B.M.S COLLEGE OF ENGINEERING BENGALURU

Autonomous Institute, Affiliated to VTU

LAB REPORT

23CS3PCOOJ

Submitted in partial fulfillment of the
requirements for Lab Bachelor of Engineering
in
Computer Science and Engineering

Submitted by:

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INDEX

Sl-No	Title Name	Date	Page no
1	Lab Program 1	22-12-2024	1-2
2	Lab Program 2	29-12-2024	3-5
3	Lab Program 3	12-01-2024	6-8
4	Lab Program 4	12-01-2024	9-11
5	Lab Program 5	19-01-2024	12-17
6	Lab Program 6	02-02-2024	18-20
7	Lab Program 7	16-02-2024	21-23
8	Lab Program 8	16-02-2024	24-26
9	Lab Program 9	23-02-2024	27-30

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:

```
import java.util.Scanner;

public class New{

  public static void main(String[] args) {

    Scanner scanner = new Scanner(System.in);

    System.out.println("Enter the coefficients of the quadratic equation (a, b, c):");

    double a = scanner.nextDouble();

    double b = scanner.nextDouble();

    double c = scanner.nextDouble();

    double discriminant = b * b - 4 * a * c

    if (discriminant > 0) {

      double root1 = (-b + Math.sqrt(discriminant)) / (2 * a);

      double root2 = (-b - Math.sqrt(discriminant)) / (2 * a);

      System.out.println("The roots of the quadratic equation are: " + root1 + " and " + root2);

    }

     else if (discriminant == 0) {

      double root = -b / (2 * a);

      System.out.println("The root of the quadratic equation is: " + root);

    }

     else {

      System.out.println("The quadratic equation has no real solutions.");
```

```
    }
    System.out.println("Name: Arbaj Wadagera.");
  }  System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051>javac New.java

C:\Users\arbaa\Desktop\CS051>java New
Enter the coefficients of the quadratic equation (a, b, c):
1
5
2
The roots of the quadratic equation are: -0.4384471871911697 and -4.561552812808831
Name: Arbaj Wadagera.
USN: 1BM22CS051.

C:\Users\arbaa\Desktop\CS051>java New
Enter the coefficients of the quadratic equation (a, b, c):
1
2
1
The root of the quadratic equation is: -1.0
Name: Arbaj Wadagera.
USN: 1BM22CS051.

C:\Users\arbaa\Desktop\CS051>java New
Enter the coefficients of the quadratic equation (a, b, c):
4
2
2
The quadratic equation has no real solutions.
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

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.Scanner;

class Student {

  Scanner s = new Scanner(System.in);

  String usn;

  String name;

  int[] credits = new int[5];

  int[] marks = new int[5];

  public void entered() {

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

    usn = s.next();

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

    name = s.next();

    for (int i = 0; i < 5; i++) {

      System.out.println("Enter the number of credits for Subject " + (i + 1) + ":");

      credits[i] = s.nextInt();

      System.out.println("Enter the marks for Subject " + (i + 1) + ":");

      marks[i] = s.nextInt();

    }

  }

  public void displayDetails() {

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

```
        System.out.println("Your name is: " + name);
        for (int i = 0; i < 5; i++) {
            System.out.println("Your entered marks for Subject " + (i + 1) + " are: " + marks[i]);
        }
    }
    public void Spga() {
        float sgpa = 0;
        for (int j = 0; j < 5; j++) {
            sgpa += credits[j] * ((marks[j] / 10) + 1);
        }
        System.out.println("Your SGPA is: " + sgpa / 120);
    }
}
public class Main {
    public static void main(String[] args) {
        Student p = new Student();
        p.entered();
        p.displayDetails();
        p.Spga();
        System.out.println("Name: Arbaj Wadagera.");
        System.out.println("USN: 1BM22CS051.");
    }
}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051>javac Main.java

C:\Users\arbaa\Desktop\CS051>java Main
Enter your USN:
1BM22CS051
Enter your name:
Arbaj
Enter the number of credits for Subject 1:
4
Enter the marks for Subject 1:
87
Enter the number of credits for Subject 2:
4
Enter the marks for Subject 2:
98
Enter the number of credits for Subject 3:
3
Enter the marks for Subject 3:
67
Enter the number of credits for Subject 4:
2
Enter the marks for Subject 4:
67
Enter the number of credits for Subject 5:
1
Enter the marks for Subject 5:
49
Your USN is: 1BM22CS051
Your name is: Arbaj
Your entered marks for Subject 1 are: 87
Your entered marks for Subject 2 are: 98
Your entered marks for Subject 3 are: 67
Your entered marks for Subject 4 are: 67
Your entered marks for Subject 5 are: 49
Your SGPA is: 0.96666664
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

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.Scanner;

class Book {

  String name;

  String author;

  float price;

  int num_pages;

  void setDetails() {

    Scanner sc = new Scanner(System.in);

    System.out.println("Enter book name, author, price, num-pages:");

    name = sc.next();

    author = sc.next();

    price = sc.nextFloat();

    num_pages = sc.nextInt();

  }

  String getDetails() {

    return "The book '" + name + "' written by " + author + " consists of " +

        num_pages + " pages and costs $" + price;

  }

  public String toString() {

    return getDetails();

  }
```

```
}

public class Main {

   public static void main(String[] args) {

      Scanner scan = new Scanner(System.in);

      System.out.println("Enter the number of books you want to generate:");

      int no = scan.nextInt();

      Book[] books = new Book[no];

      for (int i = 0; i < no; i++) {

         Book book = new Book();

         book.setDetails();

         books[i] = book;

      }

      System.out.println("Book details:");

      for (int i = 0; i < no; i++) {

         System.out.println(books[i].getDetails());

      }
     System.out.println("Name: Arbaj Wadagera.");
   }  System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051\new>javac Main.java

C:\Users\arbaa\Desktop\CS051\new>java Main
Enter the number of books you want to generate:
2
Enter book name, author, price, num-pages:
Violent_killer
Arbaaz
99
140
Enter book name, author, price, num-pages:
Think_Like_Me
Salman_khan
890
70
Book details:
The book 'Violent_killer' written by Arbaaz consists of 140 pages and costs $99.0
The book 'Think_Like_Me' written by Salman_khan consists of 70 pages and costs $890.0
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

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:

```
import java.util.Scanner;

abstract class Shapes {

   protected int a;

   protected int b;



   public abstract void printArea();

}

class Rectangle extends Shapes {

   public Rectangle(int l, int br) {

      a = l;

      b = br;

   }

   public void printArea() {

      int area = a * b;

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

   }

}

class Triangle extends Shapes {

   public Triangle(int base, int height) {

      a = base;
```

```
    b = height;
  }
  public void printArea() {
    double area = 0.5 * a * b;
    System.out.println("Area of Triangle: " + area);
  }
}
class Circle extends Shapes {
  public Circle(int radius) {
    a = radius;
  }
  public void printArea() {
    double area = Math.PI * a * a;
    System.out.println("Area of Circle: " + area);
  }
}
public class Main {
  public static void main(String[] args) {
    Scanner in = new Scanner(System.in);
    System.out.println("Enter length and width of a rectangle:");
    Rectangle rec = new Rectangle(in.nextInt(), in.nextInt());
    rec.printArea();
    System.out.println("Enter base and height of a triangle:");
    Triangle tri = new Triangle(in.nextInt(), in.nextInt());
    tri.printArea();
    System.out.println("Enter the radius of a circle:");
    Circle cir = new Circle(in.nextInt());
```

```
        cir.printArea();
        System.out.println("Name: Arbaj Wadagera.");
    }   System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051\new4>javac Main.java

C:\Users\arbaa\Desktop\CS051\new4>java Main
Enter length and width of a rectangle:
20
12
Area of Rectangle: 240
Enter base and height of a triangle:
60
120
Area of Triangle: 3600.0
Enter the radius of a circle:
4
Area of Circle: 50.265482457436691
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

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 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.

code:

```
import java.util.Scanner;

abstract class Account {

  String customerName;

  long accNo;

  String accountType;

  double balance;

  public Account(String customerName, long accNo, String accountType) {

    this.customerName = customerName;

    this.accNo = accNo;

    this.accountType = accountType;

    this.balance = 0.0;

  }
```

```
    public void displayBalance() {
        System.out.println("Account Number: " + accNo);
        System.out.println("Customer Name: " + customerName);
        System.out.println("Balance: $" + balance);
    }
    abstract void withdraw(double amount);
}
class CurrAcc extends Account {
    double serviceCharge;
    double minBalance;
    public CurrAcc(String customerName, long accNo) {
        super(customerName, accNo, "Current");
        this.serviceCharge = 0.0;
        this.minBalance = 500.0;
    }
    public void withdraw(double amount) {
        if (balance - amount >= minBalance) {
            balance -= amount;
            System.out.println("Withdrawal successful. Current Balance: $" + balance);
        } else {
            System.out.println("Insufficient funds. Withdrawal not allowed.");
        }
    }
    public void imposeServiceCharge() {
        if (balance < minBalance) {
            balance -= serviceCharge;
            System.out.println("Service charge imposed. Current Balance: $" + balance);
```

```
        }
    }
}
class SavAcc extends Account {
    double interestRate;
    public SavAcc(String customerName, long accNo) {
        super(customerName, accNo, "Savings");
        this.interestRate = 0.05;
    }
    public void withdraw(double amount) {
        balance -= amount;
        System.out.println("Withdrawal successful. Current Balance: $" + balance);
    }
    public void depositInterest() {
        double interest = balance * interestRate;
        balance += interest;
         System.out.println("Interest deposited. Current Balance: $" + balance);
    }
    public void compoundInterest(double initialAmount, int term) {
        double compoundInterest = initialAmount * Math.pow((1 + interestRate), term) - initialAmount;
        balance += compoundInterest;
        System.out.println("Compound interest calculated. Current Balance: $" + balance);
    }
}
public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
```

```
System.out.println("Enter account type (1. Current, 2. Savings): ");
int choice = scanner.nextInt();
if (choice == 1) {
    System.out.println("Enter customer name: ");
    String customerName = scanner.next();
    System.out.println("Enter account number: ");
    long accNo = scanner.nextLong();
    CurrAcc currAccount = new CurrAcc(customerName, accNo);
    System.out.println("Enter initial balance: ");
    double initialBalance = scanner.nextDouble();
    currAccount.balance = initialBalance;
    System.out.println("Enter withdrawal amount: ");
    double withdrawalAmount = scanner.nextDouble();
    currAccount.withdraw(withdrawalAmount);
    System.out.println("Enter interest rate: ");
    double interestRate = scanner.nextDouble();
    currAccount.imposeServiceCharge();
    currAccount.displayBalance();
} else if (choice == 2) {
    System.out.println("Enter customer name: ");
    String customerName = scanner.next();
    System.out.println("Enter account number: ");
    long accNo = scanner.nextLong();
    SavAcc savAccount = new SavAcc(customerName, accNo);
    System.out.println("Enter initial balance: ");
    double initialBalance = scanner.nextDouble();
    savAccount.balance = initialBalance;
```

```
        System.out.println("Enter withdrawal amount: ");
        double withdrawalAmount = scanner.nextDouble();
        savAccount.withdraw(withdrawalAmount);
        System.out.println("Enter interest rate: ");
        double interestRate = scanner.nextDouble();
        savAccount.depositInterest();
        savAccount.displayBalance();
    } else {
        System.out.println("Invalid choice.");
    }
    System.out.println("Name: Arbaj Wadagera.");
  }  System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051\new5>javac Main.java

C:\Users\arbaa\Desktop\CS051\new5>java Main
Enter account type (1. Current, 2. Savings):
2
Enter customer name:
Arbaj
Enter account number:
63310100024650
Enter initial balance:
47036
Enter withdrawal amount:
3078
Withdrawal successful. Current Balance: $43958.0
Enter interest rate:
5
Interest deposited. Current Balance: $46155.9
Account Number: 63310100024650
Customer Name: Arbaj
Balance: $46155.9
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

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:

```
package CIE;

import java.util.Scanner;

public class Student {

   public int sem;

   public String usn;

   public String name;

   public int[] im = new int[5]; // Changed from internal marks to im

   public void accept() {

      Scanner scan = new Scanner(System.in);

      System.out.println("Enter USN, Name, and Semester:");

      usn = scan.nextLine();

      name = scan.nextLine();

      sem = scan.nextInt();

   }

}

package SEE;

import CIE.Student;

public class External extends Student {

   public int sm[] = new int[5]; // Changed from SEE marks to sm
```

```
}

import java.util.Scanner;

import SEE.External;

import CIE.Student;

public class FinalMarks {

   public static void main(String args[]) {

      int fm[] = new int[5];

      Scanner sc = new Scanner(System.in);

      System.out.println("Enter n: ");

      int n = sc.nextInt();

      External st[] = new External[n];

      Student s[] = new Student[n];

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

         st[i] = new External();

         s[i] = new Student();

         System.out.println("Enter details for student " + (i + 1));

         s[i].accept();

         for (int j = 0; j < 5; j++) {

            System.out.println("Enter im and sm of subject " + (j + 1));

            s[i].im[j] = sc.nextInt();

            st[i].sm[j] = sc.nextInt();

            fm[j] = s[i].im[j] + st[i].sm[j];

         }

         System.out.println("Final marks of " + s[i].name);

         for (int k = 0; k < 5; k++) {

            System.out.println("Subject " + (k + 1) + " = " + fm[k]);

         }
```

```
    System.out.println("Name: Arbaj Wadagera.");

    System.out.println("USN: 1BM22CS051.");

      }
     System.out.println("Name: Arbaj Wadagera.");
   } System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051>javac FinalMarks.java

C:\Users\arbaa\Desktop\CS051>java FinalMarks
Enter n:
1
Enter details for student 1
Enter USN, Name, and Semester:
051
Arbaj
3
Enter im and sm of subject 1
15
92
Enter im and sm of subject 2
36
93
Enter im and sm of subject 3
39
90
Enter im and sm of subject 4
26
87
Enter im and sm of subject 5
32
86
Final marks of Arbaj
Subject 1 = 107
Subject 2 = 129
Subject 3 = 129
Subject 4 = 113
Subject 5 = 118
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```

PROGRAM_7:

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.

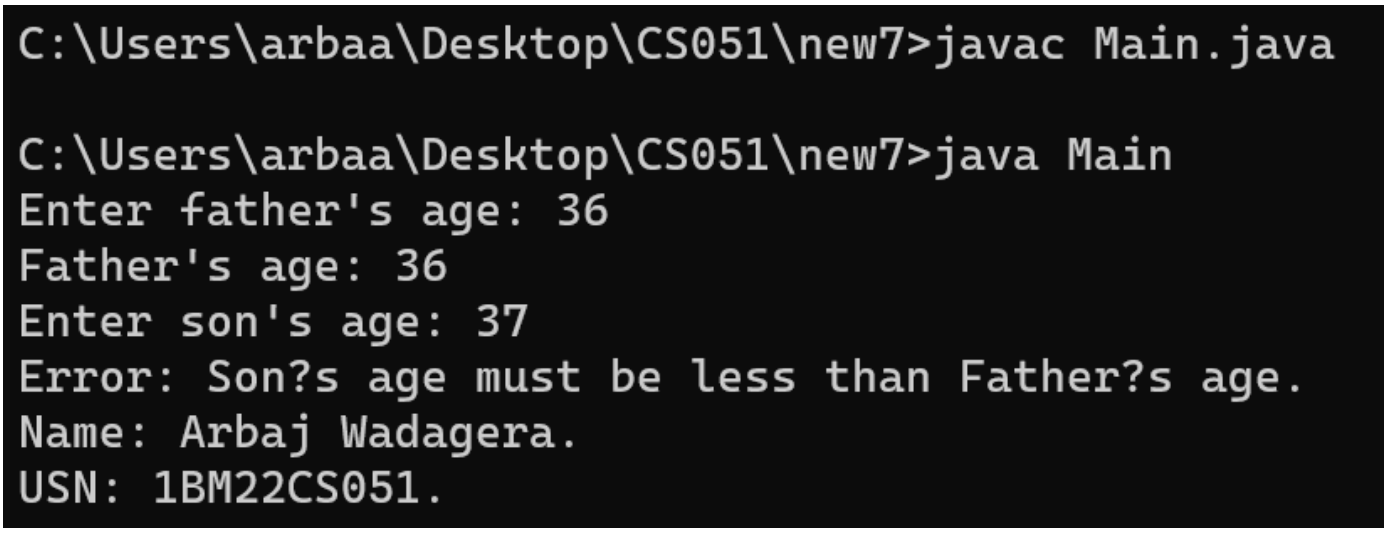
code:

```
import java.util.Scanner;

class WrongAge extends Exception {

  public WrongAge() {

    super("Son’s age must be less than Father’s age");

  }

}

class Father {

  private int age;

  public Father(int age) throws WrongAge {

    if (age < 0) {

      throw new WrongAge();

    }

    this.age = age;

  }

  public int getAge() {

    return age;

  }

}

class Son extends Father {
```

```
    private int sonAge;
    public Son(int fatherAge, int sonAge) throws WrongAge {
        super(fatherAge);
        if (sonAge >= fatherAge) {
            throw new WrongAge();
        }
        this.sonAge = sonAge;
    }
    public int getSonAge() {
        return sonAge;
    }
}
public class Main {
    public static void main(String[] args) {
        try {
            Scanner scanner = new Scanner(System.in);
            System.out.print("Enter father's age: ");
            int fatherAge = scanner.nextInt();
            Father father = new Father(fatherAge);
            System.out.println("Father's age: " + father.getAge());
            System.out.print("Enter son's age: ");
            int sonAge = scanner.nextInt();
            Son son = new Son(fatherAge, sonAge);
            System.out.println("Son's age: " + son.getSonAge());
            Son invalidSon = new Son(fatherAge, 55);
            System.out.println("This line will not be executed.");
        } catch (WrongAge e) {
```

```
            System.out.println("Error: " + e.getMessage());

        }
        System.out.println("Name: Arbaj Wadagera.");
        System.out.println("USN: 1BM22CS051.");
    }

}
```

OUTPUT:



PROGRAM_8:

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 A extends Thread {
  public void run() {
    int i = 0;
    while (i < 5) {
      i++;
      try {
        System.out.println("BMS College of Engineering");
        Thread.sleep(10000);
      } catch (InterruptedException e) {
        e.printStackTrace();
      }
    }
  }
}
class B extends Thread {
  public void run() {
    int i = 0;
    while (i < 5) {
      i++;
      try {
        System.out.println("CSE");
```

```
            Thread.sleep(2000);
        } catch (InterruptedException e) {
            e.printStackTrace();
        }
    }
  }
}
public class I {
  public static void main(String[] args) {
    A t1 = new A();
    B t2 = new B();
    t1.start();
    t2.start();
    System.out.println("Name: Arbaj Wadagera.");
  }  System.out.println("USN: 1BM22CS051.");
}
```

OUTPUT:

```
C:\Users\arbaa\Desktop\CS051>javac I.java

C:\Users\arbaa\Desktop\CS051>java I
Name: Arbaj Wadagera.
USN: 1BM22CS051.
BMS College of Engineering
CSE
CSE
CSE
CSE
CSE
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
BMS College of Engineering
```

PROGRAM_9:

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.

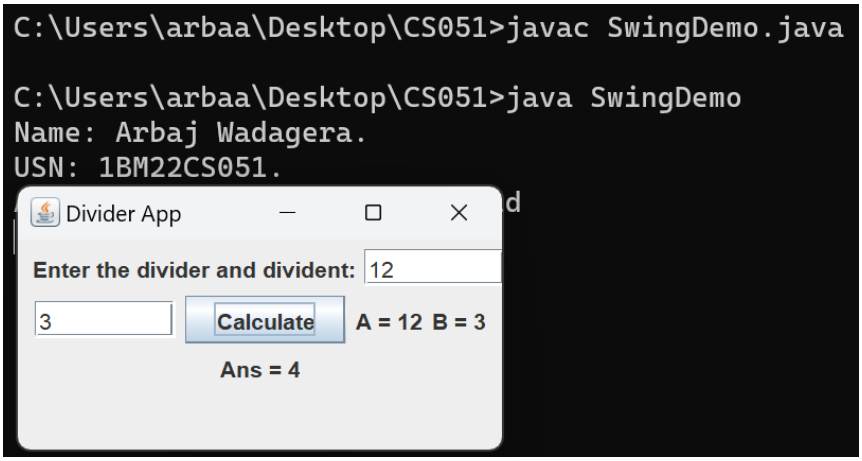
code:

```
import javax.swing.*;

import java.awt.*;

import java.awt.event.*;

class SwingDemo {

  SwingDemo() {

    JFrame jfrm = new JFrame("Divider App");

    jfrm.setSize(275, 150);

    jfrm.setLayout(new FlowLayout());

    jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);

    JLabel jlab = new JLabel("Enter the divider and divident:");

    JTextField ajtf = new JTextField(8);

    JTextField bjtf = new JTextField(8);

    JButton button = new JButton("Calculate");

    JLabel err = new JLabel();

    JLabel alab = new JLabel();

    JLabel blab = new JLabel();

    JLabel anslab = new JLabel();

    jfrm.add(err);

    jfrm.add(jlab);
```

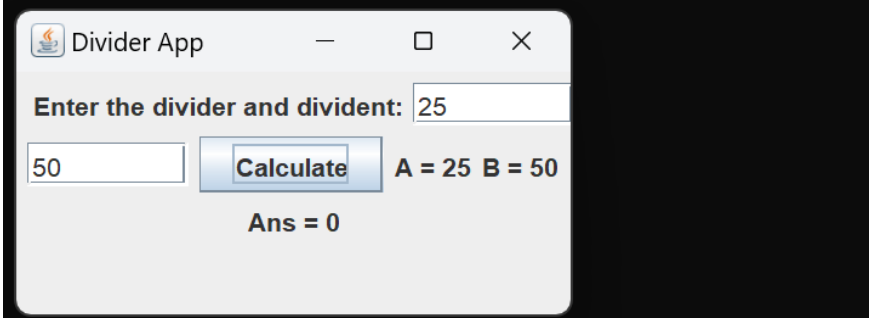
```
jfrm.add(ajtf);

jfrm.add(bjtf);

jfrm.add(button);

jfrm.add(alab);

jfrm.add(blab);

jfrm.add(anslab);

ActionListener l = new ActionListener() {

  public void actionPerformed(ActionEvent evt) {

    System.out.println("Action event from a text field");

  }

};

ajtf.addActionListener(l);

bjtf.addActionListener(l);

button.addActionListener(new ActionListener() {

  public void actionPerformed(ActionEvent evt) {

    try {

      int a = Integer.parseInt(ajtf.getText());

      int b = Integer.parseInt(bjtf.getText());

      int ans = a / b;

      alab.setText("\nA = " + a);

      blab.setText("\nB = " + b);

      anslab.setText("\nAns = " + ans);

    } catch (NumberFormatException e) {

      alab.setText("");

      blab.setText("");

      anslab.setText("");

      err.setText("Enter Only Integers!");
```

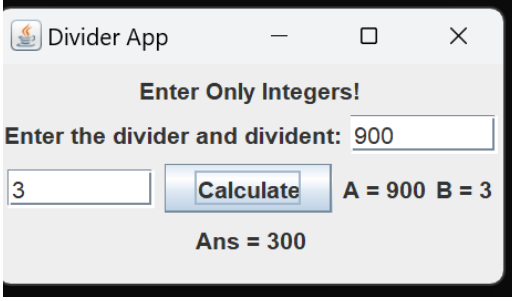
```
            } catch (ArithmeticException e) {
                alab.setText("");
                blab.setText("");
                anslab.setText("");
                err.setText("B should be NON zero!");
            }
        }
    });
    jfrm.setVisible(true);
  }
  public static void main(String args[]) {
    SwingUtilities.invokeLater(new Runnable() {
      public void run() {
        new SwingDemo();
      }
    });
    System.out.println("Name: Arbaj Wadagera.");
  }  System.out.println("USN: 1BM22CS051.");

}
```

OUTPUT:



```
C:\Users\arbaa\Desktop\CS051>javac SwingDemo.java

C:\Users\arbaa\Desktop\CS051>java SwingDemo
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```




```
C:\Users\arbaa\Desktop\CS051>javac SwingDemo.java

C:\Users\arbaa\Desktop\CS051>java SwingDemo
Name: Arbaj Wadagera.
USN: 1BM22CS051.
```