

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“JnanaSangama”, Belgaum -590014, Karnataka.



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



B.M.S. COLLEGE OF ENGINEERING

(Autonomous Institution under VTU)

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Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “**OOJ Lab**” carried out by **MAHAVIR NAHATA(1BM21CS100)**, who is a 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 Data structures Lab - () work prescribed for the said degree.

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| 2 | 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. | 7-10 |
| 3 | 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 | 11-13 |

| | | |
|---|---|-------|
| | the area of the given shape. | |
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| | | |
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| | | |

Course Outcome :

| | |
|-----|--|
| CO1 | Apply the concept of linear and nonlinear data structures. |
| CO2 | Analyze data structure operations for a given problem. |
| CO3 | Design and develop solutions using Data Structure concepts. |
| CO4 | Conduct practical experiments for demonstrating the operations of different data structures. |

LAB PROGRAM 1:

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

Program code:

```
import java.util.Scanner;

class qe {

    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;

        d=(b*b)-(4*a*c);

        double r1,r2;

        if(a==0)

        {

            System.out.println("Invaild Input");

        }

        else if(d>0)

        {

            System.out.println("Roots are Real and Unique");

            r1=(-b+Math.sqrt(d))/(2*a);

            r2=(-b-Math.sqrt(d))/(2*a);

            System.out.println("Root 1: "+r1);

            System.out.println("Root 2: "+r2);

        }

        else if(d==0)

        {
```

```
        System.out.println("Roots are Real and Equal");

        r1=(-b/(2*a));

        r2=(-b/(2*a));

        System.out.println("Root 1:"+r1);

        System.out.println("Root 2:"+r2);

    }

    else

    {

        System.out.println("Roots are Imaginary");

        r1=(-b/(2*a));

        r2=(Math.sqrt(-d)/(2*a));

        System.out.println("Root 1:"+r1+"+i"+r2);

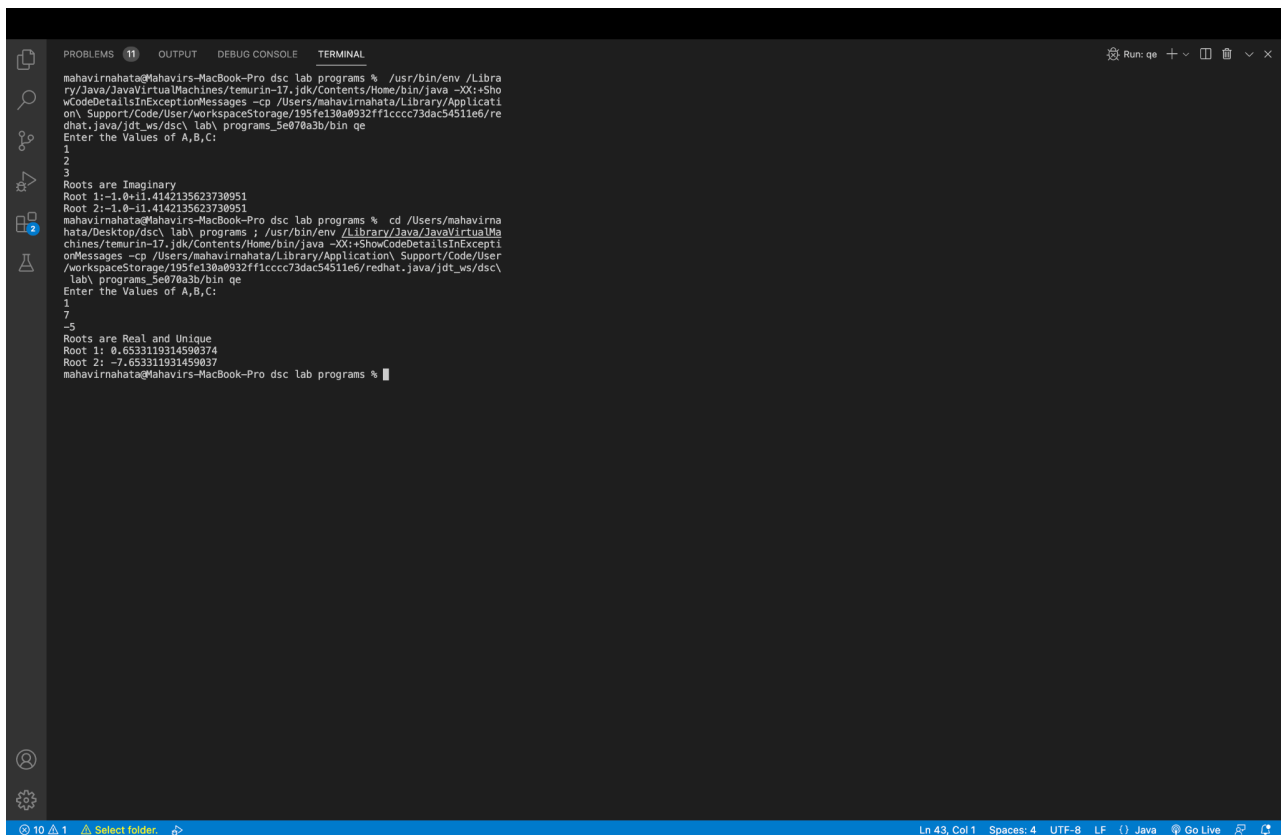
        System.out.println("Root 2:"+r1+"-i"+r2);

    }

}

}
```

Output:



```
mahavirahata@Mahavirs-MacBook-Pro dsc lab programs % /usr/bin/env /Library/Java/JavaVirtualMachines/temurin-17.jdk/Contents/Home/bin/java -Xx:ShowCodeDetailsInExceptionMessages -cp /Users/mahavirahata/Library/Application\ Support/Code/User/workspaceStorage/195fe138a0932ff1cccc73dac54511e6/redhat.java/jdt_ws/dsc\ lab\ programs_5e078a3b/bin qe
Enter the Values of A,B,C:
1
2
3
Roots are Imaginary
Root 1: -1.0+11.4142135623730951i
Root 2: -1.0-11.4142135623730951i
mahavirahata@Mahavirs-MacBook-Pro dsc lab programs % cd /Users/mahavirahata/Desktop/dsc\ lab\ programs ; /usr/bin/env /Library/Java/JavaVirtualMachines/temurin-17.jdk/Contents/Home/bin/java -Xx:ShowCodeDetailsInExceptionMessages -cp /Users/mahavirahata/Library/Application\ Support/Code/User/workspaceStorage/195fe138a0932ff1cccc73dac54511e6/redhat.java/jdt_ws/dsc\ lab\ programs_5e078a3b/bin qe
Enter the Values of A,B,C:
1
2
3
Roots are Real and Unique
Root 1: 0.6533119314590374
Root 2: -7.653311931459037
mahavirahata@Mahavirs-MacBook-Pro dsc lab programs %
```

LAB PROGRAM 2:

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:

Program code:

```
import java.util.Scanner;
```

```
import java.lang.*;
```

```
class Book1 {
```

```
    String name;
```

```
    String author;
```



```
float price;

Integer pages;

Book1(String n,String a,float p,Integer pa) {

    name=n;

    author=a;

    price=p;

    pages=pa;

}

void display() {

    System.out.println("Name : "+name);

    System.out.println("Author : "+author);

    String pricee=Float.toString(price);

    System.out.println("Price : "+pricee);

    System.out.println("Pages : "+pages.toString());

}

}
```

```
class book {

    public static void main(String args[])

    {

        int n;

        String name;

        String author;

        float price;

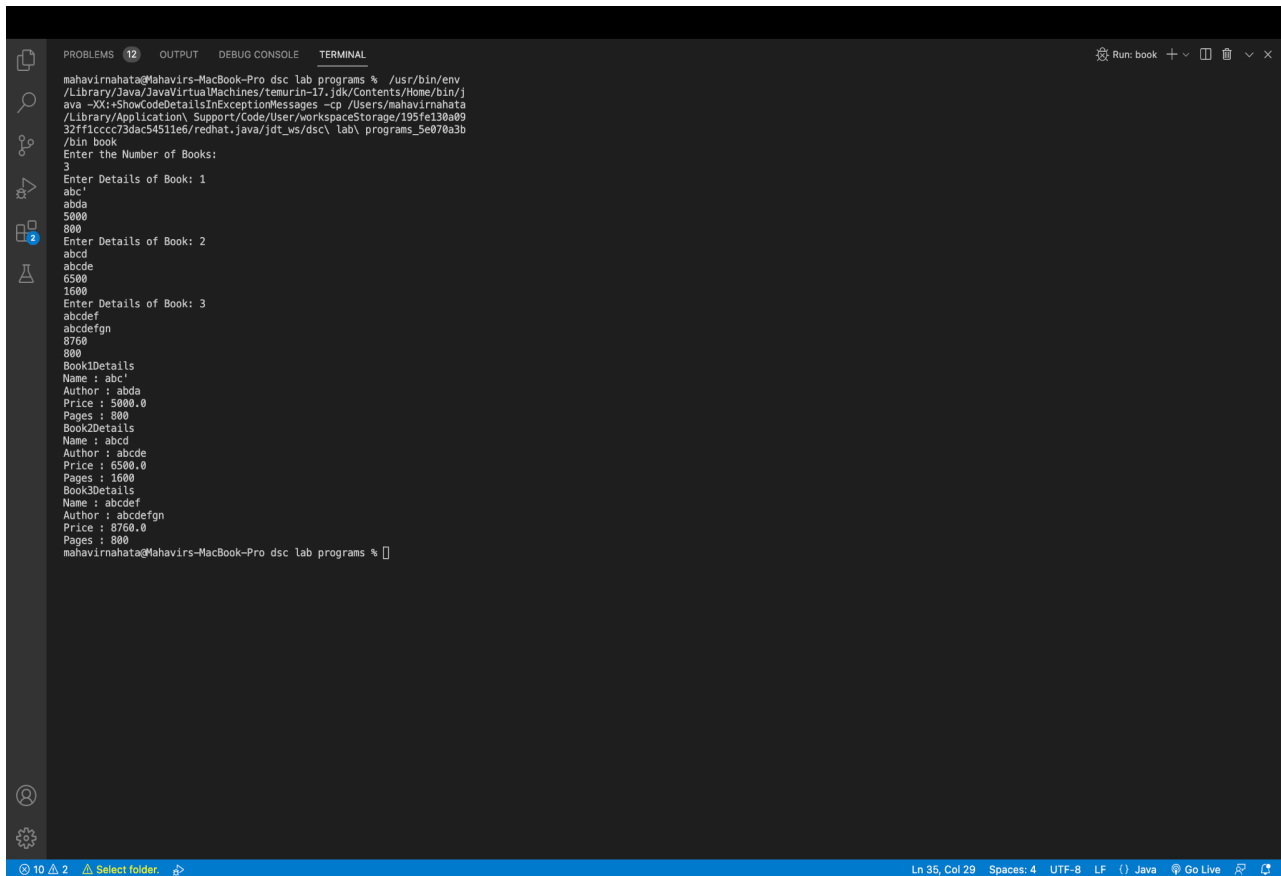
        Integer pages;
```

```

System.out.println("Enter the Number of Books: ");
Scanner sc=new Scanner(System.in);
n=sc.nextInt();
Book1[] arr;
arr = new Book1[n];
for(int i=0;i<n;i++)
{
    System.out.println("Enter Details of Book: "+(i+1));
    name=sc.next();
    author=sc.next();
    price=sc.nextFloat();
    pages=sc.nextInt();
    arr[i]=new Book1(name,author,price,pages);
}
for(int i=0;i<n;i++)
{
    System.out.println("Book"+(i+1)+"Details");
    arr[i].display();
}
}
}

```

Outputs:



```
mahavirnahata@Mahavirs-MacBook-Pro dsc lab programs % /usr/bin/env
/Library/Java/JavaVirtualMachines/temurin-17.jdk/Contents/Home/bin/j
ava -XX:+ShowCodeDetailsInExceptionMessages -cp /Users/mahavirnahata
/Library/Application\ Support/Code/User/workspaceStorage/195fe130a08
32ff1cccc73dac54511e6/redhat.java/jdt_ws/dsc\ lab\ programs_5e070a3b
/bin/book
Enter the Number of Books:
3
Enter Details of Book: 1
abc'
abda
5000
800
Enter Details of Book: 2
abcd
abcde
6500
1600
Enter Details of Book: 3
abcdef
abcdefgn
8760
800
Book1Details
Name : abc'
Author : abda
Price : 5000.0
Pages : 800
Book2Details
Name : abcd
Author : abcde
Price : 6500.0
Pages : 1600
Book3Details
Name : abcdef
Author : abcdefgn
Price : 8760.0
Pages : 800
mahavirnahata@Mahavirs-MacBook-Pro dsc lab programs %
```

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LAB PROGRAM 3:

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:

Program code:

```
import java.util.*;

abstract class Shape
{
```

```
Scanner sc=new Scanner(System.in);

abstract void printArea();
}

class Rectangle extends Shape
{
    void printArea()
    {
        int l,b;

        System.out.println("Area of Rectangle");

        System.out.println("Enter Lenght and Breadth");

        l=sc.nextInt();

        b=sc.nextInt();

        double area=l*b;

        System.out.println("Area of Rectangle="+ " "+area);
    }
}

class Triangle extends Shape
{
    void printArea()
    {
        int b,h;

        System.out.println("Area of Triangle");

        System.out.println("Enter Base and Height");

        b=sc.nextInt();

        h=sc.nextInt();

        double area=(b*h)/2;

        System.out.println("Area of Triangle="+ " "+area);
    }
}

class Circle extends Shape
```

```

{
    void printArea()
    {
        int r;

        System.out.println("Area of Circle");

        System.out.println("Enter Radius");

        r=sc.nextInt();

        double area=3.14*r*r;

        System.out.println("Area of Circle="+ " "+area);
    }
}

class curves {

    public static void main(String ars[])
    {
        Rectangle rec=new Rectangle();

        rec.printArea();

        Triangle tri=new Triangle();

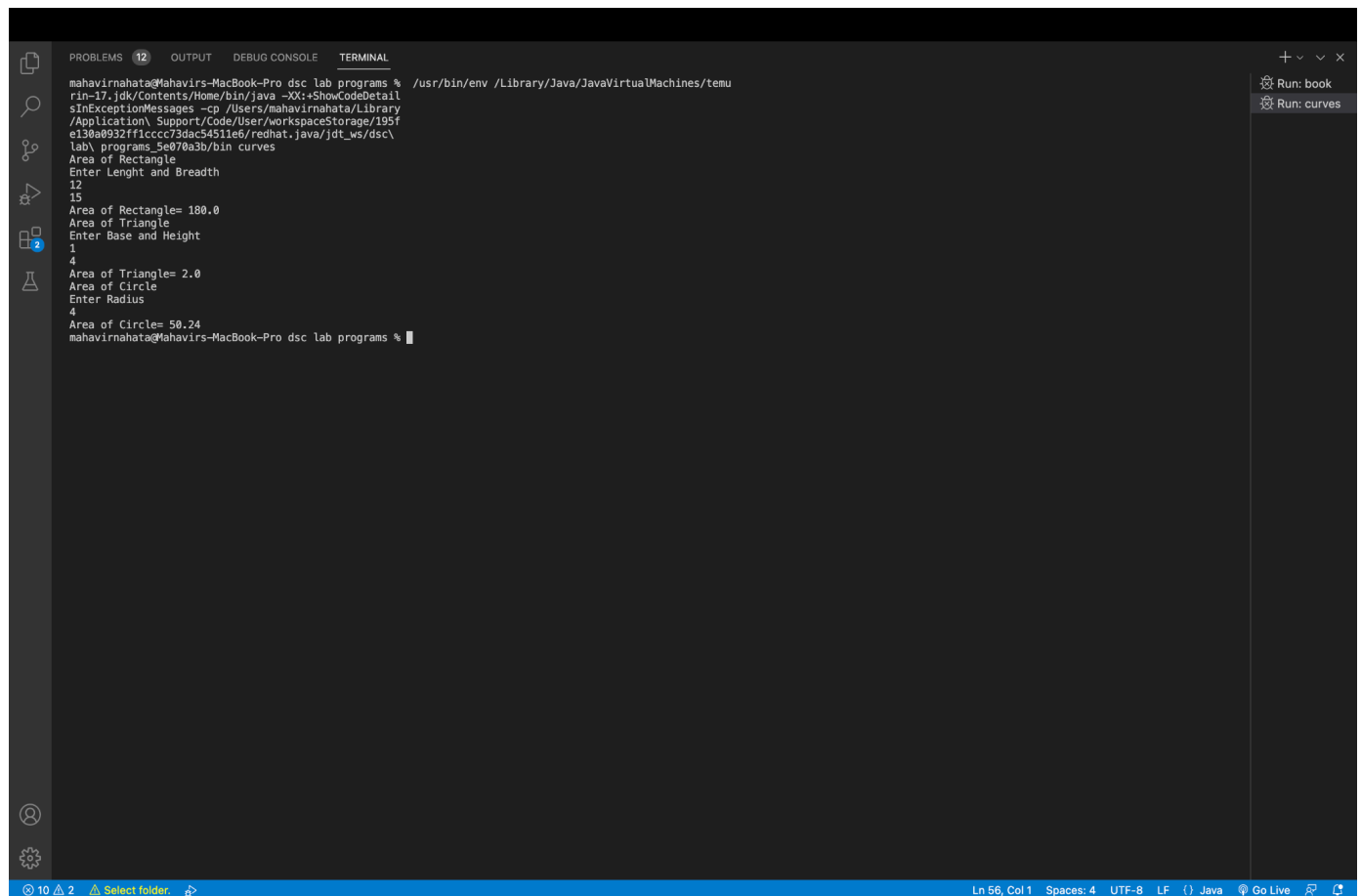
        tri.printArea();

        Circle cir=new Circle();

        cir.printArea();
    }
}

```

Outputs:



The screenshot shows an IDE terminal window with the following content:

```
mahavirnahata@Mahavirs-MacBook-Pro dsc lab programs % /usr/bin/env ./Library/Java/JavaVirtualMachines/temu
rin-17.jdk/Contents/Home/bin/java -Xt:ShowCodeDetail
sInExceptionMessages -cp /Users/mahavirnahata/Library
/Application\ Support/Code/User/workspaceStorage/195f
e138a0932ff1ccccc73dac54511e6/redhat.java/jdt_ws/dsc\
lab\ programs_5e070a3b/bin curves
Area of Rectangle
Enter Lenght and Breadth
12
15
Area of Rectangle= 180.0
Area of Triangle
Enter Base and Height
1
4
Area of Triangle= 2.0
Area of Circle
Enter Radius
4
Area of Circle= 50.24
mahavirnahata@Mahavirs-MacBook-Pro dsc lab programs %
```

On the right side of the terminal, there are two buttons: "Run: book" and "Run: curves". The status bar at the bottom indicates "Ln 56, Col 1", "Spaces: 4", "UTF-8", "LF", "Java", and "Go Live".

LAB PROGRAM 4:

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:

Program code:

```
import java.util.Scanner;
```

```
class Account {
```

```
    String customerName;
```

```
    String accType;
```

```
    int accNum;
```

```
    double balance = 1000;
```

```
    void deposit(int amount) {
```

```
        balance += amount;
```

```
    }
```

```
    void displayBalance() {
```

```
        System.out.println("The balance in the account is : " + balance);
```

```
    }
```

```
}
```

```
class SavAcct extends Account {  
  
    int n = 4;  
  
    double r = 0.07;  
  
    void interest(double y) {  
  
        double x = balance;  
  
        balance = balance * Math.pow((1 + r / n), (y * n));  
  
        System.out.println("An amount of " + (balance - x) + " has been deposited as interest");  
    }  
  
    void withdrawal(int amount) {  
  
        if (balance >= amount) {  
  
            balance -= amount;  
  
        } else {  
  
            System.out.println("You dont have the sufficient balance");  
  
        }  
    }  
}
```

```
class CurrAcct extends Account {  
  
    int minBalance = 1000, penalty = 7;  
  
    void withdrawal(int amount) {  
  
        if (balance <= minBalance) {  
  
            balance -= penalty;  
  
            System.out.println("A penalty of 7 rupees has been imposed!");  
  
        }  
    }  
}
```



```

        System.out.println("Enter the amount to be withdrawn : ");

        int amt = sc.nextInt();

        act.withdrawal(amt);

        break;

    case 3:

        System.out.println("Enter the duration in years : ");

        double y = sc.nextDouble();

        act.interest(y);

        break;

    case 4:

        act.displayBalance();

        break;

    default:

        System.out.println("Enter a valid choice!");

        break;

    }

}

}

```

```

else if (choice == 2) {

    CurrAcct act = new CurrAcct();

    while (true) {

        System.out.println(

            "Enter the transactions you would like to do :\n1 Deposit via chequebook\n2
Withdraw via chequebook\n3 Display Balance: ");

        choice = sc.nextInt();

        switch (choice) {

            case 1:

```

```
        System.out.println("Enter the amount to be deposited : ");

        int amount = sc.nextInt();

        if (amount < act.minBalance) {

            act.balance -= act.penalty;

            System.out.println("A penalty of 7 rupees has been imposed!");

        }

        act.deposit(amount);

        break;

    case 2:

        System.out.println("Enter the amount to be withdrawn : ");

        int amt = sc.nextInt();

        act.withdrawal(amt);

        break;

    case 3:

        act.displayBalance();

        break;

    default:

        System.out.println("Enter a valid choice!");

        break;

    }

}

}

}

else {

    System.out.println("Enter a valid choice!");

    System.exit(0);

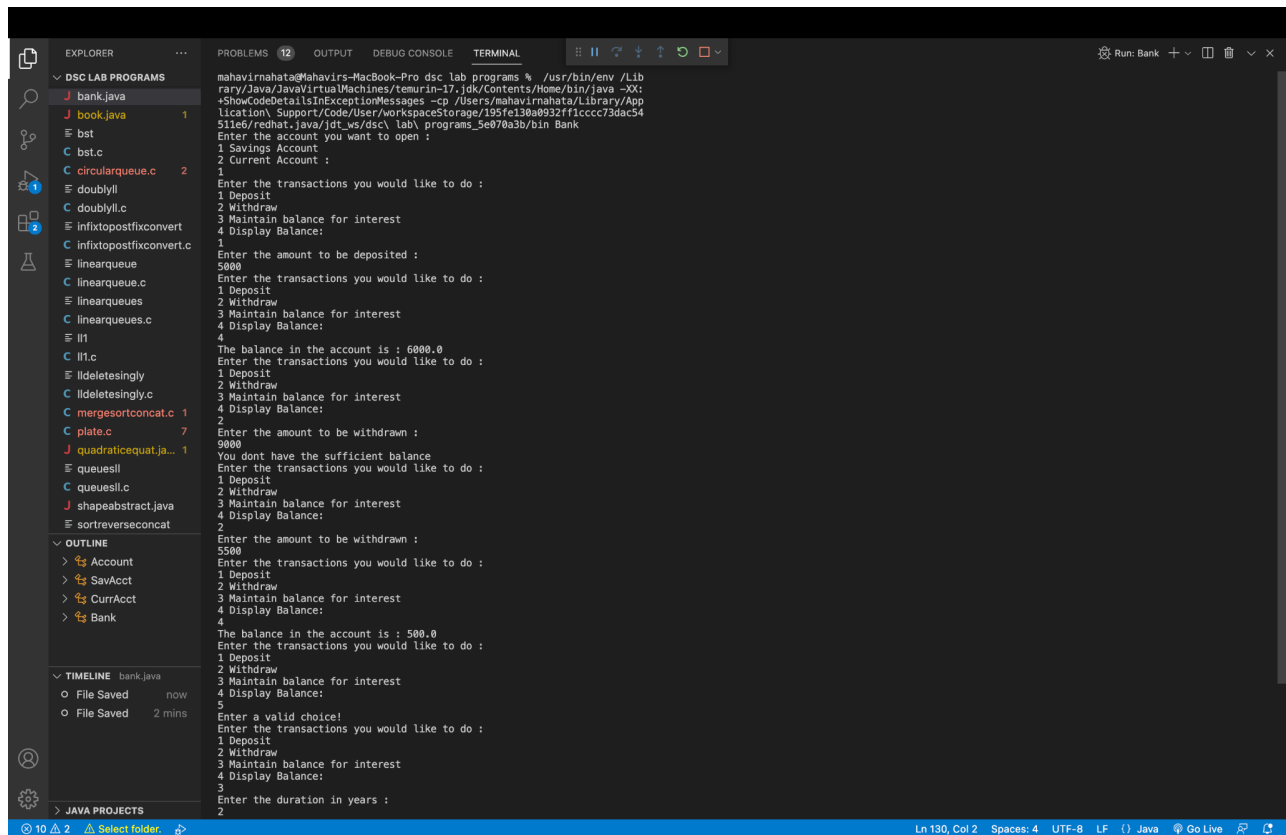
}

sc.close();
```

```
}  
  
}
```

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Outputs:



```
mahavirahata@Mahavirs-MacBook-Pro dsc lab programs % /usr/bin/env /Library/Java/JavaVirtualMachines/temurin-17.jdk/Contents/Home/bin/java -XX:+ShowCodeDetailsInExceptionMessages -cp /Users/mahavirahata/Library/Application\ Support/Code/User/workspaceStorage/193fe138a0932ff1cccc73dac54511e6/redhat.java/jdt_ws/dsc\ lab\ programs_5e070a3b/bin Bank  
Enter the account you want to open :  
1 Savings Account  
2 Current Account :  
1  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
1  
Enter the amount to be deposited :  
5000  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
4  
The balance in the account is : 6000.0  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
2  
Enter the amount to be withdrawn :  
9000  
You dont have the sufficient balance  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
2  
Enter the amount to be withdrawn :  
5500  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
5  
Enter a valid choice!  
Enter the transactions you would like to do :  
1 Deposit  
2 Withdraw  
3 Maintain balance for interest  
4 Display Balance:  
3  
Enter the duration in years :  
2
```

```
1
Enter the amount to be deposited :
5000
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
4
The balance in the account is : 6000.0
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
2
Enter the amount to be withdrawn :
9000
You dont have the sufficient balance
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
2
Enter the amount to be withdrawn :
5500
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
4
The balance in the account is : 500.0
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
5
Enter a valid choice!
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
3
Enter the duration in years :
2
An amount of 74.4408914779641 has been deposited as interest
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
4
The balance in the account is : 574.4408914779641
Enter the transactions you would like to do :
1 Deposit
2 Withdraw
3 Maintain balance for interest
4 Display Balance:
```

```
Enter the account you want to open :
1 Savings Account
2 Current Account :
2
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
1
Enter the amount to be deposited :
45000
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
2
Enter the amount to be withdrawn :
78000
You dont have the sufficient balance
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
2
Enter the amount to be withdrawn :
19000
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
3
The balance in the account is : 27000.0
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
2
Enter the amount to be withdrawn :
25000
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
3
The balance in the account is : 2000.0
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
1
Enter the amount to be deposited :
98000
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
3
The balance in the account is : 100000.0
Enter the transactions you would like to do :
1 Deposit via chequebook
2 Withdraw via chequebook
3 Display Balance:
```

LAB PROGRAM 5:

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:

Program code:

```
class MyException
extends Exception {

    private int detail;

    MyException(int a) {

        detail = a;

    }

    public String toString() {

        return "MyException[" + detail + "
user defined Exception" + "];"

    }
```

```
}
```

```
class ExceptionDemo {
```

```
    static void compute(int a) throws  
    MyException
```

```
{
```

```
    System.out.println("Called  
compute(" + a + ") ");
```

```
    if(a > 10)
```

```
        throw new MyException(a);
```

```
    System.out.println("Normal exit");
```

```
}
```

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

```
{
```

```
    try {
```

```
        compute(1);
```

```
compute(20);
```

```
}
```

```
catch (MyException e)
```

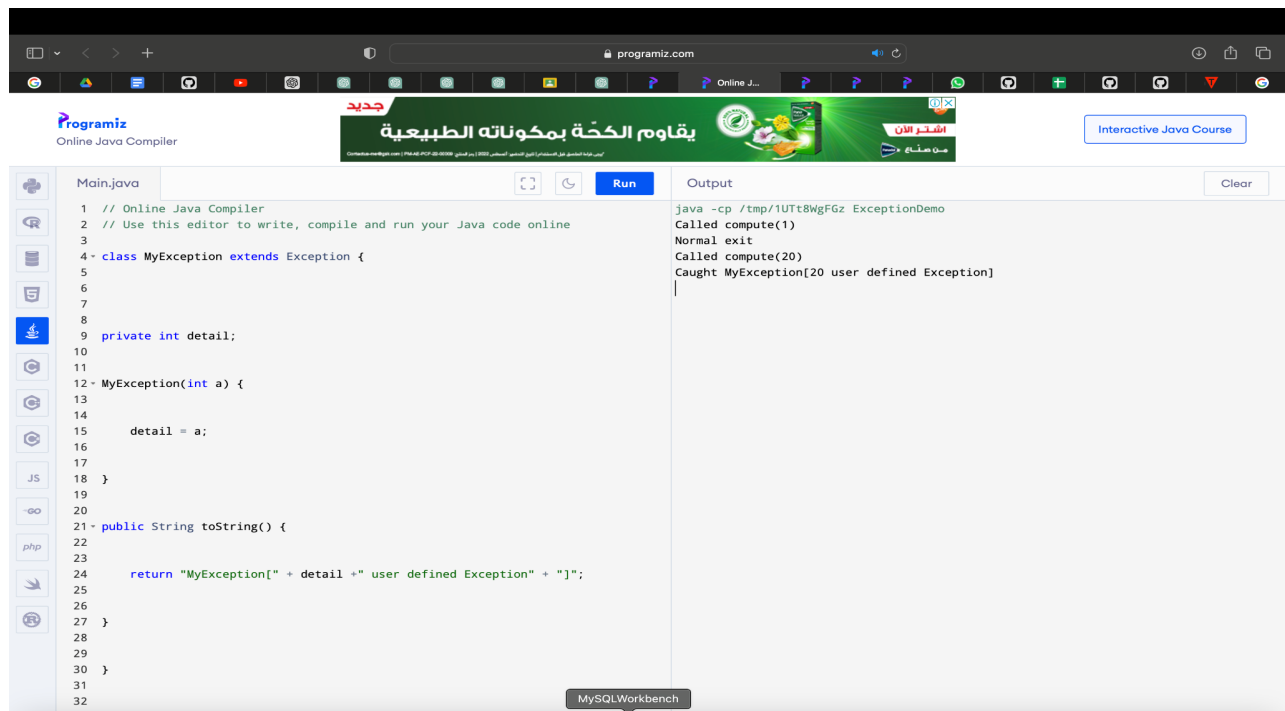
```
{
```

```
System.out.println("Caught "+e);
```

```
}
```

```
}
```

```
}
```

LAB PROGRAM 6:

```
import
java.util
Scanner
r;
```

```
class IllogicalAgeException extends Exception {
```

```
    private String message;
```

```
    IllogicalAgeException(String error_text) {
```

```

        this.message = error_text;

    }

    @Override

    public String toString() {

        return "IllogicalAgeException: " +
this.message;

    }

}

class Father {

    private int age;

    Father(int age) throws IllogicalAgeException
    {

        if(age < 0)

            throw new IllogicalAgeException("Age
is negative");

        this.age = age;

    }

    int getAge() {return this.age;}

```

```
}
```

```
class Son extends Father{

    private int age;

    Son(int age_son, int age_father) throws
    IllogicalAgeException {

        super(age_father);

        if(age_son < 0)

            throw new IllogicalAgeException("Age
is negative");

        if(age_son >= age_father)

            throw new IllogicalAgeException("Age
of son is greater than or equal to father");

        this.age = age_son;

    }

    int getAge() {return this.age;}

    int getParentAge() {return super.getAge();}

}
```

```
class Main {
```

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

            Scanner sc = new Scanner(System.in);

            System.out.println("Enter the age of son
            and father:");

            Son son = new Son(sc.nextInt(),
            sc.nextInt());

            System.out.println("Age of father is: "
            + son.getParentAge());

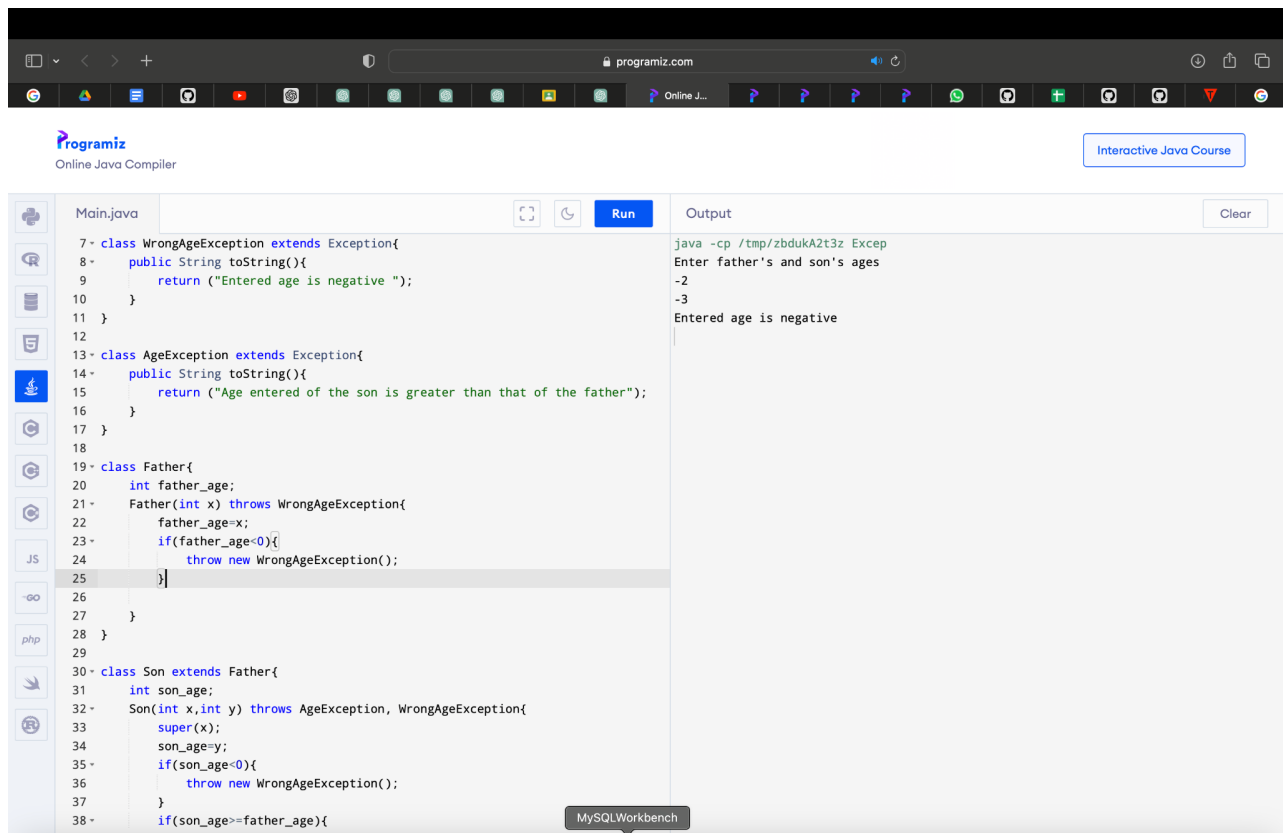
            System.out.println("Age of son is: " +
            son.getAge());

            sc.close();

        }

    }
```

Output::



LAB PROGRAM 7:

class Call

implements Runnable

{

String a;

int x,time;

Thread t;

Call(String tn,int ti,int ex)

```
{
```

```
    a=tn;
```

```
    x=ex;
```

```
    time=ti;
```

```
    t=new Thread(this,a);
```

```
    t.start();
```

```
}
```

```
public void run()
```

```
{
```

```
    try{
```

```
        for(int i=0;i<x      ;i++)
```

```
        {
```

```
            System.out.println(a);
```

```

        Thread.sleep(time);

    }

}

catch (InterruptedException ie)

{

    System.out.println("Inturrupted ");

}

}

}

```

```

class Lab8

{

    public static void main(String xx[])

```

```
{  
  
    new Call("BMS College of  
Enginnering",10000,2);  
  
    new Call("CSE",2000,10);  
  
}  
  
}
```
