

1. Lab Program:

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.



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\* LAB-1:

Algorithm :

Step 1: Input the values of  $a, b$  and  $c$   
Step 2: Calculate using formula

$$d = (b^2 - 4ac)$$

Step 3: If ( $d < 0$ )

Print: No real solutions

else if ( $d = 0$ )

Print: Roots are equal

$$\pi_1 = \pi_2 = -b / (2a)$$

else

Print: Roots are real

$$\pi_1 = -b + \sqrt{d} / (2a);$$

$$\pi_2 = -b - \sqrt{d} / (2a);$$

Step 4: End

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\* Program:

```
import java.util.*  
public class quad-roots  
{  
    public static void main(String args[])  
    {  
        double a,b,c,d,p1,p2;  
        System.out.print("Enter the values of a, b  
        and c");  
        Scanner sc = new Scanner(System.in);  
        a = sc.nextDouble();  
        b = sc.nextDouble();  
        c = sc.nextDouble();  
        d = (b*b) - (4*a*c);
```



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$$\text{Root 1: } \pi_1 = -b + \sqrt{d} / (2\pi a);$$

Step 4: End

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### \* Program.

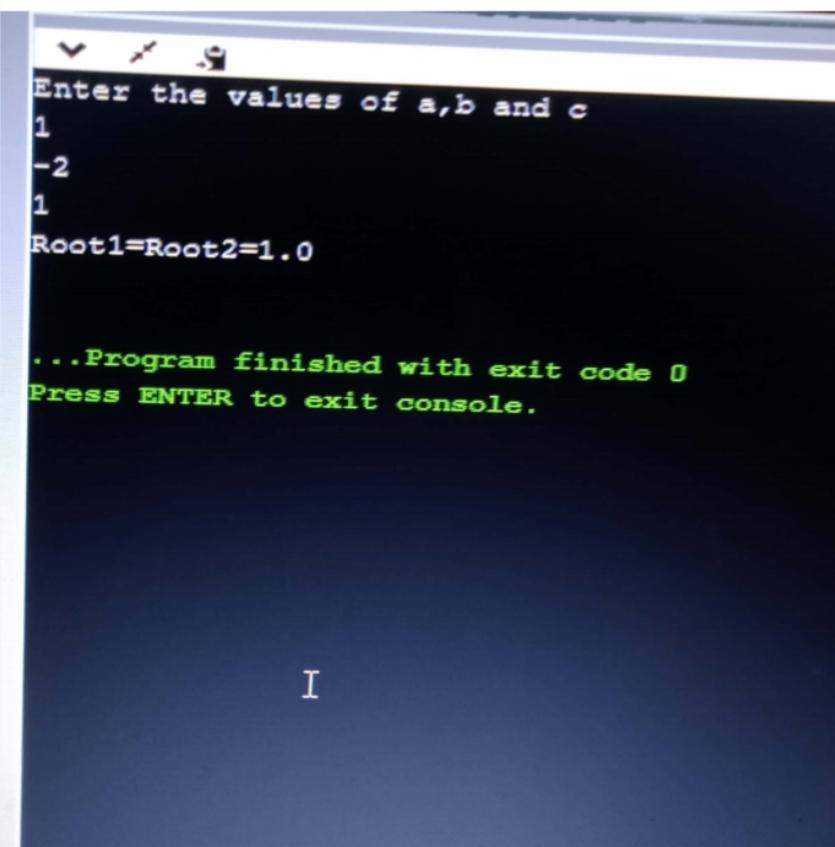
```
import java.util.*  
public class quad_roots  
{  
    public static void main(String args[])  
    {  
        double a,b,c,d,p1,p2;  
        System.out.print("Enter the values of a, b  
        and c:");  
        Scanner sc = new Scanner(System.in);  
        a = sc.nextDouble();  
        b = sc.nextDouble();  
        c = sc.nextDouble();  
        d = (b*b) - (4*a*c);  
        if(d>0)  
        {  
            p1 = (-b + Math.sqrt(d)) / (2*a);  
            p2 = (-b - Math.sqrt(d)) / (2*a);  
            System.out.println("Root 1 = " + p1 + " Root 2 = " + p2);  
        }  
        else if(d==0)  
        {  
            p1 = p2 = -b / (2*a);  
        }  
    }  
}
```

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```
System.out.println("Root 1 = Root 2 = " + p1);  
}  
else  
{  
    System.out.println("There are no real  
    solutions for given equation");  
}  
}
```



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A screenshot of a terminal window on a dark blue background. The window title bar shows a small icon followed by three dots. The terminal displays the following text:

```
Enter the values of a,b and c
1
-2
1
Root1=Root2=1.0

...Program finished with exit code 0
Press ENTER to exit console.
```

The text is white on a black background, with the error message and exit information in green.

## 2. 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.



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```

* import java.util.*;
class student {
    private String usn;
    private String name;
    private int audits[];
    private int marks[];
    private int n;
    void accept() {
        Scanner s=new Scanner (System.in);
        System.out.println("Enter student details");
        System.out.println("USN:");
        usn=s.nextLine();
        System.out.println("Name:");
        name=s.nextLine();
        System.out.println("Enter audits and marks obtained by the student in each subject");
        for(int i=0;i<n;i++)
        {
            audits[i]=s.nextInt();
            marks[i]=s.nextInt();
        }
    }
    void display()
    {
        System.out.println("Student details");
        System.out.println("USN:"+usn);
        System.out.println("Name:"+name);
        System.out.println("Marks in each subject:");
        for(int i=0;i<n;i++)
        {
            System.out.println("Subject "+(i+1)+" : "+marks[i]);
        }
    }
    double calculate()
}

```

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```

System.out.println("Student details");
System.out.println("USN:" + usn);
System.out.println("Name:" + name);
System.out.println("Marks in each subject:");
for (int i = 0; i < n; i++) {
    System.out.println("Subject " + (i + 1) + ":" + marks[i]);
}
double calculate()
}

```



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```
System.out.println ("Name:" +name);
System.out.println ("Marks in each subject:");
for (int i=0; i<n; i++)
{
    System.out.println ("Subject " +(i+1) ":" +marks[i]);
}
double calculate ()
{
    int tc=0, tc=0;
    for (int i=0; i<n; i++)
    {
        tc=tc+credits[i];
        if (marks[i]>=50)
        {
            tc=tc+(marks[i]/10)*credits[i];
        }
        else if (marks[i]>=40 && marks[i]<50)
        {
            tc=tc+(4*credits[i]);
        }
    }
}
```

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```
return (double) tc/tc;
}
}
class Student Main
{
public static void main (String ss[])
{
    Student s1= new Student ();
    s1.accept ();
    s1.display ();
    System.out.println ("SGPA :" +s1.calculate ());
}
}
```



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```
C:\Users\Surendra\Desktop>java StudentMain
Enter student details
USN:
01
Name:
priya
Enter the number of subjects:
3
Enter credits and marks attained by the student in each subject:
4
78
3
89
5
88
Student details:
USN:01
Name:priya
Marks in each subject:
Subject 1:78
Subject 2:89
Subject 3:88
SGPA: 8.666666666666666
C:\Users\Surendra\Desktop>
```

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### 3. 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.



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```

1. import java.util.*;
class Book {
    String name;
    String author;
    int price;
    int numPages;
    Book()
    {
        Book(String name, String author, int price, int numPages)
    {
        this.name = name;
        this.author = author;
        this.price = price;
        this.numPages = numPages;
    }
    void accept()
    {
        Scanner s = new Scanner(System.in);
        System.out.println("Enter the name of book");
        name = s.nextLine();
        System.out.println("Enter the author of book");
        author = s.nextLine();
        System.out.println("Enter the price of the book");
        price = s.nextInt();
        System.out.println("Enter the number of pages of book");
        numPages = s.nextInt();
    }
    public String toString()
    {
        return ("Name: " + name + "\n" + "Author: " + author + "\n"
                + "Price: " + price + "\n" + "Number of Pages: " + numPages);
    }
}

```

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```

class BookMain {
    public static void main (String args)
    {
        Scanner a = new Scanner(System.in);
        Book b1 = new
        Book ("Wings of Fire", "APJ.Abdul.Kalam", 100, 200);
        System.out.println ("Sample input : \n" + b1);
        System.out.println ("Enter the number of books");
        int n = a.nextInt();
        Book b[] = new Book [n];
        for (int i=0; i<n; i++)
        {
            a.nextLine();
        }
    }
}

```



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```
System.out.println("Enter the name of book");
name=s.nextLine();
System.out.println("Enter the author of book");
author=s.nextLine();
System.out.println("Enter the price of the book");
price=s.nextInt();
System.out.println("Enter the number of pages of book");
numPages=s.nextInt();
}
public String toString()
{
return ("Name:" + name + "Author:" + author + "\n"
+ "Price:" + price + "Number of Pages:" + numPages);
}
}
```

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```
class BookMain {
public static void main (String sso)
{
Scanner a = new Scanner (System.in);
Book b1 = new Book ("Wings of Fire", "APJ.AbdulKalam", 100, 200);
System.out.println ("Sample input : \n" + b1);
System.out.println ("Enter the number of books");
int n = a.nextInt();
Book b[] = new Book [n];
for (int i = 0; i < n; i++)
{
b[i] = new Book ();
System.out.print ("Enter the details of " + (i + 1) + " "
book");
b[i].accept ();
}
for (int i = 0; i < n; i++)
{
System.out.println ("Details of book" + (i + 1));
System.out.println (b[i]);
}
}
}
```

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```
Game
Enter the author of the book
shahid
Enter the price of the book
800
Enter the number of pages of the book
67
Enter the details of 2 book
Enter the name of the book
Overstory
Enter the author of the book
Richard
Enter the price of the book
890
Enter the number of pages of the book
789
Details of book 1
Name: Game
Author: shahid
Price: 800
Number of pages: 67
Details of book 2
Name: Overstory
Author: Richard
Price: 890
Number of pages: 789
```

```
C:\Users\Surendra\Desktop>
```

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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.



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Saraswathi.B  
IBM19CS032  
Week 8

```
1. import java.util.Scanner;
abstract class shape
{
int a,b;
abstract void printArea();
}
class Rectangle extends shape
{
void printArea()
{
System.out.println ("Area of Rectangle = "+(a*b));
}
}
class Triangle extends shape
{
void printArea()
{
System.out.println ("Area of Triangle = "+(0.5*a*b));
}
}
class Circle extends shape
{
void printArea()
{
System.out.println ("Area of Circle = "+(3.142*a*b));
}
}
```

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Class Shapemain



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```
y  
}
```

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```
class Shapemain  
{  
    Public static void main (String args[])  
    {  
        Scanner sc=new Scanner (System.in);  
        Rectangle r= new Rectangle ();  
        Triangle t= new Triangle ();  
        Circle c= new Circle ();
```

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```
System.out.println ("Enter length and breadth: ");  
r.a = sc.nextInt();  
r.b = sc.nextInt();  
r.print Area ();  
System.out.println ("Enter height and base: ");  
t.a = sc.nextInt();  
t.b = sc.nextInt();  
t.print Area ();  
System.out.println ("Enter radius: ");  
c.a = sc.nextInt();  
c.print Area ();  
}  
}
```



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```
Enter length and breadth:  
5 6  
Area of Rectangle=30  
Enter height and base:  
5 9  
Area of Triangle=22.5  
Enter radius:  
3  
Area of Circle=28.278
```

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 Curr-acct and Sav-acct to make them more specific to their requirements. Include the necessary methods in order to achieve the following tasks:

- Accept deposit from customer and update the balance.
- Display the balance.
- Compute and deposit interest
- Permit withdrawal and update the balance
- Check for the minimum balance,
- impose penalty if necessary and update the balance



```
2. import java.util.Scanner;
class account
{
    private String name;
    private long account_number;
    private int account_type;
    double balance;
    void get_data()
    {
        Scanner ss = new Scanner(System.in);
        System.out.println("Enter the name");
        name = ss.next();
        System.out.println("Enter the account_number");
        account_number = ss.nextLong();
        System.out.println("choose the account type");
        System.out.println("1:Savings account");
        System.out.println("2:Current account");
```

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```
account_type = ss.nextInt();
}
int return_account_type()
{
    return account_type;
}
class savings extends account
{
    Scanner ss = new Scanner(System.in);
    double amount;
    void get_sav_balance()
    {
        System.out.println("Enter the amount to be placed in your
savings account");
        amount = ss.nextDouble();
        balance += amount;
    }
    void display_sav_balance()
    {
        System.out.println("balance : " + balance);
    }
    void compute_sav_interest()
    {
        System.out.println("Interest of 5% shall be added to your
balance");
        balance = balance + (0.05 * balance);
    }
    void withdraw_sav()
    {
        System.out.println("Enter the amount to be withdrawn");
        amount = ss.nextDouble();
```

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```

balance = balance - amount;
}
}
class account extends Account
{
Scanner ss = new Scanner(System.in);
double amount;
final double min_balance = 5000;
void get_acc_balance()
{
System.out.println("Enter the amount to be placed in your
account");
amount = ss.nextDouble();
balance += amount;
}
void display_acc_balance()
{
System.out.println("balance=" + balance);
}
void compute_acc_service_charges()
{
if(balance < min_balance)
{
System.out.println("Service tax of rs.500 shall be levied");
balance = balance - 500;
}
else
{
}
}

```

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```

System.out.println("minimum balance is maintained");
}
}
void withdrawl_acc()
{
System.out.println("Enter the amount to be withdrawn");
amount = ss.nextDouble();
balance = balance - amount;
}
}
class bankmain
{
public static void main(String args[])
{
int type;
System.out.println("Enter the bank details");
Account acc = new Account();
acc.get_data();
type = acc.return_account_type();
}
}

```



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```
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System.out.println("minimum balance is maintained");
}
}
void withdrawl_wdc()
{
System.out.println("Enter the amount to be withdrawn");
amount=nextDouble();
balance=balance-amount;
}
class bankmain
{
public static void main(String args[])
{
int type;
System.out.println("Enter the bank details");
account acc=new account();
acc.get_data();
type=acc.return_account_type();
if(type==1)
{
System.out.println("SAVINGS ACCOUNT");
savings sav=new savings();
sav.set_sav_balance();
sav.display_sav_blnce();
sav.compute_sav_interest();
sav.display_sav_blnce();
sav.withdrawl_sav();
sav.display_sav_blnce();
}
}
}
```

```
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if (type==2)
{
System.out.println("CURRENT ACCOUNT");
current cur=new current();
cur.get_cer_balance();
cur.display_cer_balance();
cur.compute_cer_service_charges();
cur.display_cer_blnce();
cur.withdrawl_cer();
cur.display_cer_blnce();
}
}
}
```



```
enter the bank details
enter your name
priya
enter the account_number
35259767
choose the account type
1.savings account
2.current account
1
SAVINGS ACCOUNT
enter the amount to be placed in your savings account
5688
balance=5688.0
interest of 5% shall be added to your balance
balance=5972.4
enter the amount to be withdrawn
678
balance=5294.4
```

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.



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1BM19CS032

```
* Package CIE;
import java.util.Scanner;
public class Student
{
    public String name;
    public String usn;
    public int sem;
    public void display()
    {
        Scanner s = new Scanner(System.in);
        System.out.println("Name : ");
        name = s.nextLine();
        System.out.println("USN : ");
        usn = s.nextLine();
        System.out.println("Semester : ");
        sem = s.nextInt();
    }
}
Package SEE;
import java.util.*;
import CIE.*;
public class External extends CIE.Student
{
    public double sem[5];
    public void display()
    {
        sem = new double[5];
```

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```
Scanner s = new Scanner(System.in);
System.out.println("SEE Marks for 5 subjects out of
100 : ");
for(int i = 0; i < 5; i++)
    sem[i] = s.nextDouble();
}
}
import CIE.*;
import SEE.*;
import java.util.Scanner;
public class Main
{
    public static void main (String args[])
    {
        int n;
        Scanner s = new Scanner(System.in)
        System.out.println("Enter the number of students : ");
```



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```

import java.util.Scanner;
public class Main
{
    public static void main (String args[])
    {
        int n;
        Scanner s = new Scanner (System.in);
        System.out.println ("Enter the number of students: ");
        n = s.nextInt ();
        CIE.Student st[] = new CIE.Student [n];
        CIE.Internals in[] = new CIE.Internals [n];
        SEE.Externals e[] = new SEE.Externals [n];
        for (int i = 0; i < n; i++)
        {
            st[i] = new CIE.Student ();
            in[i] = new CIE.Internals ();

```

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```

e[i] = new SEE.Externals ();
st[i].display ();
in[i].display ();
e[i].display ();
System.out.println ("Total marks of student " + st[i].name + " in 5 subjects are: ");
for (int j = 0; j < 5; j++)
{
    System.out.println (in[i].itemc[i] + (e[i].seem[j]/2));
}
}
}
}
}

Package CIE;
import java.util.Scanner;
public class Internals extends Student
{
    public double itemc[];
    public void display ()
    {
        Itemc = new double [5];
        Scanner t = new Scanner (System.in);
        System.out.println ("CIE Marks for 5 subjects (out of 50): ");
        for (int i = 0; i < 5; i++)
        {
            itemc[i] = t.nextDouble ();
        }
    }
}

```



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```
on.                                         Command Prompt
C:\Users\Surendra\Desktop\packages>java Main
Enter the number of students:
2
Name:
saraswathi
USN:
1bm19cs032
Semester:
2
CIE Marks for 5 subjects(out of 50):
45
45
45
34
45
SEE Marks for 5 subjects(out of 100):
98
99
89
89
78
Total marks of student Saraswathi in 5 subjects are:
98.0
94.5
78.5
89.5
84.0
Name:
vidya
USN:
1bm19cs032
Semester:
3
CIE Marks for 5 subjects(out of 50):
45
45
34
34
45
SEE Marks for 5 subjects(out of 100):
89
89
78
78
98
Total marks of student Vidya in 5 subjects are:
89.5
89.5
73.0
72.0
98.0
C:\Users\Surendra\Desktop\packages>_
```

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



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IBM19C8032

```
class Generics <T,U,S>
{
    T obj1;
    U obj2;
    S obj3;
    Generics (T obj1, U obj2, S obj3)
    {
        this.obj1 = obj1;
        this.obj2 = obj2;
        this.obj3 = obj3;
    }
    public void print()
    {
        System.out.println(obj1);
        System.out.println(obj2);
        System.out.println(obj3);
    }
}
class Generics main
{
    public static void main (String [] args)
    {
        Generics<String, Integer, String>
        obj = new Generics<String, Integer, String> ("WEEK", 7, "LAB");
        obj.print();
    }
}
```

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```
--> setup for a list of pc  
C:\Users\Surendra\Desktop>j  
C:\Users\Surendra\Desktop>j  
WEEK  
?  
LAB-PROGRAM  
C:\Users\Surendra\Desktop>_
```

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 Wrong Age( ) when the input age=father's age.



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```

* class WrongAge extends Exception
{
    public String toString()
    {
        return "Please enter the right age: "+son's ages
            Father's age";
    }
}

class Father
{
    int age;
    Father(int age)
    {
        age=age;
        System.out.println("Father age: "+age);
    }
}

class Son extends Father
{
    Son(int age)
    {
        super(age);
        System.out.println("Son age: "+age);
    }
}

class AOE_main
{
    public static void main (String args[])
    throws WrongAge
}

```

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```

int i= args.length;
int j= Integer.parseInt(args[0]);
int k= Integer.parseInt(args[1]);
if (i==0 || k<j)
{
    throw new WrongAge();
}
else
{
    Father f= new Father(j);
    Son s= new Son(k);
}

```



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```
LAB-PROGRAM
C:\Users\Surendra\Desktop>javac AGE_main1.java
C:\Users\Surendra\Desktop>java AGE_main1 23 45
Exception in thread "main" Please enter the right age:Son's age > Father's age
at AGE_main1.main(AGE_main1.java:36)
C:\Users\Surendra\Desktop>
```



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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.



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SARASWATHI.B  
IBM19CS032

```
* class Thread1 implements Runnable {  
    String name;  
    Thread t;  
    int time;  
    Thread1 (String threadname, int time) {  
        name = threadname;  
        this.time = time;  
        t = new Thread (this, name);  
        System.out.println ("thread : " + t);  
        t.start ();  
    }  
    public void run () {  
        try {  
            for (int i = 5; i > 0; i--) {  
                System.out.println (name);  
                Thread.sleep (time);  
            }  
        } catch (InterruptedException e) {  
            System.out.println (name + " interrupted");  
        }  
        System.out.println (name + " exiting.");  
    }  
}  
class Thread main {  
    public static void main (String args[]) {  
        Thread1 t1 = new Thread1 ("BMS COLLEGE OF ENGINEERING", 10000);  
        Thread1 t2 = new Thread1 ("COMPUTER SCIENCE AND ENGINEERING", 2000);  
    }  
}
```

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```
C:\Users\Surendra>java -version
Java version "13.0.2" 2020-01-14
Java(TM) SE Runtime Environment (build 13
C:\Users\Surendra>cd desktop
C:\Users\Surendra\Desktop>javac threadmain
C:\Users\Surendra\Desktop>java threadmain
thread:Thread[BMS COLLEGE OF ENGINEERING,
thread:Thread[COMPUTER SCIENCE AND ENGINEERING
BMS COLLEGE OF ENGINEERING
COMPUTER SCIENCE AND ENGINEERING
BMS COLLEGE OF ENGINEERING exiting.
COMPUTER SCIENCE AND ENGINEERING
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```

Scan



Edit with WPS Office

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.



```
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
public class IntegerDivision extends Frame implements ActionListener {
    JTextField n1,n2,res;
    JLabel l1,l2,lres;
    JButton b;
    public IntegerDivision() {
        setLayout(new FlowLayout());
        Label l1 = new Label("NUMBER1",Label.LEFT);
        Label l2 = new Label("NUMBER2",Label.LEFT);
        Label lres = new Label("RESULT",Label.RIGHT);
        n1 = new JTextField(12);
        n2 = new JTextField(12);
        res = new JTextField(12);
        b = new JButton("DIVIDE");
        add(l1);
        add(n1);
        add(l2);
        add(n2);
        add(b);
        add(lres);
        add(res);
        b.addActionListener(this);
        addWindowListener(new WindowAdapter());
    }
    public void actionPerformed(ActionEvent ae)
    {
        if(ae.getSource() == b)
        {
            try {

```

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```
                int num1= Integer.parseInt(n1.getText());
                int num2= Integer.parseInt(n2.getText());
                int num3= num1/num2;
                res.setText(String.valueOf((num3)));
            }
            catch (NumberFormatException ne) {
                JOptionPane.showMessageDialog(this, "ERROR", JOptionPane.ERROR_MESSAGE);
            }
        }
    }
    public static void main(String args[])
    {
        IntegerDivision i = new IntegerDivision();
        i.setSize(new Dimension(400,400));
        i.setTitle("INTEGER DIVISION OF TWO NUMBERS");
        i.setVisible(true);
    }
    class WindowAdapter extends WindowAdapter {
        public void windowClosing(WindowEvent we)
        {
            System.exit(0);
        }
    }
}
```

