VISVESVARAYA TECHNOLOGICAL UNIVERSITY
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LAB REPORT
on

OBJECT ORIENTED JAVA PROGRAMMING

Submitted by

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

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<u>CERTIFICATE</u>

This is to certify that the Lab work entitled "**OBJECT ORIENTED JAVA PROGRAMMING**" carried out by **POOJASHREE K V(1BM21CS129),** 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 during the year 2022-23. The Lab report has been approved as it satisfies the academic requirements in respect of Object oriented Java Programming Lab **- (22CS3PCOOJ)**work prescribed for the said degree.

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Course Outcome

CO1	Apply the knowledge of Java concepts to find the solution for a given problem.
CO2	Analyse the given Java application for correctness/functionalities.
CO3	Develop Java programs / applications for a given requirement.
CO4	Conduct practical experiments for demonstrating features of Java.

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.

```java
import java.io.*;
import java.util.*;
class Quadratic
public static void main(String args[])
Scanner sc = new Scanner(System.in);
System.out.println("Enter the values of a,b,c");
double a = sc.nextDouble();
double b = sc.nextDouble();
double c = sc.nextDouble();
double d = b*b-4*a*c;
if(d>0)
{
    double r1 = (-b+Math.pow(d,0.5))/(2*a);
    double r2 = (-b-Math.pow(d,0.5))/(2*a);
    System.out.println("Roots are" +r1 +" "+r2);
}
else if(d==0)
{
    double r =(-b)/(2*a);
    System.out.println("Root is "+r);
}
else
System.out.println("Roots are imaginary");
}
}
```

OUTPUT:

```
Enter the values of a,b,c:
1 5 6
Roots are:-2.0 -3.0
```

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.

```
import java.util.*;
class Student {
        String usn;
        String name;
        int credits[] = new int[20];
        int marks[] = new int[20];
        int gradepoints[] = new int[20];
        double name = 0;
        double denum = 0;
        double sgpa;
        int i, n;
void accept()
{
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Student details:");
        System.out.println(" Enter Student USN:");

        usn = sc.next();
        System.out.println(" Enter Student name:");
        name = sc.next();
        System.out.println(" Enter number of subjects:");
        n = sc.nextInt();

        for(i=0; i<n; i++)
        {
        System.out.println("Enter Subject"+(i+1)+"\t"+ "marks");
        marks[i] = sc.nextInt();
        System.out.println("Enter subject" + (i+1) +"\t"+"credits");
        credits[i] = sc.nextInt();
        denom += credits[i];
        }
}
}
```

```java
void calculate()
{
    for(i=0; i<n; i++)
    {
        if(marks[i] >= 90)
            gradepoints[i] = 10;
        else if(marks[i] >= 80 && marks <90)
            gradepoints[i] = 9;
        else if(marks[i] >= 70 && marks <80)
            gradepoints[i] = 8;
        else if(marks[i] >= 60 && marks < 70)
            gradepoints[i] = 7;
        else if(marks[i] >=55 && marks < 60)
            gradepoints[i] = 6;
        else if(marks[i] >=50 && marks[i] < 55)
            gradepoints[i] = 5;
        else if(marks[i] >= 40 && marks[i] < 50)
            gradepoints[i] = 4;
        else
            gradepoints[i] = 4;
        nume += (credits[i] * gradepoints[i]);
    }
    sgpa = (nume / denom);
}

void display()
{
    System.out.println("The student details :");
    System.out.println("Name :" + name + "\n" + "USN:" + usn);
    System.out.println("marks" + "\t" + "credits");
    for(i=0; i<n; i++)
    {
        System.out.println(marks[i] + "\t" + credits[i]);
    }
    System.out.println("SGPA :" + sgpa);
}
}
```

```
class StudentDemo {
    public static void main(String args[]) {
        Student s = new Student();
        s.accept();
        s.calculate();
        s.display();
    }
}
```

OUTPUT:

```
Enter Student Details
Enter Student USN
1BM21Cs129
Enter Student Name
Pooja
Enter number of Subjects
2
Enter Subject1  marks
90
Enter Subject1  credits
4
Enter Subject2  marks
80
Enter Subject2  credits
3
The Student Details
Name:    Pooja
USN:     1BM21Cs129
marks    credits90    4
80  3
SGPA:    9.571428571428571
```

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.

```java
import java.util.*;
import java.io.*;
class Book{
    String title, author;
    double price;
    int numpages;
    Book(){
        title = "Default";
        author = "default";
        price = 0.0;
        numpages = 0;
    }
    void setTitle(String t){
        title = t;
    }
    void setAuthor(String a){
        author = a;
    }
    void setPrice(String p){
        price = p;
    }
    void setPages(int np){
        numPages = np;
    }
    public String toString(){
        return title +"\t"+ author+"\t"+ price +"\t"+ numpages.
    }
}
```

```java
class BookDetails {
    public static void main(String args[]) {
        String t, a;
        double p;
        int n, np;
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the no. of books:");
        n = sc.nextInt();
        Book b[] = new Book[n];
        for(int i=0; i<n; i++) {
            System.out.println("Enter the title of the book:");
            t = sc.next();
            System.out.println("Enter the author of the book");
            a = sc.next();
            System.out.println("Enter the price of the book");
            p = sc.nextDouble();
            System.out.println("Enter the no. of pages.");
            np = sc.nextInt();
            b[i] = new Book();
            b[i].setTitle(t);
            b[i].setAuthor(a);
            b[i].setPrice(p);
            b[i].setPages(np);
        }
        System.out.println("Title \t Author \t price \t pages\n");
        for(int i=0; i<n; i++) {
            System.out.println(b[i]);
```

OUTPUT:

```
Enter the number of books
2
Enter the title of the books:
Java
Enter the author of the books:William
Enter the price of the books:
100
Enter the number of pages of the books:
48
Enter the title of the books:
Python
Enter the author of the books:
Henry
Enter the price of the books:
200
Enter the number of pages of the books:
100
Title    Author       price   pages

Java     William 100.0   48

Python  Henry    200.0    100
```

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.

```java
import java.util. * ;
abstract class Shape {
    int a, b;
    Shape (int x , int y) {
        a = x;
        b = y;
    }
    abstract double area();
}
class Triangle extends Shape {
    Triangle (int x, int y)
    {
        super (x, y);
    }
    double area()
    {
        return 0.5 * a * b;
    }
}
```

```java
class Rectangle extends Shape {
    Rectangle (int x, int y)
    {
        super (x,y);
    }
    double area()
    {
        return a*b;
    }
}
class Circle extends Shape {
    Circle (int x, int y)
    {
        super (x,y);
    }
    double area()
    {
        return 3.14 * x * y;
    }
}
class AbstractDemo
{
    public static void main(String args[])
    {
        Rectangle r = new Rectangle(10, 20);
        System.out.println (" Area of rectangle: "+ r.area());
        Circle c = new Circle (5, 5);
        System.out.println ("Area of circle: " + c.area());
        Triangle t = new Triangle (10,20);
        System.out.println("Area of triangle" + t.area());
    }
}
```

OUTPUT:

```
Area of rectangle:200.0ARea of triangle:100.0
Area of circle:78.5
```

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.

```java
import java.util.Scanner;
class Account {
    String customer_name;
    long acc_no; float bal;
    Scanner s = new Scanner(System.in);
    public void input() {
        System.out.println("Enter the customer name:");
        customer_name = s.nextLine();
        System.out.println("Enter the Account number:");
        acc_no = s.nextLong();
        System.out.print("Enter the starting amount (min. -5000)");
        bal = s.nextFloat();
        if (bal<5000)
        {
            System.out.println("\n Account balance can't be less than 5000");
            System.exit(0);
        }
    }

    public void display() {
        System.out.println("\n customer name : "+ customer_name);
        System.out.println("Account number : " + acc_no);
        System.out.println("Amount : "+ bal);
    }
}

class Savings extends Account
{
    Scanner s = new Scanner(System.in);
    float deposit, withdraw, interest;
```

```java
public void deposit()
{
System.out.println("Enter the amount to be deposited");
deposit = s.nextFloat();
bal += deposit;
System.out.println("Balance : "+Bal);
}
public void withdraw()
{
System.out.println("Enter the amount to be withdrawn");
withdraw = s.nextFloat();
boat if(bal<5000)
{
    System.out.println("Insufficient balance");
}
else
{
    bal -= withdraw;
    System.out.println("Amount withdrawn : "+withdraw+" Balance : "+bal);
}
}
public void check.bal(){
if(bal<5000)
{
system.out.println("Insufficient balance!! \n Balance: "+bal);
}
else
{
System.out.println("Interest Credited: "+(interest+" \n Balance : "+bal);
}
}
class current extends Account
{
float deposit, withdraw, penalty;
public void deposit()
{
System.out.println("enter amount to be deposited :");
deposit = s.nextFloat();
bal += deposit;
System.out.println("Balance "+bal);
}
public void check_bal()
{
    if(bal<5000)
    {
    penalty = (0.1f *bal);
    System.out.println("Initial amount balance: "+ bal);
    bal = bal-penalty;
```

```java
System.out.println("Low balance (\npenalty amount :"+penalty +"\n
                    Account balance :"+bal);
}
else
{
System.out.println("Balance :"+bal);
}
public boolean check_bal_part2()
{
    if(bal<5000)
    {
    penalty = (0.1f * bal);
    System.out.println("Initial Account Balance :"+bal);
    bal = bal - penalty;
    System.out.println("Low balance \n Penalty amount :"+penalty+
                        "\nAccountbalance :"+bal);
    return false;
    }
    return true;
}
public void withdraw()
{
    System.out.println("Enter amount to withdraw");
    withdraw = s.nextFloat();
    if(check_bal_part2())
    {
        bal-=withdraw;
        System.out.println("Amount withdrawn:"+ withdraw +
                           "\n Balance "+bal);
    }
}
Public void chequeBook()
{
    System.out.println("Cheque book has been issued");
}
}
Public class Bank
{
    Public static void main(String[] args)
    {
        Scanner s = new Scanner(System.in);
        String ch;
        int n;
        Current c = new Current();
```

```java
Savings sa = new Savings();
System.out.print("\nEnter the account type (s for savings
                  c for current): ");
ch = s.next();
switch (ch.toLowerCase())
{
  case "s": sa.input();
            do
            {
Syslem.out.print("\n1. Deposit \n2. Withdrawal \n3.Check balance
                  \n4. Check Interest \n5. Show account details
                  \n6. Exit \n Enter your choice: ");
    n = s.nextInt();
    switch(n)
    {
      case 1: sa.deposit();
              break;
      case 2: sa.withdraw();
              break;
      case 3: sa.check_bal();
              break;
      case 4: sa.interest();
              break;
      case 5: sa.display();
              break;
      case 6: System.out.println("\n Exiting transaction");
              System.exit(0);
              break;
      default: System.out.println("\nInvalid operation");
    }
  } while (true);
  case "c": c.input();
            do {
System.out.print("\n1. Deposit \n2. Withdrawal \n3. Check balance
                 \n4. Issue cheque book" +\n5. Show
                 Account details \n6. Exit transaction \n
                 Enter your choice");
    n = s.nextInt();
    switch(n)
    {
      case 1: c.deposit();
              break,
```

```java
            case 2 :  C.withdraw();
                    break;
            case 3 : C.check_bal();
                    break;
            case 4 : c.chequebook();
                    break;
            case 5 : c.display();
                    break;
            case 6 : System.out.println(" Exiting transaction");
                    System.exit(0);
                    break;
            default : System.out.println("\nInvalid Operation");
            }
        }while(true);
        default : System.out.println("Invalid choice");
                    break;
        }
    }
}
```

OUTPUT:

```
Enter the Account Type (S for Savings , C for Current) : S
Enter the Customer Name: Pooja
Enter the Account Number: 12345
Enter the Starting Amount (Minimum Amount = 5000): 6000
1. Deposit
2. Withdrawal
3. Check Balance
4. Check Interest
5. Show Account Details
6. Exit Transaction

Enter your choice: 1
Enter the amount to be deposited: 1000
Balance: 7000.01. Deposit
2. Withdrawal
3. Check Balance
4. Check Interest
5. Show Account Details
6. Exit Transaction

Enter your choice: |
```

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=father's age

```
import java.util.*;
class    Father  extends Exception{
    int  f-age;
    Father (int f-age){
        this.f-age = f-age;
    }
    public  String  toString(){
        return "Age must be a positive number";
    }
}

class  Son extends Father{
    int  s-age;
    Son (int  f-age, int s-age){
        super(f-age);
        this-s-age = s-age;
    }
    public  String  toString(){
        return "Son's age must be less than father's age";
    }
}

class myException{
    static void WrongAge (int f-age, int s-age) throws Son
    Father{
        if (f-age <= 0 || s-age <= 0)
            throw new Father(f-age);
        else if(s-age >= f-age)
            throw new Son(f-age, s-age);
    }
    static void WrongAge(int age) throws Father{
        if (age <= 0)
            throw new Father(age);
    }
```

```java
public static void main (String args[]) {
    Scanner sc = new Scanner (System.in);
    try {
        System.out.println ("Enter father age");
        int f-age = sc.nextInt():
        wrongAge (f-age);
        System.out.print ("Enter son age");
        int s-age = sc.nextInt();
        wrongAge (s.age);
        wrongAge (f-age, s-age);
        System.out.println ("No error \n " + "Son's age" + s-age
            "\n" + "Father's age" + f-age);
    }
    catch (son s) {
        System.out.println (" \n Error!!: "+ s);
    }
    catch (Father f) {
        System.out.println (" \n Error!!: "+ f );
    }
}
}
```

OUTPUT:

```
Enter father age
40
Enter son age
50
Error!!!: Son's age must be less than father's age
```

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.

```
create NewThread implements Runnable {
    String name;
    Thread t;
    NewThread (String name) {
        this. name = name;
        t = new Thread (this, name);
        t.start ();
    }
    public void run() {
        if (name .equals ("BMS college of Engineering") {
            try {
                for (int i = 5; i > 0; i--) {
                    System.out. println (name +"\n");
                    Thread. sleep (10000);  }
            } catch (InterruptedException e) {
                System.out. printh ("caught:" + e);
            }
            System.out. println (name +"exiting");
        }
        else if (name. equals(" CSE ") {
            try {
                for (int i=5; i>0; i--) {
                    System. out. println (name+ "\n");
                    Thread. sleep (2000);
                }
            } catch (Interrupted Exception e) {
                System.out. println(" Caught :' + e );
            }
        }
```

```java
        System.out.println (name + "exiting");
    }
}

class    MainThread {
    public static void main(String args[]) {
        new   NewThread ("BMS college of Engineering");
        new   NewThread ("CSE");
        try {
            Thread.sleep (50000);
        } catch (InterruptedException e) {
            System.out.println (" Caught:" +e);
        }
        System.out.println ("Main thread exiting");
    }
}
```

OUTPUT:

```
CSE
CSE
CSE
CSE
BMSCE
CSE
BMSCE
BMSCE
BMSCE
BMSCE
```

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.

```
import java.util.InputMismatch Exception;
import java.util.Scanner;

interface z
{
    void int calc(int a, int b);
}
class Y implements z
{
    public int calc(int a, int b)
    {
        int c = a/b;
        return c;
    }
}
public class Try-1
{
    public static void main (string args[])
    {
        Scanner sc=new Scanner(System.in);
        Y  y=new Y();
        int num1, num2;
        try {
            System.out.println ("Enter 2 numbers:");
            num1 = sc.nextInt();
            num2 = sc.nextInt();
            int c = y.calc(num1, num2);
            System.out.println ("Quotient:" + c);
        }
        catch (ArithmeticException  InputMismatchException e)
        {
            System.out.println("Exception:" + e);
        }
    }
}
```

OUTPUT:

```
Enter the two numbers:
2 0
Exception: java.lang.ArithmeticException: / by zero
```