B.M.S. College of Engineering
(Autonomous Institution affiliated to VTU, Belagavi)

Department of Computer Science and Engineering

AAT

OOJ REPORT

NAME: KEERTHI REDDY

USN: 1BM22CS094

SEC: 'B' CSE

SUBMITTED TO: Shravya AR

Assistant professor

1) Quadratic Equations:

```
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: KEERTHI REDDY");
    System.out.println("USN:  1BM22CS094");

                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:

Output Clear

```
java -cp /tmp/TLs1djYVBM QRun
NAME: KEERTHI REDDY
USN:  1BM22CS094
Enter a : 2
Enter b : 3
Enter c : -4
First Root = 0.85 and Second Root = -2.35
```

2) STUDENT CLASS

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

        System.out.println("NAME: KEERTHI REDDY");
        System.out.println("USN:  1BM22CS094\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:

Output Clear

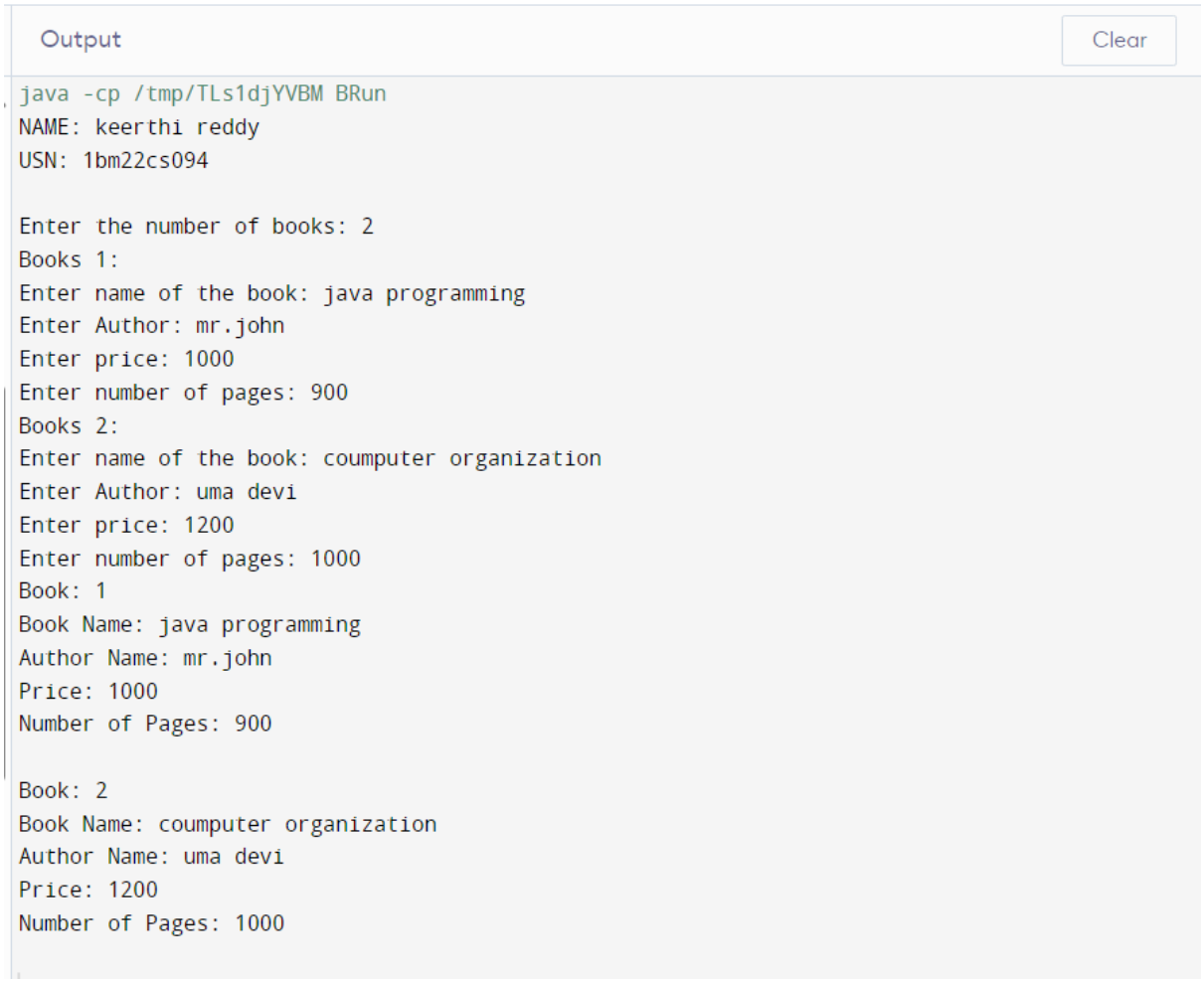
```
java -cp /tmp/TLs1djYVBM SRun
NAME: KEERTHI REDDY
USN:  1BM22CS094

Enter the number of subjects:  2
Enter credits for each subject:
4
4
Enter USN:  1bm22cs094
Enter Name:  keerthi
himani
Enter marks for subject 1:  90
Enter marks for subject 2:  98
USN: 1bm22cs094
Name: keerthi
Credits: 4, 4
Marks: 90, 98
SGPA: 10.0
```

3) BOOK CLASS

```
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 BRun{
    public static void main(String[] args) {
        System.out.println("NAME: keerthi reddy");
        System.out.println("USN: 1bm22cs094\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();
    }
}
```

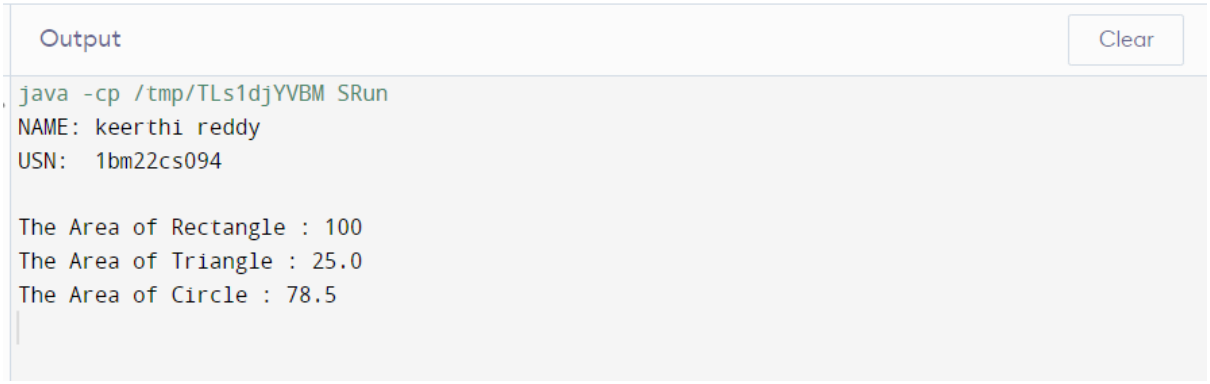


4) SHAPE CLASS

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

        System.out.println("NAME: keerthi reddy");
        System.out.println("USN:  1bm22cs094\n");

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

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



5) BANK CLASS

```
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: HIMANI BOHARA");
        System.out.println("USN:  1BM22CS112\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 Clear

```
java -cp /tmp/TLs1djYVBM Brun
NAME: keerthi reddy
USN:  1BM22CS094

Enter customer name: KEERTHI
Enter account number: 094
Enter account type (savings/current): SAVINGS
Enter initial balance: 15000

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

Enter choice: 2
Balance: 15000.0
Enter choice: 3
Current account does not earn interest
```

4) STUDENTS MARKS

```
// File: CIE/Student.java

package CIE;


public class Student {
    protected String usn;
    protected String name;
    protected int sem;
```

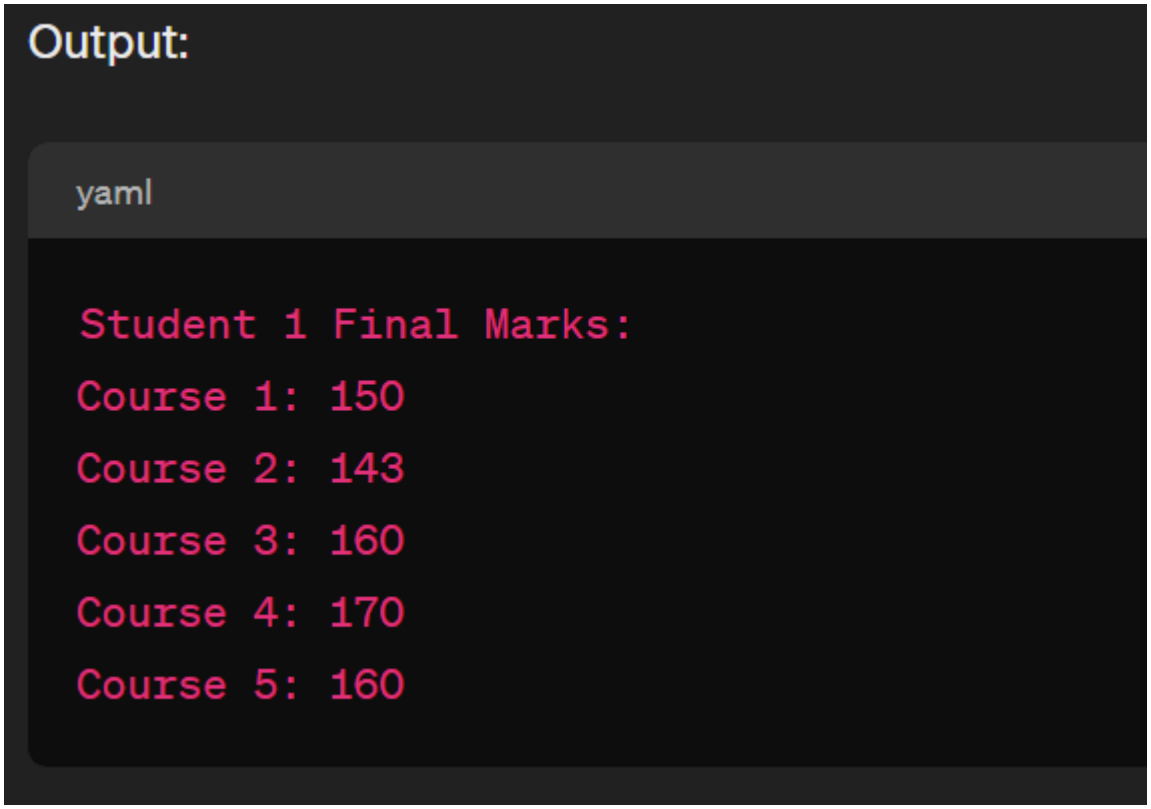
```
    public Student(String usn, String name, int sem) {
        this.usn = usn;
        this.name = name;
        this.sem = sem;
    }
}


// File: CIE/Internals.java
package CIE;

public class Internals extends Student {
    protected int[] internalMarks = new int[5];

    public Internals(String usn, String name, int sem, int[] internalMarks) {
        super(usn, name, sem);
        this.internalMarks = internalMarks;
    }
}

// File: SEE/External.java
package SEE;
import CIE.*;

public class External extends Student {
    protected int[] externalMarks = new int[5];

    public External(String usn, String name, int sem, int[] externalMarks) {
        super(usn, name, sem);
        this.externalMarks = externalMarks;
    }
}
```

```
// File: Main.java
import CIE.*;
import SEE.*;

public class Main {
    public static void main(String[] args) {
        // Example usage
        // Internal marks for student 1
        int[] internalMarks1 = {80, 75, 85, 90, 88};
        Internals student1Internal = new Internals("1MS16CS001", "Alice", 3, internalMarks1);

        // External marks for student 1
        int[] externalMarks1 = {70, 68, 75, 80, 72};
        External student1External = new External("1MS16CS001", "Alice", 3, externalMarks1);

        // Display final marks for student 1
        System.out.println("Student 1 Final Marks:");
        for (int i = 0; i < 5; i++) {
            int finalMarks = student1Internal.internalMarks[i] + student1External.externalMarks[i];
            System.out.println("Course " + (i + 1) + ": " + finalMarks);
        }
    }
}
```

KEERTHI REDDY

USN: 1BM22CS094

OUTPUT:



6) EXCEPTIONAL HANDLING

```
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: KEERTHI REDDY");
        System.out.println("USN:  1BM22CS094\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:

Output

```
java -cp /tmp/TLs1djYVBM EMain
NAME: KEERTHI REDDY
USN:  1BM22CS094

Enter father's age: 50
Enter son's age: 20
Father's age: 50
Son's age: 20
```

8) MULTI-THREADING

```
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: KEERTHI REDDY");
        System.out.println("USN:  1BM22CS094\n");

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

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

```
  }
}
```

Output

```
java -cp /tmp/9ChjOrXuIJ ThreadDemo
NAME: KEERTHI REDDY
USN:  1BM22CS094

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
```

THANK YOU