarks();
     for (int mark : externalMarks) {
       System.out.print(mark + " ");
     }
     System.out.println();
      int total = 0;
     for (int mark : internalMarks) {
       total += mark;
     }
     for (int mark : externalMarks) {
       total += mark;
     }
     System.out.println("Total Marks: " + total);
```

```
System.out.println();
              }
               scanner.close();
       }
 PS D:\1BM23CS139> cd "d:\1BM23CS139\" ; if (\$?) { javac main.java } ; if (\$?) { java main }
 Enter the number of students:
Enter details for Students here1:
Enter your usn here:
139
Enter your name here:
Karna
Enter your semester here:
3
Enter your CIE marks for the 5 subjects here:
Subject1:98
Subject3:180
Subject4:180
Subject5:97
CIE marks are as follows:
 Subject1:98
Subject2:99
Subject3:100
Subject4:100
Subject5:97
Enter the 5 SEE Marks here:
 Subject1:100
 Subject2:100
 Subject4:98
Subject5:95
Enter details for Students here2:
Enter your usn here:
140
Enter your name here:
Karthik
Enter your semester here:
3
 3
Enter your CIE marks for the 5 subjects here:
Subject:09
Subject3:99
Subject4:95
Subject4:95
Unifort5:01
CIE marks are as follows:
 Subject1:99
Subject2:98
Subject3:99
Subject4:95
Subject5:91
Enter the 5 SEE Marks here:
 Subject3:92
 Subject4:91
 Student1:
Name:Karna
USN:139
Semester:3
  Subject1:99
Subject2:99
Subject3:99
Subject4:99
Subject5:96
```

Program 7: Write a program that demonstrates handling of exceptions in inheritance tree. Create a base class called "Father" and derived class called "Son" which extends the base class. In Father class, implement a constructor which takes the age and throws the exception WrongAge() when the input age<0. In Son class, implement a constructor that uses both father and son's age and throws an exception if son's age is >=father's age.

GithubLink: https://github.com/KratishPorwal/JAVALABPROGRAMS/tree/main/labprog% 207

```
LAB Perogram 7

Werite a program that demonthatis handling of wherite a program that demonthatis handling of enceptions in inhuritance true . Create a base class called "Son in which cutted a father" and defined class called "Son in which cutted the base class. In Father Class, implement a cache which takes the age of through the enception to easy age () when the input age co 'Son son class, I haplanent a constructor that use both father is sone age in through an enception of sons age is so father age.

Import jara util Scamer;

Class Wrongage entereds Enception & public wrong age (ctring resseage) & Super (musage);

3

Class Father & public Father (intage) through wrong age & thrown run wrong age ("fathers age const se negative"))

3 thingse = age;

Public ht getage () & return this age
```

Clark Son cutinds Father &

probate int son Age

pathic Son (int Father Age, ind fon Age) throws wrong age

super, (Father Age)

if (son age 20) &

throw were wrong Age ("Sons ago cond se regative)

y

(son age 2= Father age J &

throw were wrong Age ("Sons age cond te regative)

y

thus. Son Age: Son Age;

Public int get son Age;

Public int get son Age;

Public static void rain (String & Darge) &

Scenner Scenner = were consist (ageton in)

try &

System out print ("Enter Father age")

Int father Age = Scanner institut ();

Steptim out print ("Enter Sons age:")

Int con Age = Scanner institut ();

Father father = were father (Father Age);

Son Son = reen Son (Father Age);

3 (atch Carroy Lye e) {

System. out. Parish ("Error" te get Menage)

3 Friedly &

Scanner cloke();

3

Output!

Enter fatturs Age: 23

6 who some Age: 57

Enter Fatturs Age: 57

Enter Fatturs Age: 64

Error: Some Age: 64

Error: Some Age: 64

Enter fatturs Age: 7

Cruck Fatturs Age: -4

Enter fatturs Age: 7

Cruck Fatturs Age: -6

Error: Fatturs Age: 63

Enter Fatturs Age: -6

Error: Fatturs Age: 63

Enter Fatturs Age: -6

Error: Some Age: 64

Error: Fatturs Age: -6

Error: Some Age: 64

```
System, out. Probabil ("Enret" te get Menagel)

3 Friedly &
Scanner close ();

3

Cutput!

Enter fathers Age: 23

Enter Some Age: 57

Enter Some Age: 64

Beroon: Some Age: 64

Enter Some Age: -4

Enter Some Age: -9

Enter Some Age: -6

Enter Some Age: -6
```

import java.util.Scanner;

```
class WrongAge extends Exception {
  public WrongAge(String message) {
    super(message);
  }
}
class Father {
  private int age;
```

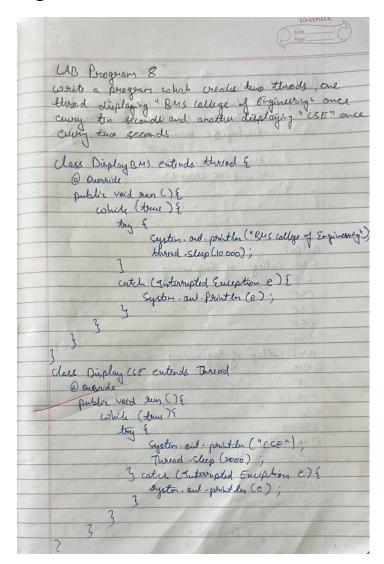
```
public Father(int age) throws WrongAge {
   if (age < 0) {
     throw new WrongAge("Father's age cannot be negative.");
   }
   this.age = age;
 }
  public int getAge() {
   return this.age;
 }
}
class Son extends Father {
  private int sonAge;
  public Son(int fatherAge, int sonAge) throws WrongAge {
    super(fatherAge); // Calls the Father's constructor
   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;
 }
  public int getSonAge() {
   return this.sonAge;
 }
}
public class Main {
  public static void main(String[] args) {
    Scanner scanner = new Scanner(System.in);
   try (
     System.out.print("Enter Father's age: ");
     int fatherAge = scanner.nextInt();
     System.out.print("Enter Son's age: ");
     int sonAge = scanner.nextInt();
     Father father = new Father(fatherAge);
     Son son = new Son(fatherAge, sonAge);
     System.out.println("Father's age: " + father.getAge());
     System.out.println("Son's age: " + son.getSonAge());
   } catch (WrongAge e) {
```

```
System.out.println("Error: " + e.getMessage());
  } finally {
    scanner.close(); // Close the scanner to prevent resource leak
  }
 }
}
 Microsoft Windows [Version 10.0.22631.4541]
 (c) Microsoft Corporation. All rights reserved.
 C:\1BM23CS157>javac Main.java
 C:\1BM23CS157>java Main
 Enter Father's age: 12
 Enter Son's age: 5
 Father's age: 12
 Son's age: 5
 C:\1BM23CS157>java Main
 Enter Father's age: 56
 Enter Son's age: 67
 Error: Son's age cannot be greater than or equal to Father's age.
 C:\1BM23CS157>java Main
 Enter Father's age: -4
 Enter Son's age: 5
 Error: Father's age cannot be negative.
 C:\1BM23CS157>java Main
 Enter Father's age: 56
 Enter Son's age: -6
 Error: Son's age cannot be negative.
 C:\1BM23CS157>
```

Program 8: Write a program which creates two threads, one thread displaying "BMS College of Engineering" once every ten seconds and another displaying "CSE" once every two seconds.

GithubLink: https://github.com/KratishPorwal/JAVALABPROGRAMS/tree/main/threads% 20prg%208



```
Aublie class Main {
     public state vaid Main (string ( ) Arys) {
         Display RMS thrad BMS = new Niplay RMS
         Horlad BMS Start ();
    4 thread (SE. Start ())
autput
BMS college of Engineering
 CSE
 CSE
 USF
BMS cottege of Engineering
 188
CSE
 CSE
 CSE
BMs college of Engineering
(Se
CSE
CSE
CSE
038
BMS college of Engineering
```

```
class DisplayBMS extends Thread {
    @Override
    public void run() {
      while (true) {
```

```
try {
       System.out.println("BMS College of Engineering");
       Thread.sleep(10000); // Sleep for 10 seconds
     } catch (InterruptedException e) {
       System.out.println(e);
     }
   }
 }
}
class DisplayCSE extends Thread {
  @Override
  public void run() {
   while (true) {
     try {
       System.out.println("CSE");
       Thread.sleep(2000); // Sleep for 2 seconds
     } catch (InterruptedException e) {
       System.out.println(e);
     }
   }
 }
}
public class threads {
 public static void main(String[] args) {
   DisplayBMS threadBMS = new DisplayBMS();
```

Program 9: Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

GithubLink: https://github.com/KratishPorwal/JAVALABPROGRAMS/tree/main/lab%20prog%209

Slabel jlab = new Slabel ("Enter the divident k divisor:"); Tent field aitf = new I tent field (8); Tent field bitf = new I tent Field (8);	Cognite a program that oreate a user interface to perform integer divisions. The user enter two numbers in the last fields Min 1 a Min 2. The division of Min 1 a Num 2 at displayed in the result of field when the divide button is dished. If Num! ar Num 2 were not an integer program would throw a Minder towned Exception of num 2 were a the program would throw a Mithen Exception. Display on exception in nesserge dislog bon. Import java x. Swing. Import java x. Swing. Import java aut. creent.; Class Swing Denno E Storm Strom = new Thronse ("Divider App"); I form set Size (300, 200); I form set Default (bee Operation (I Frame Exit on I label jlab = new Ilabel ("Eater the divident k divident k)		elaccaste Dote Page
Cognite a pleagram that create a user interface to perform integer divisions. The user enter two numbers in the last fields Min 1 a Man 2. The division of Men 1 a New 2 set displayed in the result of feeld when the divide button is clithed. If Num! ar Num 2 were not an integer program would those a Number Format Exception. By num 2 were a truly from Exception. Display who exception in necessary disclog born. Import java x. Gwing. Import java aut. Creent.; Class Swing Denno ? Storm set Size (300, 200); I from set Size (300, 200); I from set Default Close Operation (I Frome Exit on Slabel jlab = new Ilabel ("Futer the dividual k divisor:"); I text field ait = new I text Field (8); I text field biff = new I text Field (8);	Cognite a program that oreate a user interface to perform integer divisions. The user enter two numbers in the lant fields Minn 1 a Many 2. The denistran of Men 1 a New 2 set displayed in the result of feeld when the divide button is dished. If Num! ar Num 2 were not an integer program would those a Number Formal Exception of num 2 were o the program would throw a brither. Exception Display whe exception in newsory dislog bon. Import java x. Guing. Import java aut. creent; Class Suing Deno () { Stevent Streen = new Throne ("Divider App"); Ifing set Size (300, 200); Ifing set Defoult (love Operation (I Frome Exit on Slabel jlab = new Ilabel ("Enter the divident k divisor: "); I text field ait = new I text field (8); I text field bit = new I text field (8);	LAB	Program 9
Monteson Integer observers. The cless Entire the members in the lint fields When I a Many 2. The deviction of When I a New 2 set displayed in the result of field when the devide button is clicked. If New 1 ar New 2 were not an integer program. would throw a Number Cornel Exception of new 2 were 0, the program would throw an Arithmen Exception. Display whe exception in versage display have exception in versage display and aut. Import java x. swing.; Import java aut. creent.; Class Swing Denso ? There set Size (300, 200); Then set Size (300, 200); Jenn set Default (bell Operation (5 Frame Exit on Slabel jlab = new Ilabel ("Enter the divident k divisor:"); Tent field ait = new I tent Field (8); Tent field biff = new I tent Field (8);	Me flitfern integer divisions. The alley enter the numbers in the lint fields When I a Many 2. The division of them I a New 2 sets displayed in the result of field when the divide butter is clithed. If New 1 ar New 2 were not an integer program. would throw a Number toward Exception of num 2 were 0, the program would throw an Arithma Exception. Display whe exception in newscape display only exception in newscape display and aut. Event; import java aut. Event; Class Suring Deard ? There set Size (300, 200); Them set Default (bee Operation (I Frame Exit on I land set) in the divident k divisor: "); That field aft = new I tent Field (8); Tent field bitf = new I tent Field (8);	open	Ended Enercise
Exception. Display out exception in vellage diclog bon. Import java x. Guing. Import java aut. Except. Import java aut. Except. Import java aut. Except. Import java aut. Except. I form set Size (300, 200); I form set Default (here Flow layout ()); I form set Default (here Flow layout ()); I form set Default (bell Operation (I From Exit.on. Slabel jlab = new Ilabel ("Enter the dividual k divisor:"); I Text field ait = new I text field (8); I text field biff = new I text Field (8);	Exception. Display who exception in villege a stitle of cheg born. Import java x. Guing. Import java aut. Event.; Class Suring Denno E Step Suring Denno E Step Suring Denno () E Throw set Size (300, 200); Throw set Size (300, 200); John set Default Close Operation (I Frame Exit-on Slabel jlab = new Ilabel ("Enter the dividual k divisor: "); Text field aitf = new I Text field (8); Text field bitf = new I Text Field (8);	number dini resal	felm integer divisions. The celes entire leads in the lant fields Norm 1 a Many 2. The come of Norm 1 a Num 2 and displayed the field when the divide button is clicked—lum! ar Num 2 were not an integer program
import jana ant creent; Class Suring Denno { Stog	import jana ant creent; Class Suring Denno { Stog	Encep	tion. Display whe exception in nulsage
import jana ant creent; Class Suring Denno { Stog	import jana ant creent; Class Suring Denno { Stog	import	java x. Suring . ; Al Al Al
Class Suring Denno { Storoma JETM = new TErronse (" Divides App"); I form set Size (300, 200); Jenn set Default Class Operation (I From Exit on Slabel jlab = new Ilabel ("Futur The dividual K divisor:"); Jent Field ait = new Jent Field (8); Tent field bit = new Jent Field (8);	Class Suring Denno { Storome JETM = new TErranse ("Divides App"); I form set Size (300, 200); Jenn set Default (new Elow Layout ()); item set Default (bee Operation (I Frame Exiton Slabel jlab = new Ilabel ("Entre The divident k divisor: "); I Text field ait = new I text field (8); I Text field bit = new I text Field (8);	import	jana aut. crent.;
Stepane (Firm = new TEranse (" Midder App"); I firm set Size (300, 200); I (sum set Default Close Operation (I Frame Exiton Slabel jlab = new Ilabel (" Futur the dividual K divisor: "); I Text field aitf = new I text field (8); I text field bitf = new I text Field (8);	Stepane (Frm = new Throme (" Divides App"); I firm set Size (300, 200); I firm set Layout (new Flow Layout ()); i form set Default (lace Operation (I forome Exit on Slabel jlab = new Ilabel ("Enter the divident k divisor: "); I Text field aitf = new I tent field (8); I text field bitf = new I tent Field (8);	100711-1011-2000	
John set Size (300, 200); John set Layout (new Flow Layout ()); i som set Defoult Close Operation (I Frome Exiton Slabel jlab = new Ilabel ("Entre the dividual K divisor: "); I Text field aitf = new I tent field (8); I text field bitf = new I tent Field (8);	I firm set Size (300, 200); I (mm. Set Layout (new Flow Layout ()); I som set Defoult (lace Operation (I Grame Exit on Slabel jlab = new Ilabel ("Entr. The dividual k divisor: "); I Text field aitf = new I tent field (8); I mitfield bitf = new I tent Field (8);	Class	Box Suite Deno () S
John set Size (300, 200); John set Layout (new Flow Layout ()); i som set Defoult Close Operation (I Frome Exiton Slabel jlab = new Ilabel ("Entre the dividual K divisor: "); I Text field aitf = new I tent field (8); I text field bitf = new I tent Field (8);	I firm set Size (300, 200); I (mm. Set Layout (new Flow Layout ()); I som set Defoult (lace Operation (I Grame Exit on Slabel jlab = new Ilabel ("Entr. The dividual k divisor: "); I Text field aitf = new I tent field (8); I mitfield bitf = new I tent Field (8);		I Forome (Form = new I France (" Divider App");
i form set Default Close Operation (I From Exit on Slabel jlab = new Ilabel ("Enter the dividual k dividual"); Tent field aitf = new I tent field (8); Tent field bitf = new I tent Field (8);	Jabel jlab = new Jlobel ("Enter the dividual K divisor: "); J Tent field aitf = new J Tent field (8); 5 Tent field bitf = new J Tent Field (8);		John sed Size (300, 200);
i form set Default Close Operation (I From Exit on Slabel jlab = new Ilabel ("Enter the dividual k dividual"); Tent field aitf = new I tent field (8); Tent field bitf = new I tent Field (8);	Jabel jlab = new Jlobel ("Enter the dividual K divisor: "); J Tent field aitf = new J Tent field (8); 5 Tent field bitf = new J Tent Field (8);		John . Set Layout (new Flow Layout ());
J'Entfield ajtf = new J tent field (8); 5 Tentfield bjtf = new J tent Field (8);	J'Entfield ajtf = new J'Entfield (8); 5 Tentfield bjtf = new J'Ent Field (8);	200	itom set Default Clase Operation (I Frame Exit on
J'Entfield ajtf = new J tent field (8); 5 Tentfield bjtf = new J tent Field (8);	J'Entfield ajtf = new J'Entfield (8); 5 Tentfield bjtf = new J'Ent Field (8);	(4) 48	Slabel jlab = new Slabel ("Enter the divident k
and the state of t	as to be the same at the same		dhisoer (4)
and the state of t	as to be the same at the same		Stentfield giff - New Stentfield (8)
and the state of t	as to be the same at the same		5 Tentield bits = new 3 lent bield (8);
	Souther button - new souther caracters,		

```
Slabel our = new Slabel()
 Slabel alab = new Jistel ();
 Blotsel blat = new Ilabel ();
 Thatelanslas = new Thatel ();
 item add (jlab);
ishm add ( gitt);
joten add (bjtt);
  Joen add (button);
jtsm. add (alab);
 jtran and (slob);
jfrn add (aneleb);
 journ add (err);
 button add Action listener Crew Action Cistner () }
     Aublic vaid action Performed (Action Front Cut)
        try {
   ht a= Jutger parce Int (giff jet Text)
   int b= Jutger parce Int (hith jet Text)
       ht ang = a/b;
       alab . Set Tent ("A = " +a)
            Wab . set Tent ("B= " +6);
            analab at Tent (" human = " + ans);
            ere set Tent (")
         3 Catch (Number Farmat Exception e) {
             alab ext text ("")
blob. set text ("")
anelab. set text ("");
       Ger extent (" Entry words Sutger")
```

alub Set lent (");

blab Set lent (");

and lets Set lent (");

corr set lent ("B should be non Zerro");

3
33;

Upon Set hichle (true);

Public static wid main (String arge(2)) {

Suning Utilities modelates Green Punnable () }

public void sun () {

neur Suning Maro ();

3
;

Out Put:

Tate the divident to driver 10 28

calculate

A= (0 B= 2 Answer = 5

Enter the divident and divisor 10 0

calculate

A= (0 B= 2 Answer = 5

Enter the divident and divisor 10 0

calculate

A= (0 B= 2 Answer = 5

Enter the divident and divisor 10 0

calculate

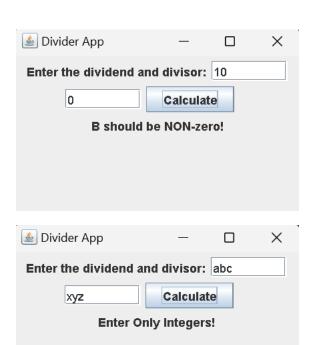
A= (0 B= 2 Answer = 5)

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
   JFrame jfrm = new JFrame("Divider App");
   jfrm.setSize(300, 200);
   jfrm.setLayout(new FlowLayout());
   jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
   JLabel jlab = new JLabel("Enter the dividend and divisor:");
   JTextField ajtf = new JTextField(8);
   JTextField bjtf = 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(jlab);
```

```
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
jfrm.add(err);
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("Answer = " + ans);
      err.setText("");
    } catch (NumberFormatException e) { alab.setText("");
      blab.setText("");
      anslab.setText("");
      err.setText("Enter Only Integers!");
    } catch (ArithmeticException e) {
      alab.setText("");
```

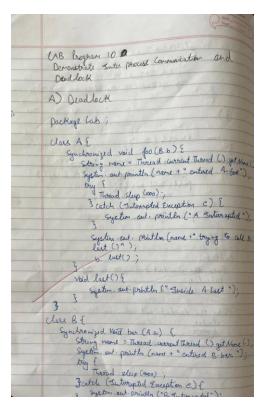
```
blab.setText("");
        anslab.setText("");
        err.setText("B should be NON-zero!");
      }
    }
 });
 jfrm.setVisible(true);
}
public static void main(String args[]) {
  SwingUtilities.invokeLater(new Runnable() {
    public void run() {
      new SwingDemo();
    }
 });
}
실 Divider App
                              ×
Enter the dividend and divisor: 10
 2
                Calculate
                            A = 10 B = 2
               Answer = 5
```

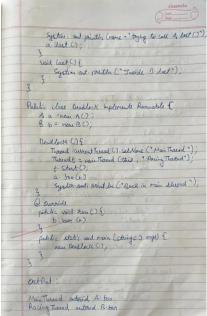
}



Program 10: Demonstrate Inter process Communication and deadlock

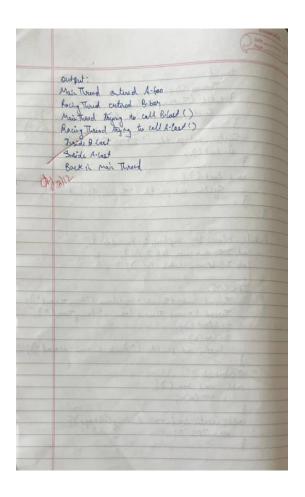
GithubLink: https://github.com/KratishPorwal/JAVALABPROGRAMS/tree/main/lab%20prog%2010





Mainthread trying to call Blast()
Racing Thread trying to call A-last()
Suride B-last Sneide A-last Back in Main Thread Paggian 10 8 IPC Palkage laba; Class A & Synchronized void for (lob 2-B b) { String name = Thread - (whent Thread () get Name System act. printle (cont + " entered A. foo ")
tory {
 (aread : Sleep (1000));
 3 (ath) (subscripted Exception c) { System. out. printle ("A Systemapted") System out pointly (name + "trying to call Blast b. Let (); void last () { System out printly ("Incide A-last") class B & Synchronized vaid bar (lab 2.Aa) { String name = Thread current Thread () get Mark System ofthe part In (nord + "extend B. bar")

try {
Thread Slep(1000);
3 Catch (Interrupted Enception C) {
(CR Justine) Seyetan out print la (aB Jutersupted"); a. last (); void last () { System out printly (" Treade B. last "); Public class IPS implemente Rumable & Lab 2-A a = new lab 2. A(); Lab 2-B b new lab 2 · B(); Thread : current Thread () . Set Name ("Main Thread") !
Thread t = new thread (thin, " Recing Thread"); t. Start (); a. 500 (b) System out printly ("Back or man storead"); e Override public void Jun () [b. bar (a) -, public static road main (String C) args) & new IPS ();



10A Deadlock

Algorithm: 10A Deadlock

Code:

```
package Lab;
```

```
class A {
    synchronized void foo(B b) {
        String name = Thread.currentThread().getName();
        System.out.println(name + " entered A.foo");
}
```

```
try {
     Thread.sleep(1000); // This may throw InterruptedException
   } catch (InterruptedException 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 (InterruptedException e) {
     System.out.println("B Interrupted");
   }
```

```
System.out.println(name + " trying to call A.last()");
   a.last();
 }
 void last() {
   System.out.println("Inside B.last");
 }
}
public class Deadlock implements Runnable {
 A = new A();
 Bb = new B();
 Deadlock() {
   Thread.currentThread().setName("MainThread");
   Thread t = new Thread(this, "RacingThread");
   t.start();
   a.foo(b);
   System.out.println("Back in main thread");
 }
  @Override
 public void run() {
```

```
b.bar(a);
 }
  public static void main(String[] args) {
    new Deadlock();
 }
}
MainThread entered A.foo
RacingThread entered B.bar
MainThread trying to call B.last()
RacingThread trying to call A.last()
 Inside B.last
 Inside A.last
Back in main thread
Process finished with exit code 0
Program 10 B: IPS
Algorithm:
Code:
package Lab2;
class A {
  synchronized void foo(Lab2.B b) {
    String name = Thread.currentThread().getName();
    System.out.println(name + " entered A.foo");
```

try {

```
Thread.sleep(1000);
   } catch (InterruptedException 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(Lab2.Aa) {
    String name = Thread.currentThread().getName();
   System.out.println(name + " entered B.bar");
   try {
     Thread.sleep(1000);
   } catch (InterruptedException e) {
     System.out.println("B Interrupted");
   }
   System.out.println(name + " trying to call A.last()");
```

```
a.last();
 }
 void last() {
   System.out.println("Inside B.last");
 }
}
public class IPS implements Runnable {
 Lab2.Aa = new Lab2.A();
 Lab2.B b = new Lab2.B();
 IPS() {
   Thread.currentThread().setName("MainThread");
   Thread t = new Thread(this, "RacingThread");
   t.start();
   a.foo(b);
   System.out.println("Back in main thread");
 }
  @Override
 public void run() {
   b.bar(a);
 }
```

```
public static void main(String[] args) {

new IPS();
}

MainThread entered A.foo
RacingThread entered B.bar
MainThread trying to call B.last()
RacingThread trying to call A.last()
Inside A.last
Inside B.last
Back in main thread

Process finished with exit code 0
```