B.M.S. COLLEGE OF ENGINEERING
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LAB RECORD

OBJECT ORIENTED JAVA PROGRAMMING

19CS3PCOOJ

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SECTION: 3 'D'

Program 1: Develop a Java program that prints all real solutions to the quadratic equation ax2 +bx+c= 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions.

CODE:

```java
import java.util.Scanner;
public class roots{
    double a,b,c,d;
    roots(double a, double b, double c)
    {
        this.a = a;
        this.b = b;
        this.c = c;
    }
    public static void main(String []args)
    {
        Scanner in = new Scanner(System.in);
        System.out.println("Enter a, b, c : ");

        double a1 = in.nextDouble();
        double b1 = in.nextDouble();
        double c1 = in.nextDouble();
        in.close();

        roots obj = new roots(a1, b1, c1);
        obj.d = obj.discriminant();

        if(obj.d>0)
            obj.distinct();
        else if(obj.d==0)
```

```java
                obj.equal();
            else
                obj.imaginary();
        }
    public double discriminant()
    {
        return(b*b-4*a*c);
    }
    public void distinct()
    {
        double x = Math.sqrt(d);
        double r1 = (-1*b+x)/(2*a);
        double r2 = (-1*b-x)/(2*a);
        System.out.println("\nThe roots are real and
distinct;\n");
        System.out.println("First Root : "+r1);
        System.out.println("Second Root : "+r2);
    }
    public void equal()
    {
        double x = Math.sqrt(d);
        double r1 = (-1*b+x)/(2*a);
        System.out.println("\nThe roots are real and
equal;\n");
        System.out.println("Root : "+r1);
    }
    public void imaginary()
    {
        System.out.println("\nThe roots are imaginary");
        double x = Math.sqrt(-d);
        double r = (-b)/(2*a);
        double i = Math.abs(x/(2*a));
        if(r==0)r = 0;
        System.out.println("The roots are : "+r+" (+/-) i *
"+i);
    }
}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java roots
Enter a, b, c :
-1 2 3

The roots are real and distinct;

First Root : -1.0
Second Root : 3.0

C:\Users\Sadik\Desktop\java>java roots
Enter a, b, c :
1 1 1

The roots are imaginary
The roots are : -0.5 (+/-) i * 0.8660254037844386

C:\Users\Sadik\Desktop\java>java roots
Enter a, b, c :
4 4 1

The roots are real and equal;

Root : -0.5
```

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:

```java
import java.util.Scanner;
public class GPA
{
    int numberOfCourses;
    String usn, name;
    int creditsArray[];
    int marksArray[];
    int gradesArray[];
    double SGPA;

    GPA()
    {
  SGPA = 0.0D;
    }
    void input()
    {
        Scanner in = new Scanner(System.in);
        System.out.print("\n Please Enter your Name: ");
        name = in.nextLine();
        System.out.print("Enter your USN: ");
        usn = in.next();
        System.out.print("Enter number of courses registered: ");
        numberOfCourses = in.nextInt();
        marksArray = new int[numberOfCourses];
        creditsArray = new int[numberOfCourses];
        gradesArray = new int[numberOfCourses];
```

```java
    int i = 0
  System.out.println();
        for(i = 0;i < numberOfCourses; i++)
        {
            System.out.print("Enter Credits for course
"+(i+1)+" = ");
            creditsArray[i] = in.nextInt();
            System.out.print("Enter marks obtained in course
"+(i+1)+" = ");
            marksArray[i] = in.nextInt();
      System.out.println();
        }
        in.close();
    }

    void computeGradesArray()
    {
        int i = 0;
        for(i=0;i<numberOfCourses;i++)
        {
            if(marksArray[i]==100)
            {
                gradesArray[i] = 10;
                continue;
            }
            if(marksArray[i]>=50)
            {
                gradesArray[i] = (marksArray[i]/10)+1;
                continue;
            }
            if(marksArray[i]>=35)
            {
                gradesArray[i] = 4;
                continue;
            }
            gradesArray[i]=0;
        }
```

```java
    void computeSGPA()
    {
        int i = 0;
        int netCredits = 0;
        for(i = 0 ; i < numberOfCourses ; i++)
        {
            SGPA = SGPA + creditsArray[i]*gradesArray[i];
            netCredits = netCredits+creditsArray[i];
        }
        SGPA = SGPA/netCredits;
    }
    void display()
    {
        System.out.println();

        System.out.println("****************************************************");
        System.out.println("Student USN: "+usn);
        System.out.println("Student Name: "+name);
        System.out.println("Number of Courses registered: "+numberOfCourses);
        int i = 0;
        for(i = 0;i<numberOfCourses; i++)
            System.out.println("Marks scored in course "+(i+1)+" is "+marksArray[i]);
        System.out.println("SGPA : "+SGPA);

        System.out.println("****************************************************");
    }
    public static void main(String []args)
    {
        GPA object = new GPA();
        object.input();
        object.computeGradesArray();
        object.computeSGPA();
        object.display();
    }}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java GPA

 Please Enter your Name: Tom
Enter your USN: 1BMCS001
Enter number of courses registered: 5

Enter Credits for course 1 = 3
Enter marks obtained in course 1 = 98

Enter Credits for course 2 = 4
Enter marks obtained in course 2 = 45

Enter Credits for course 3 = 4
Enter marks obtained in course 3 = 75

Enter Credits for course 4 = 5
Enter marks obtained in course 4 = 80

Enter Credits for course 5 = 3
Enter marks obtained in course 5 = 25


************************************************************
Student USN: 1BMCS001
Student Name: Tom
Number of Courses registered: 5
Marks scored in course 1 is 98
Marks scored in course 2 is 45
Marks scored in course 3 is 75
Marks scored in course 4 is 80
Marks scored in course 5 is 25
SGPA : 6.473684210526316
************************************************************
```

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:

```java
import java.util.*;
import java.lang.*;
class Book {
  String name, author;
  double price;
  int num_pages;
  Scanner in = new Scanner(System.in);

  Book() {
    System.out.println("***************");
    System.out.println("Name of Book: ");
    name = in.nextLine();

    System.out.println("***************");
    System.out.println("Author Name:");
    author = in.nextLine();

    System.out.println("***************");
    System.out.println("Enter price of book in Rs: ");
    price = in.nextDouble();

    System.out.println("Enter number of pages in the book: ");
    num_pages = in.nextInt();
  }
```

```java
  void show() {
    System.out.println("Name: " + name);
    System.out.println("Author: " + author);
    System.out.println("Price: " + price);
    System.out.println("Number of pages: " + num_pages);
  }

  public String toString() {
    return name + ", By " + author + " for Rs." + price + "
and has " + num_pages + " pages";
  }

  public static void main(String[] args) {

    Scanner in = new Scanner(System.in);

    int n, x;

    System.out.println("Enter number of books to be created:
");
    n = in.nextInt();

    Book B[] = new Book[n];

    for(int i = 0; i < n; i++) {
      System.out.println("Book " + (i+1));
      B[i] = new Book();
      System.out.println();
    }

    for(int i = 0; i < n; i++) {
      System.out.println("Book " + (i+1));
      System.out.println(B[i]);
      System.out.println();
    }
    do {
```

```java
        System.out.println("Please enter the book number for
information display. ");
        x = in.nextInt();
    } while(x < 1 && x > n);
    B[x-1].show();


    }
}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java Book
Enter number of books to be created:
3
Book 1
**************
Name of Book:
Java Programming
**************
Author Name:
James Gosling
**************
Enter price of book in Rs:
499
Enter number of pages in the book:
1210

Book 2
**************
Name of Book:
Computer Organization
**************
Author Name:
Carl Hamacher
**************
Enter price of book in Rs:
690
Enter number of pages in the book:
826

Book 3
**************
Name of Book:
Zero To One
**************
Author Name:
Peter Thiel
**************
Enter price of book in Rs:
1190
Enter number of pages in the book:
224
Book 1
Java Programming, By James Gosling for Rs.499.0 and has 1210 pages

Book 2
Computer Organization, By Carl Hamacher for Rs.690.0 and has 826 pages

Book 3
Zero To One, By Peter Thiel for Rs.1190.0 and has 224 pages

Please enter the book number for information display.
2
Name: Computer Organization
Author: Carl Hamacher
Price: 690.0
Number of pages: 826
```

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 contain only the method printArea( ) that prints the area of the given shape.

CODE:

```java
import java.util.*;
abstract class Shape
{
    int a;
    int b;
abstract void printArea();
  }
class Rectangle extends Shape
    {
Rectangle(int x, int y)
  {
  a=x;
  b=y;
}
void printArea()
{
  System.out.println("Area is "+(a*b));
   }
}
  class Triangle extends Shape
  {
Triangle(int x, int y)
   {
   a=x;
    b=y;
```

```java
}
void printArea()
{
System.out.println("Area is "+(a*b*0.5));
}
}
class Circle extends Shape
{
Circle(int x)
{
    a=x;
 }
    void printArea()
{
System.out.println("Area is "+(a*a*3.14));
   }
}
  class program5
  {
public static void main(String ss[])
  {
    int l,b,ba,h,ra;
   Scanner sc = new Scanner(System.in);

   System.out.println("enter the length and breadth of
rectangle");

   l= sc.nextInt();
   b= sc.nextInt();

   Rectangle r= new Rectangle(l,b);
   r.printArea();

       System.out.println("enter the base and height of
triangle");

ba= sc.nextInt();
h= sc.nextInt();
```

```java
Triangle t = new Triangle(ba,h);
t.printArea();

System.out.println("enter the radius of circle");

    ra= sc.nextInt();
  Circle c = new Circle(ra);
  c.printArea();
  }
}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java program5
enter the length and breadth of rectangle
10
20
Area is 200
enter the base and height of triangle
5
8
Area is 20.0
enter the radius of circle
75
Area is 17662.5
```

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 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 Current account 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.

CODE:

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

class Account {

    String name, abc;
    int accNo;
    char accType;
    double bal = 0;
    double deposit;
```

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

    void input_data() {

System.out.println("*************************************");
        System.out.println("Please enter your account type S
or C");
        abc = in.nextLine();
        accType = abc.charAt(0);
    }

    void deposit() {

        System.out.println("Enter an amount to deposit: ");
        deposit = in.nextDouble();

        bal += deposit;
        System.out.println("Balance has been updated! ");
    }

    void view_balance() {

        System.out.println("Balance = " + bal);
    }

    public static void main(String[] args) {

        Scanner s = new Scanner(System.in);
        int x;
        Account a1 = new Account();
        a1.input_data();

        if (a1.accType == 'C' || a1.accType == 'c') {

            Current a2 = new Current();

            do {
```

```java
System.out.println("*******************************");
            System.out.println("Current account");

System.out.println("********************************");
            System.out.println("1. Deposit ");
            System.out.println("2. Check Balance ");
            System.out.println("3. Issue Cheque ");
            System.out.println("4. Exit");
            System.out.println("Enter your choice: ");
            x = s.nextInt();

            switch (x) {
                case 1:
                    a2.deposit();
                    break;
                case 2:
                    a2.check_balance();
                    break;
                case 3:
                    a2.issue_cheque();
                    break;
                case 4:
                    System.exit(0);
                    break;
                default:
                    System.out.println("Invalid
Choice");
            }

        } while (x <= 4 && x >= 1);
    } else if (a1.accType == 'S' || a1.accType == 's') {

        Savings a3 = new Savings();

        do {

System.out.println("*************************************");
```

```java
                System.out.println("Savings Account");

System.out.println("************************************");
                System.out.println("1.Deposit");
                System.out.println("2.View Balance");
                System.out.println("3.Withdraw ");
                System.out.println("4.Calculate compound
interest ");
                System.out.println("5.Exit ");
                System.out.println("Please enter your
choice: ");
                x = s.nextInt();

                switch (x) {
                    case 1:
                        a3.deposit();
                        break;
                    case 2:
                        a3.view_balance();
                        break;
                    case 3:
                        a3.withdraw_balance();
                        break;
                    case 4:
                        a3.compute_CI();
                        break;
                    case 5:
                        System.exit(0);
                        break;
                    default:
                        System.out.println("Sorry, Invalid
Input!");
                }

            } while (x <= 5 && x >= 1);
        } else
            System.out.println("Invalid Account Type");
    }
```

```java
}

class Current extends Account {

    Current() {

        System.out.println("Enter your name: ");
        name = in.nextLine();

        System.out.println("Enter your account number: ");
        accNo = in.nextInt();

        deposit();
    }

    double chq_amount;

    void issue_cheque() {

        System.out.println("Enter amount for the cheque");
        chq_amount = in.nextDouble();
        if (chq_amount > bal) {
            System.out.println("Sorry, not enough balance in account.");
        } else {
            bal -= chq_amount;
            System.out.println("Cheque issued Successfull");
        }
    }

    void check_balance() {

        if (bal < 1000) {

            System.out.println("Current available balance less than minimum required balance.");
            bal -= 100;
```

```java
            System.out.println("Rs 100 service charge has
been deducted from your balance.");
        }
        view_balance();
    }
}

class Savings extends Account {

    double CI, withdrawal_ammount, time;

    Savings() {

        System.out.println("Please Enter your name: ");
        name = in.nextLine();

        System.out.println("Please Enter your account
number: ");
        accNo = in.nextInt();

        deposit();
    }

    void compute_CI() {

        System.out.println("Enter time period: ");
        time = in.nextInt();
        CI = bal * Math.pow(1 + (0.08 / 12), 12 * time) -
bal;
        System.out.println("CI = " + CI);
        bal += CI;
        System.out.println("CI has been deposited");
    }

    void withdraw_balance() {

        System.out.println("Enter the amount you wishto
withdraw: ");
```

```java
        withdrawal_ammount = in.nextDouble();

        if (withdrawal_ammount > bal) {
            System.out.println("Sorry, Input amount is
larger than the available balance.");
        } else {
            bal -= withdrawal_ammount;
            System.out.println("Amount has been successfully
transcacted.");
        }
    }

}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>javac Account.java

C:\Users\Sadik\Desktop\java>java Account
************************************
Please enter your account type S or C:
S
Please Enter your name:
John
Please Enter your account number:
01924
Please enter the amount to deposit:
700
Balance has been updated!
Savings Account
*****************
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
1
Please enter the amount to deposit:
1000
Balance has been updated!
Savings Account
*****************
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
4
PleaseEnter time period:
10
CI = 2073.3883987260083
CI deposited!
Savings Account
*****************
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
2
Balance = 3773.3883987260083
Savings Account
*****************
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
3
Enter the amount you want to withdraw:
3000
Amount has been withdrawn successfully!
Savings Account
*****************
1. Deposit
2. View Balance
3. Withdraw
4. Calculate compound interest
5. Exit
Enter your choice:
5

C:\Users\Sadik\Desktop\java>java Account
************************************
Please enter your account type S or C:
C
Enter your name:
John
Enter your account number:
01924
Please enter the amount to deposit:
4000
Balance has been updated!
Current Account
1. Deposit
2. Check Balance
3. Issue Cheque
4. Exit
Enter your choice:
3
Enter amount for which cheque is to be issued.
1000
Chequed issued!
Current Account
1. Deposit
2. Check Balance
3. Issue Cheque
4. Exit
Enter your choice:
2
Balance = 3000.0
Current Account
1. Deposit
2. Check Balance
3. Issue Cheque
4. Exit
Enter your choice:
1
Please enter the amount to deposit:
500
Balance has been updated!
```

PROGRAM 6: 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.

CODE:

```java
package CIE;
import java.util.Scanner;
public class Internals extends CIE.Student
{
    public int ciem[]=new int[5];
    Scanner xx =new Scanner (System.in);
    public void accept()
    {
        for(int i=0;i<5;i++)
        {
            System.out.println("Please enter the cie marks
of subject"+(i+1)+" out of 50");
            {
                ciem[i]=xx.nextInt();
            }
        }
    }


}

package CIE;
```

```java
import java.util.Scanner;

public class Student
{
    String name,usn;
    int sem;
    Scanner xx=new Scanner(System.in);
    public void accept()
    {
        System.out.println("Please enter the name:");
        name=xx.nextLine();
        System.out.println("Please enter the USN:");
        usn=xx.next();
        System.out.println("Enter Semester:");
        sem=xx.nextInt();
    }
    public void display()
    {
        System.out.println("Name :"+name);
        System.out.println("Usn :"+usn);
        System.out.println("Sem :"+sem);
    }
}

package SEE;
import CIE.*;
import java.util.Scanner;

public class Externals extends CIE.Student
{
    public int seem[]=new int[5];
    Scanner xx =new Scanner (System.in);
    public void accept()
    {
        for(int i=0;i<5;i++)
        {
            System.out.println("Please enter the SEE marks
of subject"+(i+1)+" out of 100");
```

```java
            {
                seem[i]=xx.nextInt();
            }
        }
    }

}

import CIE.*;
import SEE.*;
import java.util.*;

class TotalMarks
{
    public static void main(String sss[])
    {
        int i,j,n;
        int total[]=new int[5];
        Scanner xx=new Scanner(System.in);
        System.out.println("Please Enter the number of
students");
        n=xx.nextInt();
        CIE.Student s[]=new CIE.Student[n];
        CIE.Internals ci[]= new CIE.Internals[n];
      SEE.Externals se[]=new SEE.Externals[n];
        for(i=0;i<n;i++)
        {
            System.out.println("Enter student"+(i+1)+"
details");
            s[i]=new CIE.Student();
            s[i].accept();
            ci[i]=new CIE.Internals();
            ci[i].accept();
            se[i]=new SEE.Externals();
            se[i].accept();
        }
        for(i=0;i<n;i++)
        {
```

```java
            System.out.println("details of the student "+(i+1));
            s[i].display();
            for(j=0;j<5;j++)
            {
                total[j]=ci[i].ciem[j]+(se[i].seem[j]/2);
                System.out.println("Total marks in subject"+(j+1)+" is "+total[j]);
            }
        }
    }
}
```

OUTPUT:

```
Please Enter the number of students
2
Enter student1 details
Please enter the name:
tom
Please enter the USN:
123
Enter Semester:
2
Please enter the cie marks of subject1 out of 50
40
Please enter the cie marks of subject2 out of 50
45
Please enter the cie marks of subject3 out of 50
30
Please enter the cie marks of subject4 out of 50
36
Please enter the cie marks of subject5 out of 50
49
Please enter the SEE marks of subject1 out of 100
89
Please enter the SEE marks of subject2 out of 100
90
Please enter the SEE marks of subject3 out of 100
94
Please enter the SEE marks of subject4 out of 100
95
Please enter the SEE marks of subject5 out of 100
93
Enter student2 details
Please enter the name:
jerry
Please enter the USN:
456
Enter Semester:
3
Please enter the cie marks of subject1 out of 50
47
Please enter the cie marks of subject2 out of 50
49
Please enter the cie marks of subject3 out of 50
46
Please enter the cie marks of subject4 out of 50
45
Please enter the cie marks of subject5 out of 50
44
Please enter the SEE marks of subject1 out of 100
49
Please enter the SEE marks of subject2 out of 100
89
Please enter the SEE marks of subject3 out of 100
82
Please enter the SEE marks of subject4 out of 100
97
Please enter the SEE marks of subject5 out of 100
92
details of the student 1
Name :tom
Usn :123
Sem :2
Total marks in subject1 is 84
Total marks in subject2 is 90
Total marks in subject3 is 77
Total marks in subject4 is 83
Total marks in subject5 is 95
details of the student 2
Name :jerry
Usn :456
Sem :3
Total marks in subject1 is 71
Total marks in subject2 is 93
Total marks in subject3 is 87
Total marks in subject4 is 93
Total marks in subject5 is 90
```

PROGRAM 7:Write a program to demonstrate generics with multiple object parameters.

<u>CODE:</u>

```java
public class TwoGen<T, V> {
T obj1;
V obj2;
 TwoGen(T ob1, V ob2) {
  obj1 = ob1;
  obj2 = ob2;
    }
 void showType() {
  System.out.println("Type of T is
"+obj1.getClass().getName());
  System.out.println("Type of V is
"+obj2.getClass().getName());
}
T getObj1() {
return obj1;
}
V getObj2() {
return obj2;
    }
}
public class Main {
public static void main(String args[]) {
 TwoGen<Integer, String>  obj  =new TwoGen<Integer,
String>(50, "Java");
 obj.showType();
 int v= obj.getObj1();
 String str = obj.getObj2();
   System.out.println("The Integer value is : "+v);
     System.out.println(" The String value is : "+str);

   }
}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\New folder>java Main
Type of T is java.lang.Integer
Type of V is java.lang.String
The Integer value is : 50
 The String value is : Java


C:\Users\Sadik\Desktop\New folder>
```

PROGRAM 8: 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:

```java
import java.util.*;
class WrongAge extends Exception{
    int f,s;
     WrongAge(int fage,int sage){
       f=fage;
       s=sage;
}
  public String toString()
  {
    return "Please enter the correct ages as father's age
can't be less than or equal to the son's age.";
}
}
class NegativeAge extends Exception{
    int x;
    NegativeAge(int fage){
    x=fage;
  }
public String toString(){
  return "Age can't be a negative value.";
  }
}
```

```java
class Father
{
   int fage;
Scanner in=new Scanner(System.in);
Father() throws NegativeAge
   {
     System.out.println("Enter the father's age:");
     fage=in.nextInt();
if(fage<0)  {
     throw new NegativeAge(fage);
     }
   }
}

class Son extends Father
   {
     int sage;
     Scanner in=new Scanner(System.in);
Son() throws NegativeAge,WrongAge{
super();
     System.out.println("Enter the son's age :");
     sage=in.nextInt();
     if(sage<0)
     {
     throw new NegativeAge(sage);
   }
     if(sage>=fage)  {
  throw new WrongAge(fage,sage);
     }
   }
}

class program8{
public static void main(String args[]){
try{
Son s=new Son();
}
catch(NegativeAge n){
```

```java
System.out.println("Exception:"+n);
}
catch(WrongAge w){
System.out.println("Exception:"+w);
}
}}
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java program8
Enter the father's age:
45
Enter the son's age :
45
Exception:Please enter the correct ages as father's age can't be less than or equal to the son's age.

C:\Users\Sadik\Desktop\java>java program8
Enter the father's age:
45
Enter the son's age :
16

C:\Users\Sadik\Desktop\java>
```

PROGRAM 9: 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:

```java
class NewThread implements Runnable
{
 private String name;
 private int interval;
 private Thread t;
 NewThread(String threadname,int interval)
 {
  this.name=threadname;
  this.interval=interval;
  t=new Thread(this,name);
  t.start();
 }
 public void run()
 {
  try
  {
      for(int i=5;i>0;i--)
      {
       System.out.println("-Thread:"+this.name);
       Thread.sleep(this.interval);
      }
  }
 catch(InterruptedException e)
 {
   System.out.println(name+"Interrupted");
 }
 }
}
class college
```

```
{
 public static void main(String args[]){
 new NewThread("Bms College of Engineering",10000);
 new NewThread("CSE",2000);
 }
 }
```

OUTPUT:

```
C:\Users\Sadik\Desktop\java>java college
-Thread:Bms College of Engineering
-Thread:CSE
-Thread:CSE
-Thread:CSE
-Thread:CSE
-Thread:CSE
-Thread:Bms College of Engineering
-Thread:Bms College of Engineering
-Thread:Bms College of Engineering
-Thread:Bms College of Engineering
```

Program 10: 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.

CODE:

```java
import java.awt.*;
import java.awt.event.*;
class DivisionInteger extends Frame implements
ActionListener{
  TextField num1TextField;
  TextField num2TextField;
Button calculate;
  int a,b;
  float result;
String msg="Enter the numbers";

public DivisionInteger()  {

  setLayout(new FlowLayout());
  calculate=new Button("Calculate");
  num1TextField=new TextField(5);
  Label num1Label=new Label("Number 1",Label.RIGHT);
  num2TextField=new TextField(5);
  Label num2Label=new Label("Number 2",Label.RIGHT);

add(num1Label);
add(num1TextField);
add(num2Label);
```

```java
add(num2TextField);
add(calculate);

num1TextField.addActionListener(this);
num2TextField.addActionListener(this);
calculate.addActionListener(this);
addWindowListener(new MyWindowAdapter());


}

public void actionPerformed(ActionEvent ae){

    try{
    result=divideNumbers();
      msg=("The result is "+result);
      repaint();
}
catch(NumberFormatException e){
msg="Number is not Integer."+e;
repaint();

}catch(ArithmeticException e){
  msg="Divide By zero not Allowed."+e;
  repaint();
  }
}
public float divideNumbers(){
    a=Integer.parseInt(num1TextField.getText());
    b=Integer.parseInt(num2TextField.getText());
  if(b==0){
  throw new ArithmeticException();
}
  return (float)a/b;
}
  public void paint(Graphics g){
  g.drawString(msg,50,100);
}
public static void main(String args[]){
```

```java
        DivisionInteger div=new DivisionInteger();
        div.setSize(new Dimension(500,500));
    div.setTitle("Division Calculator");
    div.setVisible(true);
    }
}
class MyWindowAdapter extends WindowAdapter{

        public void windowClosing(WindowEvent event){
    System.exit(0);
}
}
```

OUTPUT:

Division Calculator

Number 1 `20`　Number 2 `0`　Calculate

Divide By zero not Allowed.java.lang.ArithmeticException

Division Calculator

Number 1 `3.5`　Number 2 `2`　Calculate

Number is not Integer.java.lang.NumberFormatException: For input string: "3.5"