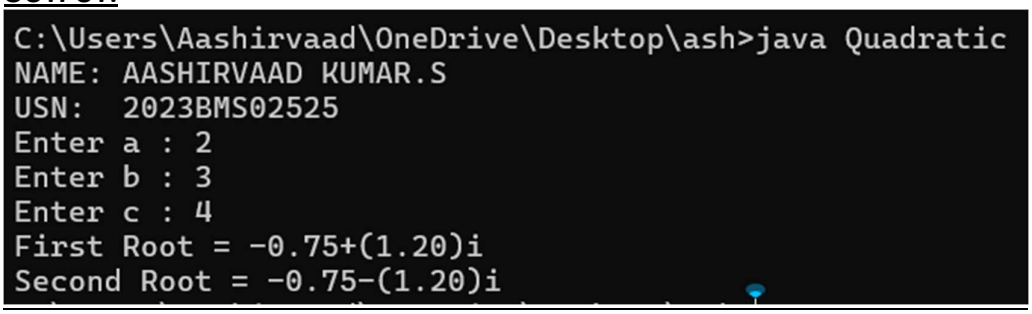
# LAB-01 QUADRATIC EQUATION

## Program:

```
import java.util.Scanner;
class QuadRoots {
   double a, b, c, firstroot, secondroot;

   QuadRoots(double a, double b, double c) {
      this.a = a;
      this.b = b;
      this.c = c;
   }

   void Eval() {
      double det = b * b - 4 * a * c;

      if (det > 0) {
                        firstroot = (-b + Math.sqrt(det)) / (2 * a);
                        secondroot = (-b - Math.sqrt(det)) / (2 * a);
                        System.out.format("First Root = %.2f and Second Root = %.2f",
firstroot, secondroot);
                }
                else if (det == 0) {
                        firstroot = secondroot = -b / (2 * a);
                        System.out.format("First Root = Second Root = %.2f;", firstroot);
      }
                else {
                        double real = -b / (2 * a);
                        double img = Math.sqrt(-det) / (2 * a);
                        System.out.printf("First Root = %.2f+(%.2f)i", real, img);
                        System.out.printf("\nSecond Root = %.2f-(%.2f)i", real, img);
                }
   }

}
class QRun {
         public static void main(String[] args) {

      System.out.println("NAME: AASHIRVAAD KUMAR.S");
      System.out.println("USN:  2023BMS02525");

                double a, b, c;
      Scanner sc = new Scanner(System.in);
      System.out.print("Enter a : ");
      a = sc.nextDouble();
      System.out.print("Enter b : ");
```

```
        b = sc.nextDouble();
        System.out.print("Enter c : ");
        c = sc.nextDouble();

        QuadRoots q = new QuadRoots(a, b, c);
        q.Eval();

        sc.close();
            }
}
```

**OUTPUT:**



# LAB-02 SGPA

# Program:

```
import java.util.Scanner;

class Student {
   private String usn;
   private String name;
   private int[] credits;
   private int[] marks;

   public Student(String usn, String name, int[] credits, int[] marks) {
      this.usn = usn;
      this.name = name;
      this.credits = credits;
      this.marks = marks;
   }

   public void acceptDetails(Scanner sc) {
      System.out.print("Enter USN:  ");
      this.usn = sc.next();

      System.out.print("Enter Name:  ");
      this.name = sc.next();
      sc.next();

      this.marks = new int[credits.length];
      for (int i = 0; i < credits.length; i++) {
         System.out.print("Enter marks for subject " + (i + 1) + ":  ");
         this.marks[i] = sc.nextInt();
      }
   }

   public void displayDetails() {
      System.out.println("USN: " + this.usn);
      System.out.println("Name: " + this.name);
      System.out.print("Credits: ");
      for (int i = 0; i < credits.length; i++) {
         System.out.print(credits[i]);
         if(i + 1 != marks.length) System.out.print(", ");
      }
      System.out.println();
      System.out.print("Marks: ");
      for (int i = 0; i < marks.length; i++) {
         System.out.print(marks[i]);
         if(i + 1 != marks.length) System.out.print(", ");
```

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

    public double calculateSGPA() {
        double totalCredits = 0;
        double totalGradePoints = 0;
        for (int i = 0; i < credits.length; i++) {
            totalCredits += credits[i];
            totalGradePoints += calculateGradePoint(marks[i]) * credits[i];
        }
        return totalGradePoints / totalCredits;
    }

    private double calculateGradePoint(int mark) {
        if (mark >= 90) return 10;
        else if (mark >= 80) return 9;
        else if (mark >= 70) return 8;
        else if (mark >= 60) return 7;
        else if (mark >= 50) return 6;
        else if (mark >= 40) return 5;
        else return 0;
    }
}

class Student1 {
    public static void main(String[] args) {

        System.out.println("NAME: AASHIRVAAD KUMAR S");
        System.out.println("USN:  2023BMS02525\n");

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter the number of subjects:  ");
        int numOfSubjects = sc.nextInt();

        int[] credits = new int[numOfSubjects];
        System.out.println("Enter credits for each subject:");
        for (int i = 0; i < numOfSubjects; i++) {
            credits[i] = sc.nextInt();
        }

        Student student = new Student("", "", credits, new int[numOfSubjects]);
        student.acceptDetails(sc);
        student.displayDetails();
        System.out.println("SGPA: " + student.calculateSGPA());
```

```
        sc.close();
    }
}
```

**OUTPUT:**

```
C:\Users\Aashirvaad\OneDrive\Desktop\ash>java Student1
NAME: AASHIRVAAD KUMAR S
USN:  2023BMS02525

Enter the number of subjects:  2
Enter credits for each subject:
3
4
Enter USN:  24
Enter Name:  arjun
a
Enter marks for subject 1:  85
Enter marks for subject 2:  96
USN: 24
Name: arjun
Credits: 3, 4
Marks: 85, 96
SGPA: 9.571428571428571
```

# LAB-03 CREATING BOOK OBJECT

## Program:

```
import java.util.Scanner;

class Books {
   String name;
   String author;
   int price;
   int numPages;

   Books() {}
   Books(String name, String author, int price, int numPages) {
      this.name = name;
      this.author = author;
      this.price = price;
      this.numPages = numPages;
   }

   public String toString() {
      return "Book Name: " + name + "\n" +
           "Author Name: " + author + "\n" +
           "Price: " + price + "\n" +
           "Number of Pages: " + numPages + "\n";
   }
}

class Book{
   public static void main(String[] args) {
      System.out.println("NAME: AASHIRVAAD KUMAR.S");
      System.out.println("USN: 2023BMS02525\n");

      Scanner sc = new Scanner(System.in);
      int n;
      String name, author;
      int price, numPages;

      System.out.print("Enter the number of books: ");
      n = sc.nextInt();
      sc.nextLine();

      Books[] b = new Books[n];
```

```
    for(int i = 0; i < n; i++) {
      System.out.println("Books " + (i + 1) + ": ");
      System.out.print("Enter name of the book: ");
      name = sc.nextLine();
      System.out.print("Enter Author: ");
      author = sc.nextLine();
      System.out.print("Enter price: ");
      price = sc.nextInt();
      sc.nextLine();
      System.out.print("Enter number of pages: ");
      numPages = sc.nextInt();
      sc.nextLine();
      b[i] = new Books(name, author, price, numPages);
    }

    for (int i = 0; i < n; i++) {
      System.out.println("Book: " + (i + 1) + "\n" + b[i]);
    }
    sc.close();
  }
}
```

**OUTPUT:**

```
C:\Users\Aashirvaad\OneDrive\Desktop\ash>java Book1
NAME: AASHIRVAAD KUMAR.S
USN: 2023BMS02525

Enter the number of books: 2
Books 1:
Enter name of the book: Wings Of Fire
Enter Author: APJ ABDUL KALAM
Enter price: 500
Enter number of pages: 98
Books 2:
Enter name of the book: You cant hurt me
Enter Author: DAVID GOGINS
Enter price: 400
Enter number of pages: 78
Book: 1
Book Name: Wings Of Fire
Author Name: APJ ABDUL KALAM
Price: 500
Number of Pages: 98

Book: 2
Book Name: You cant hurt me
Author Name: DAVID GOGINS
Price: 400
Number of Pages: 78
```

# LAB-04 ABSTRACT CLASS NAMED SHAPE

## Program:

```
abstract class Shape {
   public int side1, side2;
   abstract void printArea();
}


class Rectangle extends Shape {
   Rectangle(int length, int breadth) {
      this.side1 = length;
      this.side2 = breadth;
   }
   void printArea() {
      System.out.println("The Area of Rectangle : " + (side1 * side2));
   }
}

class Triangle extends Shape {
   Triangle(int base, int height) {
      this.side1 = base;
      this.side2 = height;
   }
   void printArea() {
      System.out.println("The Area of Triangle : " + (0.5 * side1 * side2));
   }
}

class Circle extends Shape {
   Circle(int rad) {
      this.side1 = this.side2 = rad;
   }
   void printArea() {
      System.out.println("The Area of Circle : " + (3.14 * side1 * side2));
   }
}


class Shape1{
   public static void main(String[] args) {
```

```
        System.out.println("NAME: AASHIRVAAD KUMAR.S");
        System.out.println("USN:  2023BMS02525\n");

        Rectangle r = new Rectangle(10, 10);
        Triangle t = new Triangle(5, 10);
        Circle c = new Circle(5);

        r.printArea();
        t.printArea();
        c.printArea();
    }
}
```

**OUTPUT:**

```
C:\Users\Aashirvaad\OneDrive\Desktop\ash>java Shape1
NAME: AASHIRVAAD KUMAR.S
USN:  2023BMS02525

The Area of Rectangle : 100
The Area of Triangle : 25.0
The Area of Circle : 78.5
```

# LAB-05 BANK

# Program:

```
import java.util.Scanner;

abstract class Account {
   String customerName;
   int accountNumber;
   String accountType;
   double balance;

   Account(String customerName, int accountNumber, String accountType, double balance) {
      this.customerName = customerName;
      this.accountNumber = accountNumber;
      this.accountType = accountType;
      this.balance = balance;
   }

   abstract void deposit(double amount);

   abstract void displayBalance();

   abstract void computeInterest();

   abstract void withdraw(double amount);
}

class SavingsAccount extends Account {
   SavingsAccount(String customerName, int accountNumber, String accountType, double
balance) {
      super(customerName, accountNumber, accountType, balance);
   }

   void deposit(double amount) {
      balance += amount;
      System.out.println("Amount deposited: " + amount);
   }

   void displayBalance() {
      System.out.println("Balance: " + balance);
   }

   void computeInterest() {
```

```
        double interestRate = 0.05;
        double interest = balance * interestRate;
        balance += interest;
        System.out.println("Interest added: " + interest);
    }

    void withdraw(double amount) {
        if (balance < amount) {
            System.out.println("Insufficient balance");
        } else {
            balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
        }
    }
}

class CurrentAccount extends Account {
    double minimumBalance = 1000;
    double serviceCharge = 50;

    CurrentAccount(String customerName, int accountNumber, String accountType, double
balance) {
        super(customerName, accountNumber, accountType, balance);
    }

    void deposit(double amount) {
        balance += amount;
        System.out.println("Amount deposited: " + amount);
    }

    void displayBalance() {
        System.out.println("Balance: " + balance);
    }

    void computeInterest() {
        System.out.println("Current account does not earn interest");
    }

    void withdraw(double amount) {
        if (balance - amount < minimumBalance) {
            System.out.println("Insufficient balance");
            balance -= serviceCharge;
            System.out.println("Service charge: " + serviceCharge);
        } else {
```

```
            balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
        }
    }
}

class Brun {
    public static void main(String[] args) {

        System.out.println("NAME: AASHIRVAAD KUMAR.S");
        System.out.println("USN:  2023BMS02525\n");

        Scanner sc = new Scanner(System.in);

        System.out.print("Enter customer name: ");
        String customerName = sc.nextLine();

        System.out.print("Enter account number: ");
        int accountNumber = sc.nextInt();

        System.out.print("Enter account type (savings/current): ");
        String accountType = sc.next();

        System.out.print("Enter initial balance: ");
        double balance = sc.nextDouble();

        Account account;
        if (accountType.equals("savings")) {
            account = new SavingsAccount(customerName, accountNumber, accountType,
balance);
        } else {
            account = new CurrentAccount(customerName, accountNumber, accountType,
balance);
        }

        System.out.println("\n###-MENU-###");
        System.out.println("1. Deposit");
        System.out.println("2. Display balance");
        System.out.println("3. Compute interest");
        System.out.println("4. Withdraw");
        System.out.println("5. Exit\n");

        while (true) {
            System.out.print("Enter choice: ");
```

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

            switch (choice) {
               case 1:
                  System.out.print("\nEnter amount to deposit: ");
                  double amount = sc.nextDouble();
                  account.deposit(amount);
                  break;
               case 2:
                  account.displayBalance();
                  break;
               case 3:
                  account.computeInterest();
                  break;
               case 4:
                  System.out.print("\nEnter amount to withdraw: ");
                  amount = sc.nextDouble();
                  account.withdraw(amount);
                  break;
               case 5:
                  sc.close();
                  System.exit(0);
                  break;
               default:
                  System.out.println("\nInvalid choice");
            }
         }
      }
   }
```

**OUTPUT:**

```
C:\Users\Aashirvaad\OneDrive\Desktop\ash>java Brun
NAME: AASHIRVAAD KUMAR.S
USN:  2023BMS02525

Enter customer name: Leo
Enter account number: 984452
Enter account type (savings/current): savings
Enter initial balance: 2000

###-MENU-###
1. Deposit
2. Display balance
3. Compute interest
4. Withdraw
5. Exit

Enter choice: 1

Enter amount to deposit: 3000
Amount deposited: 3000.0
Enter choice: 2
Balance: 5000.0
Enter choice: 3
Interest added: 250.0
Enter choice: 4

Enter amount to withdraw: 100
Amount withdrawn: 100.0
Enter choice: 2
Balance: 5150.0
Enter choice: 5
```

# LAB-06 PACKAGE CIE STUDENT AND INTERNALS

## Program:

```
package CIE;

public class Internals
{
   public int im[]=new int[5];
}

package SEE;
import CIE.Student;
public class External extends Student
{
   // instance variables - replace the example below with your own
   public int sm[]=new int[5];
}

package CIE;
import java.util.*;
public class Student
{
   // instance variables - replace the example below with your own
   public int sem;
   public String usn;
   public String name;

   public void accept()
   {
      Scanner scan = new Scanner(System.in);
      System.out.println("Enter U, N, S:\n");
      usn=scan.nextLine();
      name=scan.nextLine();
      sem=scan.nextInt();
   }
}

import java.util.*;
import SEE.*;
import CIE.*;
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();
    SEE.External st[]=new SEE.External[n];
    CIE.Internals s[]=new CIE.Internals[n];
    for(int i=0; i<n; i++)
    {
      st[i]=new SEE.External();
      s[i]=new CIE.Internals();
      System.out.println("Enter details "+(i+1));
      st[i].accept();
      for(int j=0; j<5; j++)
      {
        System.out.println("Enter im and sm of sub "+(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 "+st[i].name);
      for(int k=0; k<5; k++)
      {
        System.out.println("Course "+(k+1)+" = "+fm[k]);
      }
    }
  }
}
```

## OUTPUT:

```
C:\Users\Aashirvaad\OneDrive\Desktop\ash>javac CIE/*.java

C:\Users\Aashirvaad\OneDrive\Desktop\ash>javac SEE/*.java

C:\Users\Aashirvaad\OneDrive\Desktop\ash>javac FinalMarks.java

C:\Users\Aashirvaad\OneDrive\Desktop\ash>java FinalMarks
NAME: AASHIRVAAD KUMAR.S
USN:  2023BMS02525

Enter n:
2
Enter details 1
Enter U, N, S:

02525
Aashirvaad
2
Enter im and sm of sub 1
1
90
Enter im and sm of sub 2
30
90
Enter im and sm of sub 3
29
90
Enter im and sm of sub 4
90
90
Enter im and sm of sub 5
90
90
Final marks of Aashirvaad
Course 1 = 91
Course 2 = 120
Course 3 = 119
Course 4 = 180
Course 5 = 180
```

# LAB-07 EXCEPTION

## Program:

```
import java.util.Scanner;

class WrongAge extends Exception {
   public WrongAge() {
      super("Invalid 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;
   }
}
```

```
class EMain{
   public static void main(String[] args) {

      System.out.println("NAME: AASHIRVAAD KUMAR.S");
      System.out.println("USN:  2023BMS02525\n");

      Scanner sc = new Scanner(System.in);

      try {
         System.out.print("Enter father's age: ");
         int fatherAge = sc.nextInt();

         System.out.print("Enter son's age: ");
         int sonAge = sc.nextInt();

         Father father = new Father(fatherAge);
         System.out.println("Father's age: " + father.getAge());

         Son son = new Son(fatherAge, sonAge);
         System.out.println("Son's age: " + son.getSonAge());
      } catch (WrongAge e) {
         System.out.println(e.getMessage());
      } catch (Exception e) {
         System.out.println("Invalid input.");
      } finally {
         sc.close();
      }
   }
}
```

**OUTPUT:**

```
C:\Users\Admin\Desktop\Aashirvaad>java Main
Hello World
Exception: Age is less than zero!
Name:Aashirvaad Kumar S
usn:2023BMS02525
```

# LAB-08 MULTITHREADS

## Program:

```
class DisplayThread extends Thread {
   private String message;
   private int interval;

   public DisplayThread(String message, int interval) {
      this.message = message;
      this.interval = interval;
   }

   public void run() {
      try {
         for(int i = 0; i < 5; i++) {
            System.out.println(message);
            Thread.sleep(interval * 1000);
         }
      } catch (InterruptedException e) {
         e.printStackTrace();
      }
   }
}

class ThreadDemo {
   public static void main(String[] args) {

      System.out.println("NAME: AASHIRVAAD KUMAR.S");
      System.out.println("USN:  2023BMS02525\n");

      DisplayThread thread1 = new DisplayThread("BMS College of Engineering", 10);
      thread1.start();

      DisplayThread thread2 = new DisplayThread("CSE", 2);
      thread2.start();
   }
}
```

**OUTPUT:**

```
C:\Users\Admin\Desktop\Aashirvaad>java Main1
Name:Aashirvaad Kumar S
usn:2023BMS02525
CSE
BMS COLLEGE OF ENGG
CSE
CSE
CSE
CSE
BMS COLLEGE OF ENGG
BMS COLLEGE OF ENGG
BMS COLLEGE OF ENGG
BMS COLLEGE OF ENGG
```

# LAB-09 USER INTERFACE TO PERFORM INTEGER DIVISION

## Program:

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;


class SwingDemo {
   SwingDemo() {
      // create jframe container
      JFrame jfrm = new JFrame("Divider App");
      jfrm.setSize(275, 150);
      jfrm.setLayout(new FlowLayout());
      // to terminate on close
      jfrm.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
      // text label
      JLabel jlab = new JLabel("Enter the divider and dividend:");
      // add text field for both numbers
      JTextField ajtf = new JTextField(8);
      JTextField bjtf = new JTextField(8);
      // calc button
      JButton button = new JButton("Calculate");
      // labels
      JLabel err = new JLabel();
      JLabel alab = new JLabel();
      JLabel blab = new JLabel();
      JLabel anslab = new JLabel();
      // add in order :)
      jfrm.add(err);  // to display error bois
      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!");
            }
        }
    });
    // display frame
    jfrm.setVisible(true);
  }
  public static void main(String[] args) {
    // Create the Swing application on the event dispatching thread
    SwingUtilities.invokeLater(new Runnable() {
      public void run() {
        new SwingDemo();
      }
    });
  }
}
```

**OUTPUT:**