VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JnanaSangama", Belgaum -590014, Karnataka.



LAB REPORT on

Object Oriented Java Programming (23CS3PCOOJ)

Submitted by

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

in

COMPUTER SCIENCE AND ENGINEERING



B.M.S. COLLEGE OF ENGINEERING
(Autonomous Institution under VTU)
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 **BOLLA RAJA SIMHA REDDY (1BM23CS070)**, who is Bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of an Object-Oriented Java Programming (23CS3PCOOJ) work prescribed for the said degree.

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Index

Sl. No.	Date	Experiment Title	Page No.
1	1/10/24	Quadratic Equation	4-7
2	8/10/24	Calculating SGPA	8-12
3	15/10/24	Book Details	13-17
4	22/10/24	Abstract Class Shape	18-21
5	29/10/24	Bank Details	21-26
6	12/11/24	Packages	27-33
7	19/11/24	Interface	33-37
8	26/11/24	Exception Handling	37 -40
9	3/12/24	Threads	41-43
10	3/12/24	GUI – Java Swing	43-51

GitHub Link: https://github.com/Rajasimhareddybolla/OOJ_LAB_U

Implemente Quadratic Equation

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 Algorithm:

impost Java. Utils. Scanner;

public class Rooks &

Rublic Static Doid main (Storng CJ angs) {

Scanner in Aut = new Scanner (System.in).

System. with Pointin (" Enter a., b, c ");

int a = infor. next Int();

int b = infor. next Int();

int c = infor. next Int();

if (det co)?

System. out frintln (" No seal door Bird);

}

```
2150
                                       (196) tope Stom
                   moot 1 = (-b + det ** 0.1) (4 * a * c) :
                  System . 601 . Printin (" Short 1 = " + Sheet 1 + " Short 2=
                 @ if ( o det == 0) {
                  inport Close();
                          System.out. Pointh (" moots one equa")
                     esse if (det >0) {
                             System. out . Pointly ("noots are distinct an
                                         neal ");
                     input. closel) 3
OUTPOF !
     MULTIPLICATION
```

```
Code:
import java.util.Scanner;
public class quad{
    public static void main(String [] args){
        Scanner input = new Scanner(System.in);
        System.out.println("enter a b c constants in the quad equaion");
        int a = input.nextInt();
        int b = input.nextInt();
        int c = input.nextInt();
```

```
float det = b*b - 4*a*c;
                if (det < 0)
                        System.out.println("roots are imaginert");
                else {
                        double root1 = (-b+Math.sqrt(det))/(2*a);
                        double root2 = (-b - Math.sqrt(det))/(2*a);
                        if (det == 0){
                                System.out.println("roots are same ");
                                System.out.println("root 1 = " + root1 + " \setminus n root2 - " + root2);
                        else{
                                System.out.println("roots are real and distinct");
                                System.out.println("root 1 = " + root1 + " \setminus n root2 - " + root2);
                        }
                        }
        }
}
```

Output:

```
    (.venv) rajasimna@Rajas-MacBook-Air java % javac quad.java
    (.venv) rajasimha@Rajas-MacBook-Air java % java quad enter a b c constants in the quad equaion
    3
    4
    5
    roots are imaginert
```

```
Enter co-efficient of x square

4
Enter co-efficient of x

4
Enter the constant

2
No real root exists

CHETHAN K S

1BM23CSO74
```

```
Enter co-efficient of x square

2
Enter co-efficient of x

4
Enter the constant

2
The roots are equal -1.0
```

Calculating SGPA

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

```
Systemion. Pointing (" cordity :");
       Coedil (13 = infor next Int ();
        EXHUM.OUT. POINTIN();
      Public
int total coedite = 0:
         int s-coredit = 0;
             Pox (int i=0 ; i 1 no-806; i++) {
                     total-coedit + = Ris. coedits [:];
                       s-coedit + = this. coedits-cale(
                                         Ris. marks [1])
                                            Bis credita[13;
                    Sgpa = (Root) - coedit / total - coedits)
               Flocat
                 sewon sgea;
                int caedit-an ( int marks) {
                if (works 200) & aknow 10:3
                 else if (monts > 80) { neturn 9; 3
                 else if (money = 70% { seturn 8; }
                 and it (monus > 60) & news 7; 3
                   elle it (months so) { setuan 6:3
                   else if (monils > 40) { deturns }
                     else ? newon of &
         3
                        E His wo 1000
```

```
Student. Java
imposit
          Sto. Dia. otil. Scanca.
class
          Student-infol
             int no . Sub;
           String Usn-no;
            String
                      name;
             int CJ
                     mooks;
             int [] Coredits;
              Scanger inpot: new Scanner (Systemin):
               Public Void Student-info () }
                    System out Printin (" Enten Your name ");
                     name = input. next Line ();
                     System. out. Pointin(" Enter your USN")
                     USW-no = inpot next Linear;
                      System . OUI. Printin (" Enter no g sus"
                        NO-SUBJ = inpot. Next INE();
Conedits = new int [no-subs]; manks = new int [no-sub];
                        for (int izo; it this no-subs; it)
                             SYLEM OUR POINHT(" HOOKI");
                             meanics [1] = inpor. next Line 4);
```

```
Public
         class
                 Student & Makers
        Poblic static Doid main ( story crange) &
               student into Stude = new student info ()
                                                              SGIPA
                System. Out. Printte (" SGRA ").
                                                                       8-8 181
                                                              anter your none
                 studt . a
                  SProat Sgra: Studi. get - Sgr
                                                               enter your usa
                  System. out. Point ( 89Pa );
                                                                16m22Cd020
                                                                 U0-70837
                                                                 Enter monk 99
                                                                  Entor coeding 4
                                                                   ener mank 93
                                                                    entor coedits 4
                                                                     Entor money 88
                                                                      Enton Coedibs 3
Enter your rame
 B. Raja
 Exter your Usa
   10-20671
                                                               import java.util.Scanner;
     ENTER MORKS 87
                                                               class student_info {
       enter coeding 4
                                                                    String Usn_no;
                                                                    String name;
       enter money go
                                                                    int marks[];
                coedis
                                                                    int credits[];
                                                                    int no_sub;
        entry morry
                                                                    Scanner input = new
        Euro coedity 3
                                                               Scanner(System.in);
```

public void get_data() {

```
name = input.nextLine();
               System.out.println("Enter your usn");
               Usn_no = input.nextLine();
               System.out.println("no_subjs");
               no_sub = input.nextInt();
               credits = new int[no_sub];
               marks = new int[no_sub];
               for (int i = 0; i < no_sub; i++) {
                       System.out.print("Enter Mark");
                       marks[i] = input.nextInt();
                       System.out.print("Enter Credits");
                       credits[i] = input.nextInt();
               System.out.println();
       public float get_sgpa() {
               int total_credits = 0;
               int s_grade = 0;
               for (int i = 0; i < no_sub; i++) {
                       total_credits += credits[i];
                       s_grade += credit_cal(marks[i]) * credits[i];
               float sgpa = (float) s_grade / total_credits;
               return sgpa;
        }
       public int credit_cal(int marks) {
               if (\text{marks} >= 90) {
                       return 10;
                } else if (marks > 80) {
                       return 9;
                } else if (marks > 70) {
                       return 8;
                } else if (marks > 60) {
                       return 7;
                \} else if (marks > 50) {
                       return 6;
                } else if (marks > 40) {
                       return 5;
               return 0;
}
public class student {
       public static void main(String[] args) {
```

System.out.println("Enter your name");

```
Scanner input = new Scanner(System.in);
System.out.print("enter no of students ");
int student_no = input.nextInt();
for (int i = 0; i < student_no; i++) {
    student_info stud = new student_info();
    stud.get_data();
    System.out.println("SGPA");
    System.out.println(stud.get_sgpa());
}
System.out.println("B.RAJA SIMHA REDDY");
System.out.println("1BM23CS070");
}
```

Output:

```
C:\Users\Admin\Desktop\raja_070>javac student.java
C:\Users\Admin\Desktop\raja_070>java student
enter no of students 3
Enter your name
raja
Enter your usn
1bm23cs070
no_subjs
Enter Mark99
Enter Credits3
Enter Mark87
Enter Credits4
SGPA
9.428572
Enter your name
chetan
Enter your usn
1bm23cs089
no_subjs
Enter Mark99
Enter Credits3
Enter Mark78
Enter Credits4
```

Book Details

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() that could display the complete details of the book. Develop a Java program to create n book objects.

Algorithm:

Public chous Library t Rubic String get Dame (18 Public Static Dod main (Stong (3 agus) } int hobooks; system our Paintin (" Enery no of books in lib. this name , name; Scanney great = now Scanney (Sylking in) POBOON = GUBA. WORK INT(): Rublic String ger Apthox (1 & gorot. gextlinect; newsy Pas notes; for (intico; is no Books; i++) & god ser Amos (1/2 String addins) & His author = author; Stoing name; stoing anthos; Public dolble gerphice (1) & dodore Poice; metern this police; todas: System.out. PaintIn (" Book Dame ") Dois set Parice (double force) & name = impor. next Line (): this Poice : Poice; System. Out Printly (1' author name author = galut, next Line (1) Dint gerloges () & System. out. Pointly (Polce "). newon the gages as Poice - galot. next Dobule PODNIC Doid Set Pages (in Pages) & SAMEW. OCH . BOY SAM (" 40 SER"). this pages - tagy Pages = Supor. next Ent(); BOOK bOOK : new BOOK (Covennide Roblic String to String () } name, author, Poice, Page genon "Dame = " + this name + 3; " author : " + Kis. author + book " on Police = " + TRU. Price + System. out. Printly (book); " in Pages = " + This Pages &

```
Sook 1
Book Dame .
 Book Poice: 200
  Book Pagg. 100
   Dame 2 wills of fine
    Aukor: APS about Kolon
       fases =
               100
```

Code:

```
import java.util.Scanner;

class Book {
    private String name;
    private String author;
    private double price;
    private int pages;

public Book(String name, String author, double price, int pages) {
        this.name = name;
        this.author = author;
    }
}
```

```
this.pages = pages;
       }
       public String getName() {
               return this.name;
       }
       public String getAuthor() {
               return this.author;
       public double getPrice() {
               return this.price;
       }
       public double getPages() {
               return this.pages;
       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 setPages(int pages) {
               this.pages = pages;
       @Override
       public String toString() {
               return "Name =" + this.name +
                              \' \nAuthor = " + this.author +
                              "\nprice =" + this.price +
                              "\npages =" + this.pages;
       }
}
public class Library {
       public static void main(String[] args) {
               Scanner input = new Scanner(System.in);
               System.out.print("enter no of Books ");
```

this.price = price;

```
int noBooks = input.nextInt();
              input.nextLine();
              for (int i = 0; i < noBooks; i++) {
                      System.out.println("Book:" + (i + 1));
                      String name;
                      String author;
                      double price;
                      int pages;
                     System.out.print("Book Name :");
                      name = input.nextLine();
                     System.out.print("Author Name :");
                      author = input.nextLine();
                     System.out.print("Book Price :");
                     price = input.nextDouble();
                     System.out.print("Book Pages :");
                     pages = input.nextInt();
                      Book book = new Book(name, author, price, pages);
                      System.out.println();
                     System.out.println(book);
                     System.out.println();
                      input.nextLine();
              System.out.println("B.RAJA SIMHA REDDY");
              System.out.println("1BM23CS070");
       }
}
```

Output:

C:\Windows\System32\cmd.exe

```
C:\Users\Admin\Desktop\raja_070>javac Library.java
C:\Users\Admin\Desktop\raja_070>java Library
enter no of Books 2
Book :1
Book Name :wings on fire
Author Name :apj abdul kalam
Book Price :200
Book Pages :100
Name =wings on fire
Author =apj abdul kalam
price =200.0
pages =100
Book :2
Book Name :tuesday with morry
Author Name :robhin sherma
Book Price :200
Book Pages :100
Name =tuesday with morry
Author =robhin sherma
price =200.0
pages =100
B.RAJA SIMHA REDDY
1BM23CS070
```

Program 4

Abstract Class Shape

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.

Algorithm:

```
dobate Point fra (12
       Public
                                                             Public
                                                                      class
                                                                            Moses 1
              dobute area - longer + bredte
              Sukm our Print (" Apaa =
                                                                 Poblic Staric Doid main (Alogo Ed Staige) {
                                                                       System out Printing " Shapy Playground").
                                                                       Rectargie Ris new Rectarge (5,6);
                 Exercis Shape ();
                                                                         RI. Point Agraci;
               Public Triagie (int heght, int bood 18)
                                                                         Totangle Ti = new Totangle (10,5):
                     this leight = height
                                                                         TT. Print Area();
                      Hy bred K. boode;
                                                                            ciacle cià new Ciacle (0.1);
                                                                              CI. Point Areal);
               3 () respected 60 Bird Great
                     dobule : one = 1/2 + height + boedth
                      Sylemout. Printing " Asea = " + areay
                                                            DOHO!
Class
                                                             Shapey Play ground
           Subuk Saidus:
                                                              Recrongle
            Public Cincle (dobole 91) }
                                                               Area 30.0
                    78:1. 9.00: US = 7
                                                                Totale
           Public Dois Birt Apea () }
                                                                 Avea = 15.0
                                                                 Ciacie
                  System out Poigety (" orea = " + orea ) 1
                                                                 Area = 78.57
    4
```

Code:

```
import java.util.Scanner;
abstract class Shape {
  int a, b;
  abstract double printArea();
  void Value() {
    Scanner s = new Scanner(System.in);
```

```
a = s.nextInt();
     b = s.nextInt();
  }
  void Valuerad() {
     Scanner s = new Scanner(System.in);
     a = s.nextInt();
}
class Rectangle extends Shape {
  double printArea() {
     return a * b;
}
class Triangle extends Shape {
  double printArea() {
     return 0.5 * a * b;
}
class Circle extends Shape {
  double printArea() {
     return 3.14 * a * a;
  }
}
class shapeArea {
  public static void main(String args[]) {
     Rectangle r = new Rectangle();
     System.out.println("Enter the values of length and breadth: ");
     r.Value();
     Triangle t = new Triangle();
     System.out.println("Enter the values of base and height: ");
     t.Value();
     Circle c = new Circle():
     System.out.println("Enter the value of radius: ");
     c.Valuerad();
     System.out.println("The area of rectangle is: " + r.printArea());
     System.out.println("The area of Triangle is: " + t.printArea());
     System.out.println("The area of Circle is: " + c.printArea());
  }
```

Output:

```
rajasimha@Rajas-MacBook-Air 4_abstract % java shapeArea
Enter the values of length and breadth:
5
6
Enter the values of base and height:
6
7
Enter the value of radius:
9
The area of rectangle is: 30.0
The area of Circle is: 254.34
```

}

Bank Details

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

Permit withdrawal and update the balance Check for the minimum balance, impose penalty if necessary and update the balance.

Algorithm:

```
if (balance < min ammount) &
Class chance }
                                                                     Rubalance - = Penality;
Class Co-act Smelements Accounts
                                                                 Cheque history (cheary) = amnt;
       dobute min.amst 2 1000.0;
        dobute parally 2 Loo. 0 ;
                                                                 chequey +=1;
        adobute chaque history (3 = new down Room
         int Cheaves 20;
         Cor-act (stoing name , int acces , Stoing accept
                                                            3
                                                                        display history () ?
                                                                biot
                                                                        SUR-ON-POINTAC" Toggaction horony chang");
               dopose splance)}
                 Super L name, acces, accepte, bayano
                                                                         Br (int 1=0; it= choosed: 1++){
                                                                            · Sylknour Pointing " Ammount Wishoom "+
                                                                                               change history (13);
        Poid Comport group () {
         System. Ox Pointhic" Bo cuppent cucount no
                 gatoege Can be Composed");
                                                           Public dass Bank &
                                                                  Scanner great - Nes Genner (Systemin).
               wiredoan Cabule anni) }
        Dois
                                                                  Poblic Static Did main (stoing to ango) ?
               · if (amnt > 123. balance) {
                                                                       int account-us,7 }
                     system. out balance (" In suffesicent
                                                                        SARKEW OOT 6-14H J (4 SUKJ TO of accounty recognity
                                                                        account - no's = gripot. nextEnt ();
                                                                         Account A [] = new - Account Coccount-100]
                  " erse F.
                        By balance = this balance - annt;
                                                                         Pool (int 1=0) ic account no ; itt) {
                        Statem.out. Printing" Diredown
                                                                                Sylk-noon. Pointing" Enke I for Sortigis
                                                                                               Acc 2 for Compacy
                               ammount" + amnt +"
                                   Balance = "+ balance);
                                                                                int type = gapot next: Int();
                                                                      Stoing name ; dobute balance ; String type ;
```

if (type == 1) { Swall account; new Sav. acc ACIJ. Stor Baranel); case 'b': it (PM = = 5) 5 ACIZ. display husbay () type = " Savings" Sav-acc account: new Sav-acc (name, balance, type, i); bareax; A. Ci3. compore Intogics; 3 barrak; C136 1 type = " coosent"; SYLK-100+Println(" Enter our ours to withdraw") gopole d = , dubst why gopole; name, baiance, type, i); ALIJ. wite das (a); break; A [i] = account; Case , d1 . do 2 Q = 1; Systemion Pointing" a: Deposite in b: Display C', Compor lintage d', withdows "). framile (9 ! = 1); chan 1 = gapot- next Chance; elso chart a = 0; switch (i) } case 'a': System out Printing " Enter annound to depolite"); dobole m= 9 not next dobole (); ACIJ. Lensite (m); ento break ; · for saving 2 60 CUOTENT ACOINT Enter your nack Rayon

Code:

import java.util.*;

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

String accountType; Account(String customerName, int accountNumber, String accountType, double balance) { this.customerName = customerName; this.accountNumber = accountNumber; this.accountType = accountType; this.balance = balance; } void deposit(double amount) { balance += amount: System.out.println("Deposit successful. New balance: " + balance); void displayBalance() { System.out.println("Balance: " + balance); abstract void computeInterest(); abstract void withdraw(double amount); } class SavAcct extends Account { final double interestRate = 0.04; SavAcct(String customerName, int accountNumber, double balance) { super(customerName, accountNumber, "Savings", balance); @Override void computeInterest() { double interest = balance * interestRate; balance += interest; System.out.println("Interest added. New balance: " + balance); } @Override void withdraw(double amount) { if (balance >= amount) { balance -= amount; System.out.println("Withdrawal successful. New balance: " + balance); System.out.println("Insufficient balance.");

}

class CurAcct extends Account { double minBalance = 1000.00;

```
double charge = 50.00;
  double[] chequeTransactions = new double[100];
  int chequeId = 0;
  CurAcct(String customerName, int accountNumber, double balance) {
     super(customerName, accountNumber, "Current", balance);
  @Override
  void computeInterest() {
    System.out.println("Interest cannot be calculated for a Current Account.");
  @Override
  void withdraw(double amount) {
    if (balance >= amount) {
       balance -= amount;
       if (balance >= minBalance) {
          System.out.println("The updated balance is: " + balance);
         balance -= charge;
         System.out.println("Penalty of 50.0 has been deducted. The new balance is: " + balance);
       chequeTransactions[chequeId] = amount;
       chequeId++;
     } else {
       System.out.println("Insufficient balance. The withdrawal amount is greater than balance.");
  }
  void displayTransactions() {
    for (int i = 0; i < \text{chequeId}; i++) {
       System.out.println("Transaction" + (i + 1) + ":" + chequeTransactions[i]);
  }
public class Bank {
  public static void main(String[] args) {
     Scanner input = new Scanner(System.in);
     System.out.println("Enter account type:");
     System.out.println("1. Savings");
    System.out.println("2. Current");
    int choice = input.nextInt();
    input.nextLine();
    System.out.println("Enter your name:");
     String name = input.nextLine();
```

```
System.out.println("Enter your account number:");
int accountNumber = input.nextInt();
System.out.println("Enter the initial balance:");
double balance = input.nextDouble();
Account account;
if (choice == 1) {
  account = new SavAcct(name, accountNumber, balance);
  account = new CurAcct(name, accountNumber, balance);
int exit = 0;
while (exit !=1) {
  System.out.println("\nEnter the function to be done:");
  System.out.println("1. Deposit");
  System.out.println("2. Display balance");
  System.out.println("3. Compute and deposit interest");
  System.out.println("4. Withdrawal");
  System.out.println("5. Exit");
  int func = input.nextInt();
  switch (func) {
     case 1:
       System.out.println("Enter deposit amount:");
       double depAmount = input.nextDouble();
       account.deposit(depAmount);
       break;
     case 2:
       account.displayBalance();
       break;
     case 3:
       account.computeInterest();
       break:
     case 4:
       System.out.println("Enter withdrawal amount:");
       double withdrawAmount = input.nextDouble();
       account.withdraw(withdrawAmount);
       break;
     case 5:
       exit = 1;
       System.out.println("Exiting");
```

```
Balance = 102000.0
a: Deposit
b: Show Balance
c: Compute Interest
d: Withdraw
q: Quit
Enter:
1 for Savings
 for Current Account
Enter your name:
murali
Enter your initial balance:
1000000
a: Deposit
b: Show Balance
c: Compute Interest
d: Withdraw
q: Ouit
Enter amount to withdraw:
60000
Withdrawn: 60000.0
Current balance: 940000.0
a: Deposit
b: Show Balance
c: Compute Interest
d: Withdraw
g: Quit
```

Packages

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

Algorithm:

```
Students-Bosech
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       40
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     Enter SEE MORES (J COUSSES) Bo Huders 1:
       86
```

```
Code:
package CIE;
public class Student {
  public String usn;
  public String name;
  public int sem;
package CIE;
public class Internals extends Student {
  public int[] internalMarks = new int[5];
  public void setInternalMarks(int[] marks) {
     for (int i = 0; i < 5; i++) {
       internalMarks[i] = marks[i];
  }
  public int[] getInternalMarks() {
    return internalMarks;
  }
package SEE;
import CIE.Student;
public class External extends Student {
  public int[] seeMarks = new int[5];
  public void setSEEMarks(int[] marks) {
     for (int i = 0; i < 5; i++) {
       seeMarks[i] = marks[i];
  }
  public int[] getSEEMarks() {
    return seeMarks;
```

```
}
import CIE.*;
import SEE.*;
import java.util.Scanner;
public class FinalMarksCalculator {
  public static void main(String[] args) {
     Scanner sc = new Scanner(System.in);
     System.out.print("Enter the number of students: ");
     int n = sc.nextInt();
     Student[] students = new Student[n];
     Internals[] internalMarks = new Internals[n];
     External[] seeMarks = new External[n];
     for (int i = 0; i < n; i++) {
       students[i] = new Student();
       internalMarks[i] = new Internals();
       seeMarks[i] = new External();
       System.out.print("Enter USN for Student " + (i + 1) + ": ");
       students[i].usn = sc.next();
       sc.nextLine();
       System.out.print("Enter Name for Student" + (i + 1) + ":");
       students[i].name = sc.nextLine();
       System.out.print("Enter Semester for Student " + (i + 1) + ": ");
       students[i].sem = sc.nextInt();
       int[] internals = new int[5];
       System.out.println("Enter Internal Marks (5 courses) for Student " + (i + 1) + ": ");
       for (int j = 0; j < 5; j++) {
          internals[i] = sc.nextInt();
       internalMarks[i].setInternalMarks(internals);
       int[] see = new int[5];
       System.out.println("Enter SEE Marks (5 courses) for Student " + (i + 1) + ": ");
       for (int j = 0; j < 5; j++) {
          see[i] = sc.nextInt();
        }
       seeMarks[i].setSEEMarks(see);
     System.out.println("\nFinal Marks of Students:");
     for (int i = 0; i < n; i++) {
```

```
C:\Users\Dell\OneDrive\Desktop\StudentMarksProject>javac CIE\Student.java
C:\Users\Dell\OneDrive\Desktop\StudentMarksProject>javac CIE\Internals.java
C:\Users\Dell\OneDrive\Desktop\StudentMarksProject>javac SEE\External.java
C:\Users\Dell\OneDrive\Desktop\StudentMarksProject>javac FinalMarksCalculator.java
C:\Users\Dell\OneDrive\Desktop\StudentMarksProject>java FinalMarksCalculator
Enter the number of students: 2
Enter USN for Student 1: 1BM23CS074
Enter Name for Student 1: CHETHAN K S
Enter Semester for Student 1: 1
Enter Internal Marks (5 courses) for Student 1:
36
39
35
29
Enter SEE Marks (5 courses) for Student 1:
86
91
87
78
Enter USN for Student 2: 1BM23CS082
Enter Name for Student 2: CREVAN NEIL FERNANDES
Enter Semester for Student 2: 1
Enter Internal Marks (5 courses) for Student 2:
40
40
39
37
Enter SEE Marks (5 courses) for Student 2:
86
81
91
93
Final Marks of Students:
Student 1: CHETHAN K S (USN: 1BM23CS074)
Course Internal
                                      Final Marks
                                               138
122
130
Course 1:
                   40
                                      98
Course 2:
                                      86
Course 3:
                   39
                                      87
                                                122
Course 4:
                   35
                   29
Course 5:
                                      78
                                                107
```

 $System.out.println("\nStudent" + (i + 1) + ":" + students[i].name + " (USN:" + students[i].usn + ")");$

```
System.out.println("Course\tInternal\tSEE\tFinal Marks"); \\ for (int j = 0; j < 5; j++) \{ \\ int finalMark = internalMarks[i].getInternalMarks()[j] + seeMarks[i].getSEEMarks()[j]; \\ System.out.println("Course" + (j + 1) + ":\t" + internalMarks[i].getInternalMarks()[j] + "\t" + seeMarks[i].getSEEMarks()[j] + "\t" + finalMark); \\ \} \\ sc.close(); \\ \} \\ \}
```

Output:

Interfaces

Algorithm:

```
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            Public void Area () }
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```

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           Public Void set Sidey (int C) Edg) &
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              Public void Show Perinetal () &
                     System out rointin (" resinctor: " + Perincho).
                bobic void . AreaciE
                            int onea 2 sides (0)* sides(1)
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           CALL Maly {
 Public
              PODIE wid state soid Main (Stong Es angus)
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```

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           int [3 rect Sides = Louet Didk, nootleaste,
                                  necthoidk, necthons
            Rectange nectange - new Rectange .
              grechargie. sorlidy (nect side );
                rectargle . Area ().
                 rectargle. Show Perime May U;
Acca : 25
  perimeter: 20,0
Redogle
 Rectagie width: 6
  poctage length: 1
   perimeter:
```

Code:

import java.util.Scanner;

interface Polygon {
 void setSides(int[] sides);

```
void showPerimeter();
class Square implements Polygon {
  private int[] sides = new int[4];
  private float perimeter;
  public void setSides(int[] sides) {
     this.sides = sides;
     this.perimeter = 0;
     for (int side : sides) {
       this.perimeter += side;
  }
  public void showPerimeter() {
     System.out.println("Perimeter: " + perimeter);
  public void Area() {
     int side = sides[0];
     int area = side * side;
     System.out.println("Area: " + area);
  }
}
class Rectangle implements Polygon {
  private int[] sides = new int[4];
  private float perimeter;
  public void setSides(int[] sides) {
     this.sides = sides;
     this.perimeter = 0;
     for (int side : sides) {
       this.perimeter += side;
  }
  public void showPerimeter() {
     System.out.println("Perimeter: " + perimeter);
  public void Area() {
     int area = sides[0] * sides[1];
     System.out.println("Area: " + area);
public class prog {
```

```
public static void main(String[] args) {
  Scanner sc = new Scanner(System.in);
  System.out.println("Square");
  System.out.print("Square side: ");
  int squareSide = sc.nextInt();
  int[] squareSides = { squareSide, squareSide, squareSide };
  Square square = new Square();
  square.setSides(squareSides);
  square.Area();
  square.showPerimeter();
  System.out.println("\nRectangle");
  System.out.print("Rectangle width: ");
  int rectWidth = sc.nextInt();
  System.out.print("Rectangle length: ");
  int rectLength = sc.nextInt();
  int[] rectSides = { rectWidth, rectLength, rectWidth, rectLength };
  Rectangle rectangle = new Rectangle();
  rectangle.setSides(rectSides);
  rectangle.Area();
  rectangle.showPerimeter();
}
```

Output

```
rajasimha@Rajas-MacBook-Air 7_interfaces % java prog
Square
Square side: 3
Area: 9
Perimeter: 12.0

Rectangle
Rectangle width: 5
Rectangle length: 6
Area: 30
Perimeter: 22.0
```

Program 8

Exception Handling

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.

Algorithm:

```
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            int s-age;
             Public Son (int frage, int stage) Hour Apropries
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```

Code:

```
class AgeUnderFlowError extends Exception {
  public AgeUnderFlowError(String s) {
     super(s);
  }
}
class Father {
  int age;
  public Father(int age) throws AgeUnderFlowError {
     if (age < 0) {
       throw new AgeUnderFlowError("Father's age is less than zero");
     this.age = age;
class Son extends Father {
  int s_age;
  public Son(int f_age, int s_age) throws AgeUnderFlowError {
     super(f_age);
     if (s_age >= f_age) {
       throw new AgeUnderFlowError("Father's age is less than or equal to son's age");
     } else {
       this.s_age = s_age;
       System.out.println("Program successfully executed");
  }
}
public class prog {
  public static void main(String[] args) {
     try {
       java.util.Scanner scanner = new java.util.Scanner(System.in);
       System.out.print("Enter father's age for first son: ");
       int f_age1 = scanner.nextInt();
       System.out.print("Enter son's age for first son: ");
       int s_age1 = scanner.nextInt();
       Son s1 = new Son(f_age1, s_age1);
       System.out.print("Enter father's age for second son: ");
       int f_age2 = scanner.nextInt();
       System.out.print("Enter son's age for second son: ");
       int s_age2 = scanner.nextInt();
```

```
Son s2 = new Son(f_age2, s_age2);
       scanner.close();
     } catch (AgeUnderFlowError e) {
       System.out.println("Error: " + e.getMessage());
  }
}
```

Output:

```
rajasimha@Rajas-MacBook-Air 8 exceptions % java prog
 Program successfully executed
 Error: Father's age is less than zero
rajasimha@Rajas-MacBook-Air 8_exceptions % javac prog.java
rajasimha@Rajas-MacBook-Air 8_exceptions % java prog
  Enter father's age for first son: 34
 Enter son's age for first son: 45
 Error: Father's age is less than or equal to son's age
rajasimha@Rajas-MacBook-Air 8 exceptions % java prog
 Enter father's age for first son: 56
 Enter son's age for first son: 45
 Program successfully executed
 Enter father's age for second son: 45
 Enter son's age for second son: -90
  Program successfully executed
```

Program 9

Threads

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.

Algorithm:

```
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      poblic Soid que 21 8
             for (int 200; 2(80) 244) {
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   Poblic class SI &
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                  6. Storker;
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DOHPON
   consoling & Engineering
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     cse
     cse
     cue
     Cse
    Bus Coince of Engineerin
     CUG
```

Code:

```
class Message1 extends Thread {
  public void run() {
    while (true) {
       try {
          Thread.sleep(10000);
       } catch (InterruptedException e) {
         System.out.println(e);
       System.out.println("BMS College of Engineering");
  }
}
class Message2 extends Thread {
  public void run() {
    while (true) {
       try {
         Thread.sleep(2000);
       } catch (InterruptedException e) {
         System.out.println(e);
       System.out.println("CSE");
public class labthread {
  public static void main(String[] args) {
    Message1 thread1 = new Message1();
    Message2 thread2 = new Message2();
    thread1.start();
    thread2.start();
  }
}
```

Output:

GUI – Java Swing

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.

```
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                 Joens neine. Show Message alog (nous, "990 H": "+
                                           "POJUH", JOPHILOV.
                                                        Informat
                                                        Monouse)
```

Code:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
public class DivisionApp {
  public static void main(String[] args) {
    JFrame frame = new JFrame("Division Calculator");
    frame.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
    frame.setSize(400, 200);
    frame.setLayout(new GridLayout(4, 2, 10, 10));
    JLabel labelNum1 = new JLabel("Enter number 1:");
    JTextField textNum1 = new JTextField();
    JLabel labelNum2 = new JLabel("Enter number 2:");
    JTextField textNum2 = new JTextField();
    JLabel labelResult = new JLabel("Result:");
    JTextField textResult = new JTextField();
    textResult.setEditable(false);
    JButton buttonDivide = new JButton("Divide");
    frame.add(labelNum1):
    frame.add(textNum1);
    frame.add(labelNum2);
    frame.add(textNum2);
    frame.add(labelResult);
    frame.add(textResult);
    frame.add(new JLabel());
    frame.add(buttonDivide);
    buttonDivide.addActionListener(new ActionListener() {
       public void actionPerformed(ActionEvent e) {
           int num1 = Integer.parseInt(textNum1.getText());
           int num2 = Integer.parseInt(textNum2.getText());
           if (num2 == 0) {
              throw new ArithmeticException("Cannot divide by zero.");
           int result = num1 / num2;
           textResult.setText(String.valueOf(result));
         } catch (NumberFormatException ex) {
           JOptionPane.showMessageDialog(frame,
                "Invalid input! Please enter integers only.",
                "Number Format Error",
                JOptionPane.ERROR MESSAGE);
         } catch (ArithmeticException ex) {
           JOptionPane.showMessageDialog(frame,
```

Division C	Division Calculator	
Enter number 1:	98	
Enter number 2:	4	
Result:	24	
	Divide	