

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
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Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “**Object Oriented Java Programming**” carried out by **LIKHITH G S (1BM21CS096)**, 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 Data structures 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	Analyze 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.

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 discriminant b^2-4ac is negative, display a message stating that there are no real solutions.

CODE:

```
import java.util.*;

class quadratic
{
    public static void main(String args[])
    {
        int d,a,b,c;
        double r1,r2;
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter the coefficient of x^2 ");
        a=sc.nextInt();
        System.out.println("Enter the coefficient of x ");
        b=sc.nextInt();
        System.out.println("Enter the constant ");
        c=sc.nextInt();
        d=b*b-4*a*c;
        if(a==0)
        {
            System.out.println("Invalid inputs");
        }
        else
```

```

{
    if(d>0)
    {
        System.out.println("The roots are real and distinct");
        r1=(-b-Math.sqrt(d))/(2*a);
        r2=(-b+Math.sqrt(d))/(2*a);
        System.out.println("The roots are "+ r1 +" " +r2);
    }
    if(d<0)
    {
        System.out.println("The roots are imaginary");
        r1=-b/(2*a);
        r2=Math.abs(d)/(2*a);
        System.out.println("The roots are "+ r1+" "+" i"+r2 +" "+r1+" -"+" i"+r2);
    }
    if(d==0)
    {
        System.out.println("The roots are real and equal");
        r1=r2=-b/(2*a);
        System.out.println("The roots are "+ r1 +" " +r2);
    }
}
}
}
}

```

OUTPUT:

```
C:\Program Files\Java\jdk1.8.0_201\bin\Likhith>java quadratic
Enter the coefficient of x^2
1
Enter the coefficient of x
-4
Enter the constant
4
The roots are real and equal
The roots are 2.0 2.0

C:\Program Files\Java\jdk1.8.0_201\bin\Likhith>java quadratic
Enter the coefficient of x^2
1
Enter the coefficient of x
3
Enter the constant
1
The roots are real and distinct
The roots are -2.618033988749895 -0.3819660112501051

C:\Program Files\Java\jdk1.8.0_201\bin\Likhith>java quadratic
Enter the coefficient of x^2
2
Enter the coefficient of x
1
Enter the constant
2
The roots are imaginary
The roots are 0.0i3.0 0.0-i3.0
```

LAB PROGRAM 2:

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.

CODE:

```
import java.util.*;

class student
{
    String usn , name;

    int credits[] = new int[20];

    double marks[] = new double[20];

    double cie[] = new double[20];

    double see[] = new double[20];

    int n;

    String subject_name[] = new String[30];

    double sgpa;

    void accept()
    {
        Scanner sc = new Scanner(System.in);

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

        name=sc.nextLine();

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

        usn=sc.nextLine();

        System.out.println("Enter the number of subjects");
```

```
n=sc.nextInt();

System.out.println("Enter the subject names");
for(int i=0;i<n;i++)
{
    subject_name[i]=sc.next();
}

System.out.println("Enter the credits in order");
for(int i=0;i<n;i++)
{
    credits[i]=sc.nextInt();
}

System.out.println("Enter the CIE marks in order");
for(int i=0;i<n;i++)
{
    cie[i]=sc.nextDouble();
}

System.out.println("Enter the SEE marks in order");
for(int i=0;i<n;i++)
{
    see[i]=sc.nextDouble();

    marks[i] = (see[i]/2) + cie[i] ;
```



```
}  
}
```

```
int check_grade( double cie , double see ,double marks)
```

```
{  
    if(cie<20)  
        return 0;  
    else if(see<40)  
        return 0;  
    else  
    {  
        if( marks>=90 && marks<=100)  
            return 10;  
        if( marks>=80 && marks<90)  
            return 9;  
        if( marks>=70 && marks<80)  
            return 8;  
        if( marks>=60 && marks<70)  
            return 7;  
        if( marks>=55 && marks<60)  
            return 6;  
        if( marks>=50 && marks<55)
```

```
    return 5;

    if( marks>=40 && marks<50)

        return 4;

    else

        return 0;

    }

}
```

```
double calculate()

{

    int total_credits=0;

    int sum=0;

    for(int i=0;i<n;i++)

    {

        sum+= check_grade(cie[i],see[i],marks[i]) * credits[i];

        total_credits+=credits[i];

    }

    sgpa = (double)sum/total_credits;

    return sgpa;

}
```

```

void display()

{

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

    System.out.println("USN: " +usn);

    System.out.println("Subject_name \t Credits CIE marks \t SEE marks \t TOTAL marks \to Grade
points");

    for(int i=0;i<n;i++)

    {

        System.out.println(subject_name[i] +"\t"+ credits[i] + "\t"+ cie[i] + "\t" + see[i] + "\t" + marks[i]
+ "\t" + check_grade(cie[i],see[i],marks[i]) );

    }

    System.out.println("SGPA = " +cgpa);

}

}

class run

{

    public static void main(String args[])

    {

        student ob = new student();

        ob.accept();

        ob.calculate();

```

```

ob.display();

}

}

```

OUTPUT:

```

1BM21CS096_OOJ-main — -zsh — 113x36
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % javac sgpa.java
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java run
Enter your name
Likhith
Enter your USN
1BM21CS096
Enter the number of subjects
9
Enter the subject names
CDE Chem ChemLab BEC EME PSP CPL SFH Eng
Enter the credits in order
3 4 1 3 3 3 1 1 1
Enter the CIE marks in order
49 46 46 48 38 48 50 44 42
Enter the SEE marks in order
100 79 43 78 90 64 94 91 78
Name: Likhith
USN: 1BM21CS096

```

Subject_name	Credits	CIE marks	SEE marks	TOTAL marks	Grade points
CDE	3	49.0	100.0	99.0	10
Chem	4	46.0	79.0	85.5	9
ChemLab	1	46.0	43.0	67.5	7
BEC	3	48.0	78.0	87.0	9
EME	3	38.0	90.0	83.0	9
PSP	3	48.0	64.0	80.0	9
CPL	1	50.0	94.0	97.0	10
SFH	1	44.0	91.0	89.5	9
Eng	1	42.0	78.0	81.0	9

```

SGPA = 9.1
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main %

```

LAB PROGRAM 3:

Create a class Book which contains four members: name, author, price, num_pages. Include a constructor to set the values for the members. Include methods to set and get the details of the objects. Include a toString() method that could display the complete details of the book. Develop a Java program to create n book objects.

CODE:

```
import java.util.*;

class book
{
    String name , author;

    double price;

    int num_pages;

    book()
    {
        name="x";
        author="y";
        price=0.0;
        num_pages=0;
    }

    void get()
    {
        Scanner sc = new Scanner(System.in);

        System.out.println("Enter the name of the Book:");
```

```

name=sc.nextLine();

System.out.println("Enter the name of the author:");

author=sc.nextLine();

System.out.println("Enter the price of the book:");

price=sc.nextDouble();

System.out.println("Enter the number of pages:");

num_pages=sc.nextInt();

}

public String toString() {

    String str = "Book name:"+name+"\n"+"Author name:"+author +"\n" +"Book Price:"+price
    +"\n" + "Number of pages:"+num_pages ;

    return str;

}}

class run{

    public static void main(String args[])

    {

        Scanner sc = new Scanner(System.in);

        System.out.println("Enter the number of books");

        int n=sc.nextInt();

        book ob[]=new book[n];

        for(int i=0;i<n;i++)

        {

            ob[i]= new book(); //creating a object for every element of array -- so array of objects

            System.out.println("Enter the details of " + "book " + (i+1));

```

```

    ob[i].get();

}

for(int i=0;i<n;i++)

{

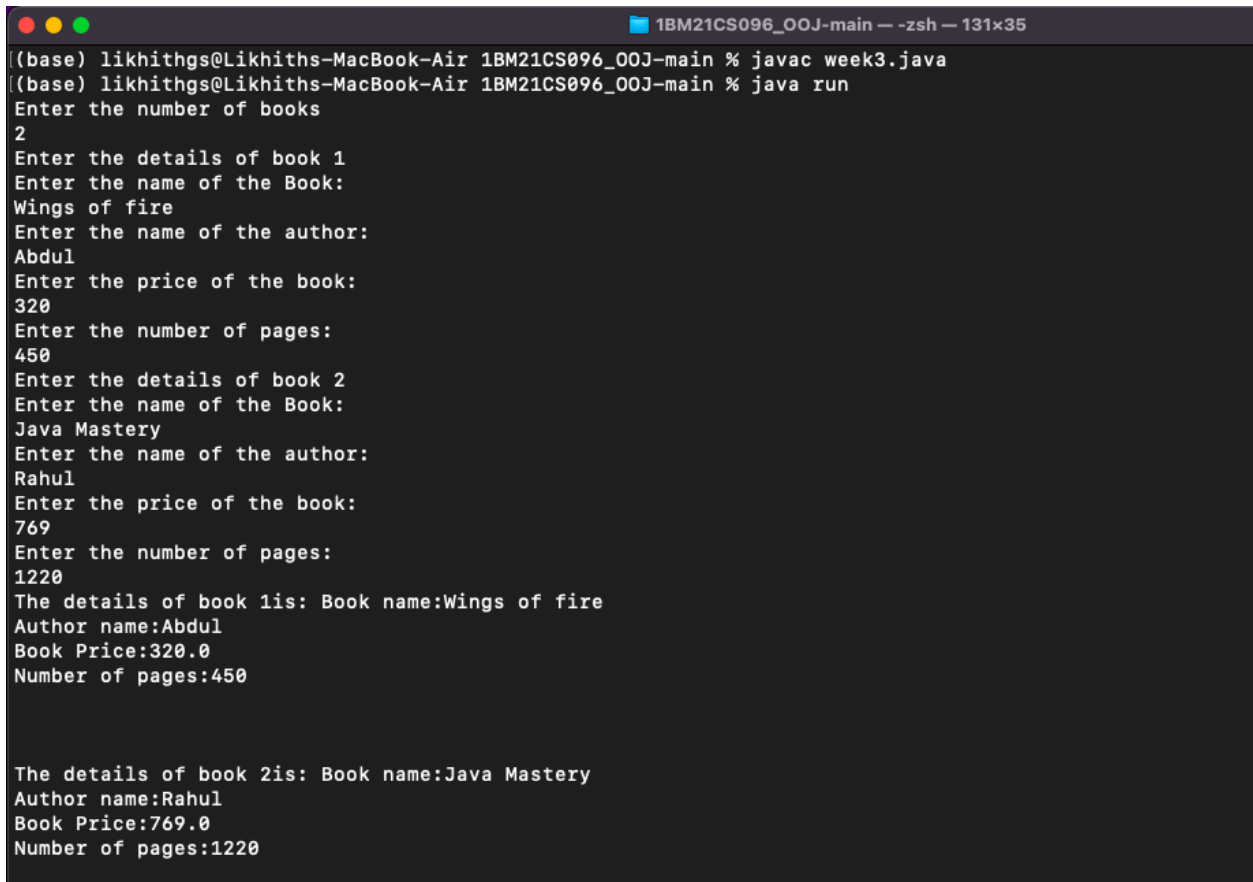
    System.out.println("The details of " + "book " + (i+1) + "is: " + ob[i]); //toString will be invoked
    when the object is called

    System.out.println("\n" + "\n");

}
}
}

```

OUTPUT:



```

1BM21CS096_OOJ-main — zsh — 131x35
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % javac week3.java
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java run
Enter the number of books
2
Enter the details of book 1
Enter the name of the Book:
Wings of fire
Enter the name of the author:
Abdul
Enter the price of the book:
320
Enter the number of pages:
450
Enter the details of book 2
Enter the name of the Book:
Java Mastery
Enter the name of the author:
Rahul
Enter the price of the book:
769
Enter the number of pages:
1220
The details of book 1is: Book name:Wings of fire
Author name:Abdul
Book Price:320.0
Number of pages:450

The details of book 2is: Book name:Java Mastery
Author name:Rahul
Book Price:769.0
Number of pages:1220

```

LAB PROGRAM 4:

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

CODE:

```
import java.util.*;

abstract class shape{

    double a,b;

    shape(int x,int y)

    {

        a=x;

        b=y;

    }

    abstract double printarea();

}

class Rectangle extends shape{

    Rectangle(int x,int y)

    {

        super(x,y);

    }

    double printarea()

    {
```



```
        return a*b;  
    }  
}
```

```
class triangle extends shape{  
    triangle(int x,int y)  
    {  
        super(x,y);  
    }  
    double printarea()  
    {  
        return 0.5*(a*b);  
    }  
}
```

```
class circle extends shape{  
    circle (int x,int y)  
    {  
        super(x,-1);  
    }  
    double printarea(){
```

```

    return Math.PI *a*a;
}
}

class abst1{

    public static void main(String args[])

    {

        Scanner sc = new Scanner(System.in);

        System.out.println("Enter 1 for Rectangle \n Enter 2 for Triangle \n Enter 3 for
Circle\n");

        int ch = sc.nextInt();

        switch(ch)

        {

            case 1: System.out.println("Enter the length and breadth");

                int l = sc.nextInt();

                int b = sc.nextInt();

                Rectangle r1=new Rectangle(l,b);

                shape s;

                s=r1;

                double a1=s.printarea();

                System.out.println("area of Rectangle is"+" "+a1);

                break;


            case 2: System.out.println("Enter the base and height");

```

```
        int base = sc.nextInt();

        int height = sc.nextInt();

        triangle t1 = new triangle(base , height);

s=t1;

a1=s.printarea();

System.out.println("area of triangle is"+" "+a1);

        break;

case 3: System.out.println("Enter the radius");

int x = sc.nextInt();

        circle c1 = new circle(x,-1);

        s=c1;

        a1=s.printarea();

        System.out.println("area of circle is"+" "+a1);

        break;

default: System.out.println("Wrong case entered!");

        break;

    }

}

}
```

OUTPUT:

```
1BM21CS096_OOJ-main — zsh — 131x35
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % javac shape_week4.java
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java abst1
Enter 1 for Rectangle
Enter 2 for Triangle
Enter 3 for Circle

1
Enter the length and breadth
12
15
area of Rectangle is 180.0
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java abst1
Enter 1 for Rectangle
Enter 2 for Triangle
Enter 3 for Circle

2
Enter the base and height
12
15
area of triangle is 90.0
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java abst1
Enter 1 for Rectangle
Enter 2 for Triangle
Enter 3 for Circle

3
Enter the radius
12
area of circle is 452.3893421169302
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main %
```

LAB PROGRAM 5:

Develop a Java program to create a class Bank that maintains two kinds of account for its customers, one called savings account and the other current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides a check 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 deposits from customers 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.

CODE:

```
import java.util.*;

class account
{
    String cname,accno;

    int acc_type;

    double balance=0,dep,withdraw;
```

```

void set()
{
    Scanner sc = new Scanner(System.in);

    System.out.println("Enter your name and account number");

    cname=sc.nextLine();

    accno=sc.nextLine();

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

    balance=sc.nextDouble();

    System.out.println("The balance is "+ balance);
}

void check()
{
    Scanner sc = new Scanner(System.in);

    System.out.println("choose the type of account to withdraw from \n 1. Savings Account \n 2. Current Account");

    acc_type=sc.nextInt();
}

} //End of Bank class -- contained set and check

class curr_account extends account
{

```

```
double minbal , penalty = (0.2)*minbal;

Scanner sc = new Scanner(System.in);

curr_account(){minbal=1000.0;};

void penalty()

{

    if(balance<minbal)

    {

        System.out.println("A penalty of "+penalty+"will be charged as the balance is below "+minbal+"\n Enter 1. To continue Enter 2.To cancel");

        int n=sc.nextInt();

        if(n==1)

            balance-=penalty;

        else

            System.out.println("Withdrawal Cancelled");

    }

}

void deposit()

{

    System.out.println("Enter the deposit amount");

    dep=sc.nextDouble();

    balance+=dep;

    display();

}
```

```
void withdrawal()
{
    System.out.println("Enter the withdrawal amount");
    withdraw=sc.nextDouble();
    if(withdraw<balance)
    {
        balance-=withdraw;
    }
    else
        System.out.println("Insufficient funds!");
    display();
}

void display()
{
    penalty();
    System.out.println("Name: "+cname +"Account number: "+accno);
    System.out.println("The balance in the account is"+balance);
}

} //end of curr_account class
```



```

class sav_account extends account
{
    Scanner sc = new Scanner(System.in);
    void intrest()
    {
        double r,n,t;
        Scanner sc= new Scanner(System.in);
        System.out.println("Enter the rate of interest ");
        r = sc.nextDouble();
        System.out.println("Enter the number of times interest is compounded per year
");
        n = sc.nextDouble();
        System.out.println("Enter the time in years ");
        t = sc.nextDouble();
        balance=balance*Math.pow((1+r/n),(n*t));
        System.out.println("A Compound interest was added");
        display();
    }

    void deposit()
    {
        System.out.println("Enter the deposit amount");
        dep=sc.nextDouble();
        balance+=dep;
    }
}

```

```
display();  
}  
  
void withdrawal()  
{  
    System.out.println("Enter the withdrawal amount");  
    withdraw=sc.nextDouble();  
    if(withdraw<balance)  
    {  
        balance-=withdraw;  
    }  
    else  
        System.out.println("Insufficient funds!");  
    display();  
}  
  
void display()  
{  
    System.out.println("Name: "+cname +"Account number: "+accno);  
    System.out.println("The balance in the account is"+balance);  
}  
}  
//End of sav_class
```

```

class Bank
{
    public static void main(String args[])
    {
        Scanner sc = new Scanner(System.in);

        int op;

        account a = new account();

        a.check();

        sav_account s = new sav_account();

        curr_account c = new curr_account();

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

        if(a.acc_type==1)
        {
            s.set();

            while(true)
            {

                System.out.print("Enter the choice: \n1. Display\n2. Deposit\n3.
Withdraw\n4. Compound Intrest\n5. Exit\n");

                op=sc.nextInt();

                switch(op)
                {

                    case 1:s.display();

                        break;

```

```

        case 2:s.deposit();

            break;

        case 3:s.withdrawal();

            break;

        case 4:s.intrest();

            break;

        case 5:System.exit(0);

        default: System.out.println("Wrong choice ");

    }

}

else if(a.acc_type==2)

{

    c.set();

    while(true)

    {

        System.out.print("Enter the choice: \n1. Display\n2. Deposit Check\n3. Withdraw
Check\n4. Exit\n");

        op=sc.nextInt();

        switch(op)

        {

            case 1:c.display();

                break;

            case 2:c.deposit();

```

```
        break;

    case 3:c.withdrawal();

        break;

    case 4:System.exit(0);

    default: System.out.println("Wrong choice ");

    }

    }

else{

    System.out.println("Wrong choice ");

}

}

}
```

OUTPUT:

```
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_00J-main % javac week5-Bank_accounts.java
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_00J-main % java Bank
choose the type of account to withdraw from
1. Savings Account
2. Current Account
1
The balance in the account is 0.0
Enter your name and account number
Likhith
096
Enter your balance
5000
The balance is 5000.0
Enter the choice:
1. Display
2. Deposit
3. Withdraw
4. Compound Intrest
5. Exit
2
Enter the deposit amount
1200
Name: Likhith Account number: 096
The balance in the account is6200.0
Enter the choice:
1. Display
2. Deposit
3. Withdraw
4. Compound Intrest
5. Exit
4
Enter the rate of interest
9
Enter the number of times interest is compounded per year
12
Enter the time in years
1
A Compound interest was added
Name: Likhith Account number: 096
The balance in the account is5115031.042468548
Enter the choice:
1. Display
2. Deposit
3. Withdraw
4. Compound Intrest
```

```
4
Enter the rate of interest
9
Enter the number of times interest is compounded per year
12
Enter the time in years
1
A Compound interest was added
Name: Likhith Account number: 096
The balance in the account is5115031.042468548
Enter the choice:
1. Display
2. Deposit
3. Withdraw
4. Compound Intrest
5. Exit
3
Enter the withdrawal amount
10000
Name: Likhith Account number: 096
The balance in the account is5105031.042468548
Enter the choice:
1. Display
2. Deposit
3. Withdraw
4. Compound Intrest
5. Exit
5
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_00J-main %
```

LAB PROGRAM 6:

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 cases both father and son’s age and throws an exception if son’s age is >=father’s age.

CODE:

```
import java.util.*;

class NegativeAge extends Exception //All udf extends exception class
{
    String msg = new String();

    NegativeAge(String s)//Inputing the passed string for this exception
    {
        msg=s;
    }

    public String toString(){ //converting to string format
        return msg;
    }
}

class WrongAgeDiff extends Exception
{
    String msg = new String();
```

```

WrongAgeDiff(String s)

{

    msg=s;

}

public String toString(){ return msg;}

}

```

```

class Father{

    int f_age;

    Father() throws NegativeAge //We have to indicate that it is throwing as we haven't used catch
    block here

    {

        Scanner sc = new Scanner(System.in);

        System.out.println("Enter Father's age");

        f_age = sc.nextInt();

        if(f_age<0)

            throw new NegativeAge("The entered age is negative!");

    }

}

```

```

class Son extends Father{

    int s_age;

    Son() throws NegativeAge

    {

```



```

super(); //For checking father's also

Scanner sc = new Scanner(System.in);

System.out.println("Enter Son's age");

s_age = sc.nextInt();

if(s_age<0)

throw new NegativeAge("The entered age is negative!");

}

void WrongAgeDiff() throws WrongAgeDiff

{

if(s_age>=f_age)

throw new WrongAgeDiff("Son's age can't be more than Father's age!");

}

}

class User_def_exception{

public static void main(String args[])

{

String s1 = new String();

try

{

Son s = new Son(); //Constructor is invoked so, checked for NegativeAge exception

s.WrongAgeDiff();

}

}

```

```

catch(NegativeAge n)
{
    //System.out.println("Caught the Negativeage exception");

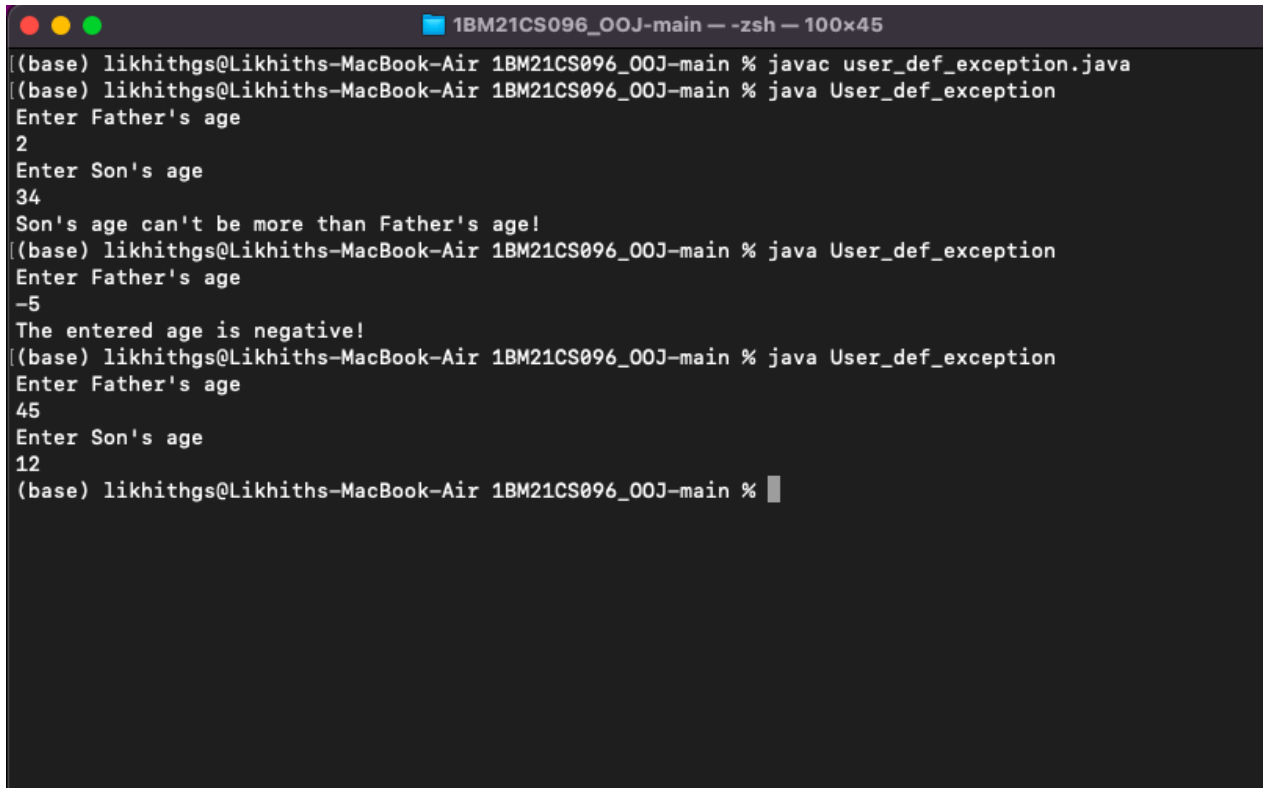
    System.out.println(n);
}

catch(WrongAgeDiff w)
{
    //System.out.println("Caught the WrongAgeDiff exception");

    System.out.println(w);
}
}
}

```

OUTPUT:



```

1BM21CS096_OOJ-main --zsh-- 100x45
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % javac user_def_exception.java
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java User_def_exception
Enter Father's age
2
Enter Son's age
34
Son's age can't be more than Father's age!
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java User_def_exception
Enter Father's age
-5
The entered age is negative!
((base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java User_def_exception
Enter Father's age
45
Enter Son's age
12
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main %

```

LAB PROGRAM 7:

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.

CODE:

```
class thread1 extends Thread
{
    public void run()
    {
        try{//Sleep throws exception

            for(int i=1;i<=3;i++)
            {
                System.out.println("BMS College of Engineering");

                Thread.sleep(10000);

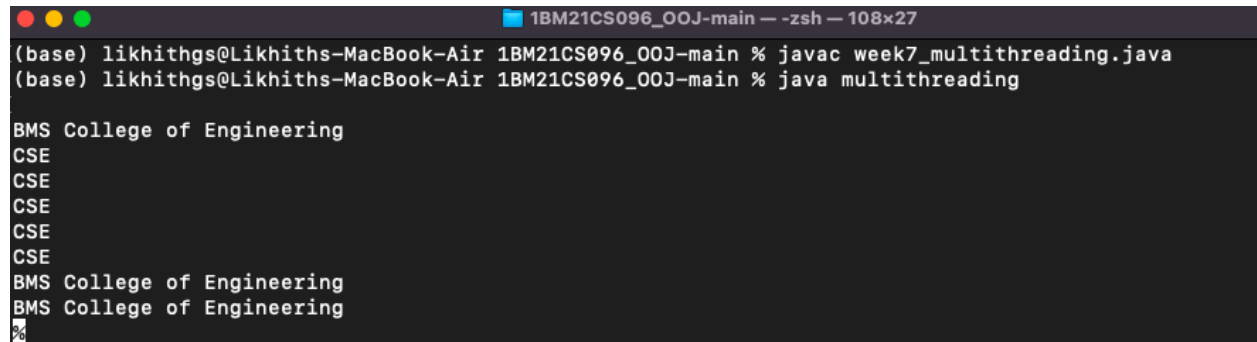
            }
        }
        catch(InterruptedException e)
        {
            System.out.println("Interrupted error "+e);
        }
    }
}

class thread2 extends Thread
```

```
{  
  
    public void run()  
  
    {  
  
        try{  
  
            for(int i=1;i<=5;i++)  
  
            {  
  
                System.out.println("CSE");  
  
                Thread.sleep(2000);  
  
            }  
  
        }  
  
        catch(InterruptedException e)  
  
        {  
  
            System.out.println("Interrupted error "+e);  
  
        }  
  
    }  
  
}  
  
class multithreading  
  
{  
  
    public static void main(String[] args) {  
  
        thread1 t1=new thread1();  
  
        thread2 t2=new thread2();  
  
        t1.start();  
  
        t2.start();  
  
    }  
  
}
```

```
}  
  
}
```

OUTPUT:



```
1BM21CS096_OOJ-main — zsh — 108x27  
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % javac week7_multithreading.java  
(base) likhithgs@Likhiths-MacBook-Air 1BM21CS096_OOJ-main % java multithreading  
  
BMS College of Engineering  
CSE  
CSE  
CSE  
CSE  
CSE  
CSE  
BMS College of Engineering  
BMS College of Engineering  
%
```