VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

Dyuthi (1BM23CS097)

in partial fulfillment 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,

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Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled "Object Oriented Java Programming (23CS3PCOOJ)" carried out by **Dyuthi** (**1BM23CS097**), 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	Department of CSE, BMSCE

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GitHub Link:

https://github.com/Dyuthiprasad/java-lab/tree/main

Program 1

Implement Quadratic Equation

Algorithm:

```
Graduatic Equation:
import java util Brisissis,
public class quad ?
      public static void main (string[largs) ?
Seanner user input: new scanner (Systemin);
             a System out - privilla ( " Input the value of a -);
             a = user input. next().
            System. ont. printle (" Input the value of 6");
             b = user input. next()
             System out privater ( - Input the value of a ");
             c = user input . next ()
             double D;
              D = b*b- 4ac;
              () ()==0) {

doublex;

X= (-b+00 nath.pon (0,05)) 12* a;
                   System and print he 1" The solution is "+"
             else if ( 5>0) ?
                  Stanblex1, X2;
                   X= (-b+ math poro (D, 0.5)) 12+a;
                   x2= (-b- math. por (0,0.5)) 12+ a;
                  System out printly ("The ortitions are "+"
                                         x1, x2);
            ehr ?
                    System out println ("There is no real solution");
      3
```

```
Output:

2. Input the value of 6

Grant the value of 6

Grant the value of 6

Angust the value of a

1. Input the value of a

2. Input the value of a

1. Input the value o
```

```
Code:
import java.util.Scanner;
public class quad {
  public static void main(String[] args) {
     int a, b, c;
     Scanner sc = new Scanner(System.in);
     System.out.println("Input the value of a:");
     a = sc.nextInt();
     System.out.println("Input the value of b:");
     b = sc.nextInt();
     System.out.println("Input the value of c:");
     c = sc.nextInt();
     double D;
     D = b * b - 4 * a * c;
     if (D >= 0) {
       double x;
       x = (-b + Math.pow(D, 0.5)) / 2 * a;
       System.out.println("The solution is + x);
```

```
}
else if (D > 0) {
    double x1, x2;
    x1 = (-b + Math.pow(D, 0.5)) / (2 * a);
    x2 = (-b - Math.pow(D, 0.5)) / (2 * a);
    System.out.println("The solutions are " + x1 + ", " + x2);
}
else {
    System.out.println("There is no real solution");
}

}
```

PROGRAM 2: SGPA calculator

```
Lab 2:
                            an away credits & an array
Include methods to accept and digitary details and a method to calculate SGPA of a student.
import java. util. +;
class Student ?
     private string usn;
     private string name;
                     total sub;
      parivate int[] credits:
     periate int [] marks;
      int i, j;
     public Student (total - sub) {
          credits = new int [total-sub];
            marks = new int [total -sub];
     public soid accept() {
          Scanner 80 = new Scanner Coal system in);
          System. out println ("Enter your USN: ");
          usn = sc. next();
         System. out println ("Enter your name: ");
          name = sc. next();
          System out paintin (" Entre your total no of subjects: "):
          total sub = sc. next lint ();
          a lieo; ic: total-sub; i++){-
          System out printles ("Enter the credits");
          1 (i=0; i <= total - snb; i++) {
               credits[i] = sc. next-intl);
```

```
System.out. privation ( "Enter the marks: ");
for (j=0; j == total sub; j++) {
                 marks [j] = sc. next lint ();
    this world display () }
           woid calculate-supA() }
               int sum , product & , sup A:
               for ( i= 0; i <= total_sub ; i++) {
                    fortjeo; ica total -mb; j++) {
                               product = cudits (i) * marks (j);
                                      sum + product;
                       3
                3 3
                resid
     3
public static void moun ( String augs ( )) {
           System out println ("The SGPA of the stude
                                         SGPA);
                                       Student (total-only):
*
                            = new student ( total-sub);
           SI. accept ()
          SD. calculate SGPA()
3
```

import java.util.Scanner;

```
class Student {
    // Class members
    private String usn;
    private String name;
    private int[] credits;
    private int[] marks;
    private int numSubjects;

// Method to accept student details
    public void acceptDetails() {
```

```
Scanner sc = new Scanner(System.in);
  System.out.print("Enter USN: ");
  usn = sc.nextLine();
  System.out.print("Enter Name: ");
  name = sc.nextLine();
  System.out.print("Enter the number of subjects: ");
  numSubjects = sc.nextInt();
  credits = new int[numSubjects];
  marks = new int[numSubjects];
  System.out.println("Enter the credits and marks for each subject:");
  for (int i = 0; i < numSubjects; i++) {
     System.out.print("Subject " + (i + 1) + " - Credits: ");
     credits[i] = sc.nextInt();
    System.out.print("Subject " + (i + 1) +" - Marks: ");
    marks[i] = sc.nextInt();
  }
}
public void displayDetails() {
  System.out.println("\n--- Student Details ---");
  System.out.println("USN: " + usn);
  System.out.println("Name: " + name);
  System.out.println("Subject-wise Credits and Marks:");
  for (int i = 0; i < numSubjects; i++) {
     System.out.println("Subject " + (i + 1) + " - Credits: " + credits[i] + ", Marks: " + marks[i]);
  }
public double calculateSGPA() {
  int totalCredits = 0;
  double total Grade Points = 0.0;
  for (int i = 0; i < numSubjects; i++) {
    int gradePoint = calculateGradePoint(marks[i]);
    totalGradePoints += gradePoint * credits[i];
    totalCredits += credits[i];
```

```
if (totalCredits == 0) {
       return 0.0; // Avoid division by zero
     return totalGradePoints / totalCredits;
  }
  private int calculateGradePoint(int marks) {
     if (marks \geq= 90) return 10;
     else if (marks >= 80) return 9;
     else if (marks \geq 70) return 8;
     else if (marks \geq 60) return 7;
     else if (marks \geq 50) return 6;
     else if (marks >= 40) return 5;
     else return 0;
  }
  public static void main(String[] args) {
     Student student = new Student();
     student.acceptDetails();
    student.displayDetails();
     double sgpa = student.calculateSGPA();
     System.out.printf("\nSGPA: %.2f\n", sgpa);
  }
}
```

PROGRAM 3:

Implementing toString() method

```
Date Page
impart Java. util. +;
public class Book {
     String name;
      String author;
      int prices;
      int num-pages;
      Book (string name, String author; int price, not num pages)
                this name = name;
                 this author = author;
                 this price = paice;
                 this num-pages = num-pages,
       public string getname() {
             return name;
       public String get Authore ?
               return author;
       public int getPuice() [
               setun price;
       public out get Num pooger () {
                 setum nun-yages;
       public noid setName (String name) {
                 this name: name;
        public word set Author (String audine) ?
                this author = author;
        public word setPrice (strong price)?

this. price = price;
```

public word and hum- pages (not num-pages)?

public word death in a good name is " a name.

possess are " to another a " hather is " to antere is " a name.

" hather is: " to another a " hather is "

proper are: " to man pages " in a the

price of the book is: " + price);

public whate now man! stronge? ago)?

Scanner se = new Scanner (System. in);

Scanner se = new Book [n];

Pook [] to = new Book [n];

Son (not i = 0; (m);

Son nome = se next();

Soften out printle (" inter the book is mere!);

Strong awher = se next();

System out printle (" inter the author name.");

Strong awher = se next();

System printle (" inter the mode is greated by system printle (" inter the author name.");

Strong awher = se next();

System printle (" inter the mode pages?

System printle (" inter the mode pages?

System pages? Se next that ();

System pages? Se next

Dutput:
Exter the number of books:
2
Enter the book name:
Inferro
Enter the auters name:
Dan Brown
Enter due price :
599
Enter tue no of pages:
625
Enter the book name:
gaa
Enter the authors name:
blab
Enter the price:
Enter the no of pages:
200
The book details are:
Rook details:
Book name i's: Inference
the author is: Dan Brawn
The manual of
The paramber of pages is: 625
Rook delah:
Book name is: raa
The side is a sag
The author is: 666
The number of pages is: 200
The price of the book is: 300
Step 10
4.5

```
import java.util.Scanner;
class Book {
  private String name;
  private String author;
  private double price;
  private int numPages;
  public Book(String name, String author, double price, int numPages) {
    this.name = name;
    this.author = author;
    this.price = price;
    this.numPages = numPages;
  }
  public void setName(String name) {
    this.name = name;
  public void setAuthor(String author) {
    this.author = author;
  public void setPrice(double price) {
    this.price = price;
  public void setNumPages(int numPages) {
    this.numPages = numPages;
  public String getName() {
    return name;
  public String getAuthor() {
     return author;
  }
  public double getPrice() {
     return price;
  public int getNumPages() {
```

```
return numPages;
  public String toString() {
     return "Book Name: " + name + "\nAuthor: " + author + "\nPrice: " + price + "\nNumber of
Pages: " + numPages;
}
public class BookDetails {
  public static void main(String[] args) {
     Scanner scanner = new Scanner(System.in);
     System.out.print("Enter the number of books: ");
     int n = scanner.nextInt();
     scanner.nextLine();
     Book[] books = new Book[n];
     for (int i = 0; i < n; i++) {
       System.out.println("\nEnter details for Book " + (i+1));
       System.out.print("Enter book name: ");
       String name = scanner.nextLine();
       System.out.print("Enter author name: ");
       String author = scanner.nextLine();
       System.out.print("Enter price: ");
       double price = scanner.nextDouble();
       System.out.print("Enter number of pages: ");
       int numPages = scanner.nextInt();
       scanner.nextLine();
       books[i] = new Book(name, author, price, numPages);
     System.out.println("\nBook Details:");
     for (int i = 0; i < n; i++) {
       System.out.println("\nDetails of Book " + (i+1) + ":");
       System.out.println(books[i].toString());
     scanner.close();
```

PROGRAM 4:

Abstract classes (Animal program):

	Classmate. Date
22/11	12024 Lab-4
	The Real would desired?
	1. Greate an abstract class arimal with the mothed est and
	1. Create an abstract class arrivingl with the method eat and sleep. Create 3 millarses lion, tiger and deer that extends
	the animal class and implement eat and sleep wethods
	based on the specific behaviour-
	based on the specific behaviores-
	import java. util. *
	abstract class Animal \$ 3 }
	abstract class Animal # 2 { problec abstract word lat (); }
	public abstract sleep 1) 54
	public abstract "sleep();
	True tis new track)
	class Lion extends durinal &
	public word earle) [
	System out println (" Lion: Eats");
	1 (Char card)
	mublic void sleep () {
	public void sleep () {
	3 Contact of the second
	Clara Tices extende duineal &
	Clars Tiger extends durinal { public word Rat() {
	purous word Rate of
	System. out. println (" Tiger: Eats");
	Louisteys ?
	system out paintln (" Tiger: 8 (egs));
	System out paintle (" Tiger: 8 (expis) i
	alor issue
	Description of the state of the

```
Clan Deer extends dumand?

matric word eat()?

System. out. pountlin ("Deer: Eats");

public void skep()!

System. out. pountlin ("Deer: Skeyro");

public clan Care?

public static word main (Sking E7 args)?

Lion lion: new Lou();

Sign tig: new Tryn();

Been deer new Deer();

Lion. skep();

Lion. skep();

Lion. skep();

deer. cat();

deer. cat();

Jon: sass

Lion: Skeps

Deer: cats

Tiger: Skeps

Deer: cats

Deer: skeps

Deer: cats

Deer: skeps

Deer: skeps

Deer: cats

Deer: skeps
```

```
import java.util.*;

abstract class Animal {
    public abstract void eat();
    public abstract void sleep();
}

class Lion extends Animal {
    public void eat() {
        System.out.println("Lion: Eats");
    }

    public void sleep() {
        System.out.println("Lion: Sleeps");
    }
}

class Tiger extends Animal {
    public void eat() {
        System.out.println("Tiger: Eats");
    }
}
```

```
public void sleep() {
     System.out.println("Tiger: Sleeps");
Class Deer extends Animal {
  public void eat() {
     System.out.println("Deer: Eats");
  public void sleep() {
     System.out.println("Deer: Sleeps");
  }
}
public class Base {
  public static void main(String[] args) {
     Lion lion = new Lion();
    Tiger tig = new Tiger();
    Deer deer = new Deer();
     lion.eat();
     lion.sleep();
     tig.eat();
    tig.sleep();
     deer.eat();
     deer.sleep();
}
```

PROGRAM 5:

Bank problem:

```
-> atilized
  import java. util.
  abstract class Account {
         String customes name;
         Stating acc-no:
         String acc-type;
         double balance = 0.0;
         double interest;
         public abstract word com acct ();
         public abstract word sow-act 1)
        Account (String customer-name, String acc-no, String acction
            this & custome rame = customer name;
             this.acc-no = acc-no;
            this - acc-type = acc-type;
 class Curs-acit extends Account & amount
 public woid deposit (double balance) ?
            balance + = amount;
            System out privile (" The balance after deposit is: "+
            Systems out printles ("Deposited: " + amount):
            displayBalance();
public word dignayBalance () {
           System out printles (" The aucent balance: " + balance);
public double get Balance () {
        setum balance;
```

Juntoric Void cheque Book (5 & 3000 to name. String formation by the print for the print to the print to the print to the print to the cheque was seemed for system out print to name);

balance == total cheque aunts

display Balance (3);

clan aur seet extends decount?

final double min bal = 500.00;

final double penalty = 500.00;

final double penalty = 500.00;

public word min bal (1)?

(balance = mon balance)?

System out paints (- Funally systhed);

display Balance ();

subtract = withdraw aunt?;

System out mithdraw aunt?;

System out mintle ("Withdraw aunt);

glisplay Balance();

Clar Sav seet extends decount [

final Couble intenstrate (3);

display Balance (3);

display balance + mintle ("Withdraw " + untildean aunt);

guith word computation (1);

doubte intenstrate to lance "subsect rate;

balance + manuest (3);

display Balance (3);

d

Clar Bank (2) (

Pullette strates with moon (string [Tough) ?

Seane Se = new Scanner (system : cu);

System out paintly ("the your himse abil account no: 2);

acc = 10 = Se = next();

System. out paintly ("Toyand your balance:");

balance Se = next();

System out paintly ("the fill ("the season occasion type: ");

System out paintly ("the train the type of Fystem out paintly ("the train to posit in as withdraw in si cheque book to in a season to see the fill ("the season of season to see a seatlant ();

Switch (class) ("season paintly ("season the season of season to season to season the season to season the season to season the season to season the season the season the season that the season the season that the season the season that season the season that the season the season that season the season that season the season the season the season that season the season the season that season the season that season the season the season that season the season the

```
Output:

Enter your name and account, mumber:

Dynthi
7289 423

Onput your balance:
452220

Enter your account type:

Enter:
1. Deposit
2. Mithdraw
3. Chequebook
4. Exit
```

```
import java.util.*;
abstract class Account {
  String customer_name;
  String acc_no;
  int acc_type;
  double balance = 0.0;
  Account(String customer_name, String acc_no, int acc_type) {
    this.customer_name = customer_name;
    this.acc_no = acc_no;
    this.acc_type = acc_type;
  public void deposit(double amount) {
    balance += amount;
    System.out.println("Deposited: " + amount);
    displayBalance();
  public void displayBalance() {
    System.out.println("The current balance is: " + balance);
  }
  public double getBalance() {
    return balance;
  }
```

```
public void chequeBook(String to_name, double cheque_amount) {
     System.out.println("A cheque was issued to: " + to_name);
    balance -= cheque_amount;
    displayBalance();
  }
}
class Curr acct extends Account {
  final double min_bal = 500.0;
  final double penalty = 50.0;
  Curr_acct(String customer_name, String acc_no, int acc_type) {
     super(customer_name, acc_no, acc_type);
  }
  public void checkMinBal() {
    if (balance < min_bal) {
       balance -= penalty;
       System.out.println("Penalty of " + penalty + " is issued due to low balance.");
    displayBalance();
  }
  public void withdraw(double withdraw_amt) {
    if (withdraw_amt <= balance) {</pre>
       balance -= withdraw_amt;
       System.out.println("Withdrew: " + withdraw_amt);
     } else {
       System.out.println("Insufficient funds for withdrawal.");
    displayBalance();
class Sav_acct extends Account {
  final double interest_rate = 7.0;
  Sav_acct(String customer_name, String acc_no, int acc_type) {
     super(customer_name, acc_no, acc_type);
  }
  public void computeInterest() {
     double interest = balance * (interest_rate / 100);
    balance += interest;
     System.out.println("Interest added: " + interest);
     displayBalance();
```

```
}
  public void withdraw(double withdraw_amt) {
     if (withdraw_amt <= balance) {</pre>
       balance -= withdraw amt;
       System.out.println("Withdrew: " + withdraw_amt);
       System.out.println("Insufficient funds for withdrawal.");
    displayBalance();
public class Bank {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.println("Enter your name and account no: ");
     String customer_name = sc.next();
     String acc no = sc.next();
     System.out.println("Input your initial balance: ");
     double balance = sc.nextDouble();
     System.out.println("Enter your account type:\nFor savings account enter 1\nFor current account
enter 2");
    int acc_type = sc.nextInt();
     Account account = null;
    if (acc_type == 1) {
       account = new Sav_acct(customer_name, acc_no, acc_type);
     } else if (acc_type == 2) {
       account = new Curr_acct(customer_name, acc_no, acc_type);
     } else {
       System.out.println("Invalid account type.");
     }
     account.deposit(balance);
     int ch;
     System.out.println("Enter:\n1: Deposit\n2: Withdraw\n3: Cheque book\n4: View Balance\n5:
Compute Interest (Savings)");
    ch = sc.nextInt();
    switch (ch) {
       case 1:
         System.out.println("Enter the amount you want to deposit: ");
```

```
double depositAmount = sc.nextDouble();
       account.deposit(depositAmount);
       break;
    case 2:
       System.out.println("Enter the amount you want to withdraw: ");
       double withdrawAmount = sc.nextDouble();
       if (account instance of Curr_acct) {
         ((Curr acct) account).withdraw(withdrawAmount);
       } else if (account instanceof Sav_acct) {
         ((Sav acct) account).withdraw(withdrawAmount);
       break;
    case 3:
       System.out.println("Enter the payee name for the cheque: ");
       String to_name = sc.next();
       System.out.println("Enter the cheque amount: ");
       double chequeAmount = sc.nextDouble();
       account.chequeBook(to_name, chequeAmount);
       break;
    case 4:
       account.displayBalance();
       break;
    case 5:
       if (account instance of Sav_acct) {
         ((Sav_acct) account).computeInterest();
         System.out.println("Interest is only applicable to savings accounts.");
       break:
    default:
       System.out.println("Invalid option.");
       break;
  }
  sc.close();
}
```

PROGRAM 6:

Packages

```
Lab Regions 6

Create a package CIE which has a classes. Shudered and
Internals. The class removal has members enclas
when some, seem. The class in the nests has an array
strat store the internal member scored in give
courts of the current remester of the finders.
Create another package set which has alone
internal External which is a period a class of
phederal. This class has an array that store
the sets made stored to fine course. If the
current services to of the shiderest. Import two jackages
in a file that declares the final marks of in
shidered in all five courses.

package into aggletails. MyDetails;

public class NyDetails?

public class NyDetails?

problem will printle ("Table Myname is: Set Dyuthi");

}

package into delails. printle ("Table Myname is: Set Dyuthi");

public class Parent Details. MyDetails;

mypast into delails. printle ("Table MyDetails;

public class Parent Details. MyDetails;

public class Parent Details.

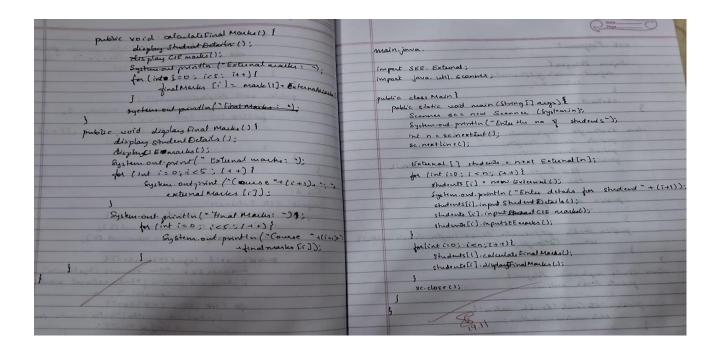
MyDetails det new MyDetails();

let myname of printle ("Table parents are: shake and

Reasod");

Pressod");
```

FOR File 2	-
parkings CIE;	
Impace Java use -	
public clan Trutuit	
String name:	
Cring var:	
int semi	
pulsic worth ingut 5 tradent delaits () &	
Second Se - new Scanner (System in);	
Egither out print he (" E the Use ");	
van : se. next (ine ();	
Extern out prout in ("Enter name");	
name : Sc. next (int();	
Engateur and provint in ("timber semm");	
sem : se next and co:	
*3	
product would display Statement dates (st) &	
Sighten and prently ("Nines: " + name);	
System out print in ("USN: " + won):	
& Septeme and providen ("Seal:" a semi);	
3	
The state of the s	
Fix 2:	
package C15;	
ingul Java with Drainer -	
public class Internals extends Stredard &	
Wat BD marks = new int (5);	
public word Ingut (15 marks () ?	
Seamed as a new Seamer (Surlawin).	
System out provided - Enter indeed mades for 5	
The state of the s	



```
Code:
package CIE;
import java.util.Scanner;
public class Student {
  protected String usn;
  protected String name;
  protected int sem;
  public void inputStudentDetails() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter USN: ");
     usn = s.nextLine();
     System.out.println("Enter Name: ");
     name = s.nextLine();
     System.out.println("Enter Semester: ");
     sem = s.nextInt();
  }
  public void displayStudentDetails() {
     System.out.println("USN: " + usn);
     System.out.println("Name: " + name);
     System.out.println("Semester: " + sem);
  }
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class External extends Internals {
  protected int[] externalMarks = new int[5];
  protected int[] finalMarks = new int[5];
  public void inputSEEmarks() {
     Scanner s = new Scanner(System.in);
     System.out.println("Enter External Marks for 5 Courses: ");
     for (int i = 0; i < 5; i++) {
       System.out.println("Enter marks for course " + (i + 1) + ": ");
       externalMarks[i] = s.nextInt();
     }
  }
  public void calculateFinalMarks() {
```

```
for (int i = 0; i < 5; i++) {
       finalMarks[i] = marks[i] + externalMarks[i];
     }
  }
  public void displayFinalMarks() {
     displayStudentDetails();
     displayCIEmarks();
     System.out.println("External Marks: ");
     for (int i = 0; i < 5; i++) {
       System.out.println("Course " + (i + 1) + ": " + externalMarks[i]);
     System.out.println("Final Marks: ");
     for (int i = 0; i < 5; i++) {
       System.out.println("Course" + (i + 1) + ":" + finalMarks[i]);
  }
}
import SEE.External;
import java.util.Scanner;
public class Main {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter the number of students: ");
     int n = \text{sc.nextInt()};
     sc.nextLine();
     External[] students = new External[n];
     for (int i = 0; i < n; i++) {
       students[i] = new External();
       System.out.println("Enter details for student " + (i + 1));
       students[i].inputStudentDetails();
       students[i].inputCIEmarks();
       students[i].inputSEEmarks();
     for (int i = 0; i < n; i++) {
       students[i].calculateFinalMarks();
       students[i].displayFinalMarks();
```

```
sc.close();
}
```

PROGRAM 7:

Interfaces

```
Lab Program 7:
 interface Polygon?
      default double get Peimeter () {
           return 0.0;
     abstract double getAua();
3
 class Rectangle implements Polygon !
      private double length;
       pervate double width;
       genblic Rectangle (double length Louble width) (
              this length: length;
       public double get Drea () ?
           return leight worder;
      public double get Perimeter (double length, double width)
class Oicle implements Polygon ?
     private double sadius;
     public & Circle (double xadius) ?
          Unis radius = radius;
    public double get Dua () }
wehrer moth. Pt + radius + radius;
```

```
public double get Yes wreter ( double souths) }

Ithus Malle PI * 2 traction;

}

class Triangle implements Polygon?

Revolt double %;

private double %;

private Langle (double x, double sy, double =) {

this x = x;

this y = y;

this y = y;

this x = x;

}

public get Areas ()?

public double s = (x + y + z)/2;

return Math. synt (3 * (s - x) * (s - y) * (s - z));

}

public double get Previousle (dou)?

youther state void main (string 1) argu?

Polygon sectangle = view Rectangle (length: s. width: string)

Polygon sectangle = view Rectangle (length: s. width: string)

Polygon suche = view Circle (7);

Polygon franche: new Triangle ( s. 6.5);

System out printle ( * Rectangle Princese: * + rectangle get Arimoto.);

System out printle ( * Rectangle Princese: * + rectangle get Arimoto.);
```

	System out paintle l'Circle Area: " + circle gel Area System out parten l'acce himolie: " + circle gel Prin
	System-out printle ("Rector area: " + trkungle get Area System-out printle ("Triangle primete: " + triangle ge
	Sile out printly ("Rector area: " + brangle get Area
	I system out printle ("Teiangle primeter: "+ triangle. ge
3	dans through implements to beginn
	plants double ?
0.,	tput:
10-4	put.
2	
2	tangle Aca: 15.0
Lac	langle perimeter: 16.0
11	1 97 - 17 ex ex ex N3
Circu	
11 -	permets: 42 9000
Circ	
Cue	1 de la companya del companya de la companya del companya de la co
Tu'a	ngle area: 60
Tu'a	ngle area: 60
Tu'a	The Permeter : 12.0
Tu'a	ngle area: 60

```
interface Polygon {
  default double getPerimeter(){
     return 0.0;
  abstract double getArea();
class Rectangle implements Polygon {
  private double length;
  private double width;
  public Rectangle(double length, double width) {
     this.length = length;
     this.width = width;
  public double getArea() {
     return length * width;
  public double getPerimeter(){
    return (2*length)+(2*width);
}
class Circle implements Polygon {
  private double radius;
  public Circle(double radius) {
     this.radius = radius;
  public double getArea() {
     return Math.PI * radius * radius;
  public double getPerimeter(){
     return Math.PI*2*radius;
  }
class Triangle implements Polygon {
  private double x;
  private double y;
  private double z;
```

```
public Triangle(double x, double y, double z) {
     this.x = x;
    this.y = y;
     this.z = z;
  }
  public double getArea() {
     double s = (x + y + z) / 2;
     return Math.sqrt(s * (s - x) * (s - y) * (s - z));
  public double getPerimeter(){
     return x+y+z;
}
public class Perimeter{
  public static void main(String[] args) {
     Polygon rectangle = new Rectangle(5, 3);
     Polygon circle = new Circle(7);
     Polygon triangle = new Triangle(3, 4, 5);
     System.out.println("Rectangle Area: " + rectangle.getArea());
     System.out.println("Rectangle Perimeter: " + rectangle.getPerimeter());
     System.out.println("Circle Area: " + circle.getArea());
     System.out.println("Circle Perimeter: " + circle.getPerimeter());
     System.out.println("Triangle Area: " + triangle.getArea());
     System.out.println("Triangle Perimeter: " + triangle.getPerimeter());
}
```

PROGRAM 8:

Exception handling

```
Program 6: (Lab Program):
What a program that demonstrates hunding of exceptions
 in inheritance tree Create a base who class called
"Father" and derived class called "son" words extends
the base clan. In father class, implement a construction
which takes be age and throws the exception
Wrong Agel) when input ageco. In son clan, implement
a constructor that uses both father and son's
 and beover an exception if son's age is >= fatheris
class WrongAge Exception extends Exception ?
    public wrongAge Exception (String menage) {
        super (menage);
class Father [
     int fatherAge;
     public father ( int age) throws wrong Age Except on &
        1 (aga < 0) 1
           throw new phrongAge Exception ("Falleis age cannot
                  be negati ve. ");
        this . father = age ;
```

class Son extends Father & int sonAge; public Son (int fatherAge, int sonAge) Throws WrongAge Exception S supres (father Age); throw her wrong system on " Son's age cannot be negative."): if (son Age >= father Age) & Throw new Wrong Hye Exception ("Son's age cannot be greater than or equal to bathers age); this. son Age = con Age; public clan Exception Inheritance Demo. 3
public static word main (string [] args) 1 tey E Father father = new Father (50); Son = new Son (450, 16);
System. ond. println (Father : rge: " + father fathers);
System. ond. println (Son's age: " + son. Son Age);
Father invalidation: new father (-5); catch (wrong Agetrication e) 1 System out privalin ("Exception caught: " + e getterregit) 3 try ? Son invalidSon = new son (40.50); 3 catch (wrong Agetic centron e) 1 system out providen ("Exception caught: "+ &

Dutput:

Father's age: 50

Son's age: 19

Exception caught: Father's age cannot be present than of
equal to baker's age.

```
class WrongAgeException extends Exception {
  public WrongAgeException(String message) {
     super(message);
  }
}
class Father {
  int fatherAge;
  public Father(int age) throws WrongAgeException {
    if (age < 0) {
       throw new WrongAgeException("Father's age cannot be negative.");
    this.fatherAge = 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 ExceptionInheritanceDemo {
  public static void main(String[] args) {
    try {
       Father father = new Father(40);
       Son son = new Son(40, 18);
       System.out.println("Father's age: " + father.fatherAge);
       System.out.println("Son's age: " + son.sonAge);
       Father invalidFather = new Father(-5);
     } catch (WrongAgeException e) {
       System.out.println("Exception caught: " + e.getMessage());
    try {
       Son invalidSon = new Son(40, 50);
     } catch (WrongAgeException e) {
       System.out.println("Exception caught: " + e.getMessage());
```

```
}
}
}
```

PROGRAM 9:

Two threads

```
Lab Program-9
      Program 1.
      blute a program which creates two threads, one thread
      displaying Bus Co Vege of Engineering once every tenseconds and another displaying "CSE" once away 2
       secondo
Gava dons DisplayMenage extends Threads &
             private string menage;
             parale int interal;
              public DiplayMenage (String menage int interal) [
                    this merage : merage;
                     this interal: interval;
             public used run () [
                  while (! Thead, current Thead () is Irileacy ted)) {
                           Expten out printle (menage)
                           Thread skep (interval "1000);
                        cotch & Interrupted exception c) }
                             System out paintles 1- Thread Interrupted");
                             returni,
                 3
       gublic dass Two Threads ?
            public static und main (Steing 17 ags) {
                    Diplay Herage thread 2 - now Diplaylerag
                                           ( BMS college of try
```

```
Display Menage Hueada: new Display Menage (-CSE', 2).
         thread 1. start();
         threads. start();
         try E
             Thread. deep (30000);
         catch (Interryted Exception e) ?
          e. printstack Trace ();
          thread 1. Interrupt ();
          thread ? interrupt ();
Output:
    college of Engineering
CSE
CSE
CSE
BMS College of Engineering
Bres College of Engineering
```

```
class DisplayMessage extends Thread {
    private String message;
    private int interval;

public DisplayMessage(String message, int interval) {
        this.message = message;
        this.interval = interval;
    }

public void run() {
    while (true) {
        try {
            System.out.println(message);
            Thread.sleep(interval * 1000);
        } catch (InterruptedException e) {
            System.out.println("Thread interrupted");
        }
    }
}
```

```
public class TwoThreads {
   public static void main(String[] args) {
      DisplayMessage thread1 = new DisplayMessage("BMS College of Engineering", 10);
      DisplayMessage thread2 = new DisplayMessage("CSE", 2);
      thread1.start();
      thread2.start();
   }
}
```

PROGRAM 10:

Integer division GUI

```
Program 10:
import javar. swing, ";
import java. aut . ";
import jana- aut. event . SchionEvent ;
import jou a. aut. went . Action Listener;
public clan Integer Division GUI &
   public static word main (String [] angs) ?
JErame frame = new JErame (" Integer division");
          frame. set Defaut Close Operation ( JFrame. EXET_ON_CLOSE );
           frame. setSize ( 600, 500);
            Itabel label1 = new Stabel ("Number I:");
            Idabel label 2= new Idabel ("Alumber 2: ");
             Text Field num 1 Field = new Jext Field (10);
             SText Field numérield = new STextfield (10);
             JButton divide Button = new JButton ("Divide");
             Idabel nesultdabel = new Kabel ("Result:");
            frame. seldayout (new Flow Layout ());
            frame add (label 1): (dd); frame add (label 2);
            frame add ( num & Field).
            frame add (divide Button);
           frame add (result Label);
```

sincede Button addicti ondistence (new Actordistance);
mille void - action the formed (Action trout c) }
int mum so Integer parsetert (membereld got
int num 2 = Integer paise Int Cours a Rield you
if (min = = 0) {
Throw me new Authoretic Exception
3 ("Division by gero");
3 gera's,
int result : min 3/ min 2;
memit Label, set Text / "Per 11."
I catch (Numbertoamatexception ex)?
- Invalid input. Please enter inte gas. " Exes "
Jatch (A. H. ERROR MESSAGE);
Commence Calentina 13
1 Option Pane stronger Dialog Chame, ex. get
mersage () "Estate to Chaine, ex. get
Justifane. EKROR.
b);
3 france set Vimble (tues);
3

	Output:
	asc1:
	asc1:
	1. [
	Num 2: 145
	Divide
	Renut: 25
- 1	
C	ared:
	Num 1: [45] Num 2: [89.5]
	Divide Remt:
	From X
	Invaled input. Alean Entre Liste gers.
	ente by te gers.
Ca	
- 1	Num 1: [45]
	Num : []
	Muma: O Dinide Renth:
	Erron X
	Division by zero
	OK
	83.13
	03

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
public class IntegerDivisionGUI {
  public static void main(String[] args) {
    JFrame frame = new JFrame("Integer Division");
    frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    frame.setSize(300, 200);
    JLabel label1 = new JLabel("Num1:");
    JLabel label2 = new JLabel("Num2:");
    JTextField num1Field = new JTextField(10);
    JTextField num2Field = new JTextField(10);
    JButton divideButton = new JButton("Divide");
    JLabel resultLabel = new JLabel("Result: ");
    frame.setLayout(new FlowLayout());
    frame.add(label1);
    frame.add(num1Field);
    frame.add(label2);
    frame.add(num2Field);
    frame.add(divideButton);
    frame.add(resultLabel);
    divideButton.addActionListener(new ActionListener() {
       public void actionPerformed(ActionEvent e) {
         try {
           int num1 = Integer.parseInt(num1Field.getText());
           int num2 = Integer.parseInt(num2Field.getText());
           if (num2 == 0) {
              throw new ArithmeticException("Division by zero");
            }
           int result = num1 / num2;
           resultLabel.setText("Result: " + result);
         } catch (NumberFormatException ex) {
           JOptionPane.showMessageDialog(frame, "Invalid input. Please enter integers.", "Error",
JOptionPane.ERROR_MESSAGE);
         } catch (ArithmeticException ex) {
           JOptionPane.showMessageDialog(frame, ex.getMessage(), "Error",
JOptionPane.ERROR_MESSAGE);
```

```
}
});
frame.setVisible(true);
}
```