

LAB PROGRAM-1

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 discriminate $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.

Roots of Quadratic equations

```
import java.util. Scanner ;
```

```
class roots {
```

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

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

```
        System.out.println ("Enter three number");
```

```
        double a = s.nextDouble();
```

```
        double b = s.nextDouble();
```

```
        double c = s.nextDouble();
```

```
        double determinant = (b*b) - (4*a*c);
```

```
        double sqrt = Math.sqrt (determinant);
```

```
        if (determinant > 0) {
```

```
            double firstroot = (-b+sqrt) / (2*a);
```

```
            double secondroot = (-b-sqrt) / (2*a);
```

```
            System.out.println ("Roots are different and real");
```

```
            System.out.printf ("Roots are = %.2f and %.2f",  
                                firstroot, secondroot);
```

```
        } else if (determinant == 0) {
```

```
            System.out.println ("Roots are real & equal");
```

```
            System.out.printf ("Root is = %.2f", (-b+sqrt) / (2*a));
```

```
        } else {
```

```
            double realpart = -b / (2*a);
```

```
            double imaginarypart = Math.sqrt (determinant) / (2*a);
```



```

System.out.println("Roots are imaginary");
System.out.printf("Root 1 = %.2f + %.2fi and\n",
    Root 2 = %.2f - %.2fi",
    realpart, imaginary part,
    realpart, imaginary part);
    }
    }
}

```

Algorithm

- i] Input value a, b, c
- ii] Calculate ~~determinant~~^{discriminant} $= b^2 - 4ac$ and sqrt of determinant.
- iii] if (determinant > 0)
 Roots are real & different
 $r_1 = (-b + \text{sqrt}) / (2 * a);$
 $r_2 = (-b - \text{sqrt}) / (2 * a);$
- iv]. else if (determinant $= 0$)
 Roots are equal;
 $r_1 = +(-b + \text{sqrt}) / (2 * a);$
- iv]. else
 Roots are imaginary.
 Real part $= -b / (2 * a);$
 imaginary part $= \text{Math.sqrt}(-\text{determinant}) / (2 * a);$

$$R_1 \text{ Root } 1 = 1.2j + 1.2j$$

$$\text{Root } 2 = -1.2j - 1.2j$$

v] Print R_1 & R_2 .

vi] End.

Administrator: Command Prompt

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C:\Users\shakti>cd C:\Program Files\Java\jdk1.8.0_261\bin\lab_2020

C:\Program Files\Java\jdk1.8.0_261\bin\lab_2020>javac roots.java

C:\Program Files\Java\jdk1.8.0_261\bin\lab_2020>java roots

Enter three number
2.3
4
5.6

Roots are imaginary
Root1 :-0.8695652173913044i and Root2 :-0.8695652173913044-1.2956229935435948i
Root1 = -0.87+1.30i and Root2 = -0.87-1.30i

C:\Program Files\Java\jdk1.8.0_261\bin\lab_2020>

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.


```
import java.util.Scanner;
class student{
```

```
    private int usn;
```

```
    private String name;
```

```
    private int cr[];
```

```
    private int mar[];
```

```
    private int i, tem, temp2 = 0;
```

```
    void getDetails(){
```

```
        System.out.println("Enter student Details");
```

```
        Scanner s1 = new Scanner(System.in);
```

```
        usn = s1.nextInt();
```

```
        name = s1.next();
```

```
        int i;
```

```
        int n = s1.nextInt();
```

```
        cr = new int[n];
```

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

```
            System.out.println("Enter credits");
```

```
            cr[i] = s1.nextInt();
```

```
            temp2 = temp2 + cr[i];
```

```
        }
```

```
        mar = new int[n];
```

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

```
            System.out.println("Enter 5 subject marks");
```

```
            mar[i] = s1.nextInt();
```

```
            if(mar[i] >= 90 && mar[i] <= 100){
```

```
                temp = 10;
```

```
            }
```

```

else if (mar[i] >= 70 && mar[i] < 90) {
    temp = 9;
}
else if (mar[i] >= 50 && mar[i] < 70) {
    temp = 8;
}
else {
    temp = 7;
}
temp1 = temp1 + temp * cr[i];
}
}

```

```

void printDetails() {
    System.out.println("usrn:" + usn);
    System.out.println("name:" + name);
    System.out.println("Total credits:" + temp2);
    System.out.println("sgpa:" + temp1/20);
}
}

```

```

class StudentMain {
    public static void main (String es[]) {
        Student s1 = new Student ();
        s1.getDetails();
        s1.printDetails();
    }
}

```


Algorithm

- i] create objects usn, name, array of credits & marks
- ii] Get input of student Details
- iii]. Calculate total credits and grades on basis of marks using if else.

if (mar[i] \geq 90 && mar[i] \leq 100)

grade = 10;

else if (mar[i] \geq 70 && mar[i] $<$ 90)

grade = 9;

else if (mar[i] \geq 50 && mar[i] $<$ 70)

grade = 8;

else

grade = 7;

- iv]. ~~Calculate~~ Calculate total by multiply multiplying credits of each subject with marks

grade1 = grade + grade * cr[i];

- v]. Print the details

usn: 83

name: manoj;

total credits: 20

seppa: grade 1/20;

- vi]. Create class Student Main and get details of students by calling function.

Microsoft Windows [Version 10.0.18363.1082]
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C:\Users\Manoj H A>cd Documents

C:\Users\Manoj H A\Documents>javac Student.java

C:\Users\Manoj H A\Documents>java StudentMain

Enter student details

83

manoj

5

Enter credits

5

Enter credits

4

Enter credits

4

Enter credits

4

Enter credits

3

Enter 5 subject marks

95

Enter 5 subject marks

85

Enter 5 subject marks

75

Enter 5 subject marks

65

Enter 5 subject marks

45

usn:83

name:manoj

Total credits:20

cgpa:8.75

C:\Users\Manoj H A\Documents>

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.

Program

```
import java.util.Scanner;
```

```
class Book {
```

```
    String name;
```

```
    String author;
```

```
    Double price;
```

```
    int num_pages;
```

```
    void Book() {
```

```
        name = null;
```

```
        author = null;
```

```
        price = 0.0;
```

```
        num_pages = 0;
```

```
    }
```

```
    void getDetails() {
```

```
        System.out.println("Enter the details of book:");
```

```
        Scanner s1 = new Scanner(System.in);
```

```
        name = s1.next();
```

```
        author = s1.next();
```

```
        price = s1.nextDouble();
```

```
        num_pages = s1.nextInt();
```

```
    }
```

```
    public String toString() {
```

```
        return("The title of book: " + name + " " + "Author: " + author  
            + " " + "Price" + price + " " + "Number of pages"  
            + num_pages);
```

```
    }
```

```

class BookMain {
    public static void main (String s[]) {
        Scanner s2 = new Scanner (System.in);
        System.out.println ("Enter number of books:");
        int n = s2.nextInt();
        Book b[] = new Book [n];
        for (int i = 0; i < n; i++) {
            System.out.println ("Enter the details of book: " + (i+1));
            b[i] = new Book ();
            b[i].getDetails();
        }
        for (int i = 0; i < n; i++) {
            System.out.println ("The details of book " + (i+1));
            System.out.println (b[i]);
        }
    }
}

```

Algorithm

- i] create a class Book with objects name, author, price, num-pages.
- ii] create a default constructor.
- iii]. Get the Details of Book for user.
- iv] By using toString() method print the details of all the Books.
- v]. Create class Book Main and the get the details and print by creating array of objects

Command Prompt

```
C:\Users\Manoj H A\Documents>java BookMain
Enter the number of books:
3
Enter the details of book:1
Enter the details of book:
aaa
bbb
500.00
400
Enter the details of book:2
Enter the details of book:
ccc
ddd
300.00
600
Enter the details of book:3
Enter the details of book:
rrr
eee
1000.00
400
The details of book1
The title of book:aaa Author:bbb Price:500.0 Number of pages400
The details of book2
The title of book:ccc Author:ddd Price:300.0 Number of pages600
The details of book3
The title of book:rrr Author:eee Price:1000.0 Number of pages400
C:\Users\Manoj H A\Documents>
```


LAB 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.

1]

Week -8

abstract class Shape {

double dim1, dim2;

Shape(double a, double b) {

dim1 = a;

dim2 = b;

}

abstract double printArea();

}

class Rectangle extends Shape {

Rectangle(double a, double b) {

super(a, b);

}

double printArea() {

~~System.out.println~~

return dim1 * dim2;

}

}

class Triangle extends Shape {

Triangle(double a, double b) {

super(a, b);

}

double printArea() {

return dim1 * dim2 / 2;

}

}

class Circle extends Shape {

Circle(double a, double b) {

super(a, b);

```

double printArea() {
    return dim1 * dim2 * dim2;
}
}

class ShapeMain {
    public static void main(String args[]) {
        Rectangle r = new Rectangle(10, 20);
        Triangle t = new Triangle(5, 4);
        Circle c = new Circle(3.142, 2);

        Shape shaperef;
        shaperef = r;
        System.out.println("Area of rectangle: " + shaperef.printArea());

        shaperef = t;
        System.out.println("Area of triangle: " + shaperef.printArea());

        shaperef = c;
        System.out.println("Area of circle: " + shaperef.printArea());
    }
}

```



```
Command Prompt
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C:\Users\Manoj H A>cd documents

C:\Users\Manoj H A\Documents>javac Shape.java

C:\Users\Manoj H A\Documents>java ShapeMain
Area of Rectangle:200.0
Area of Triangle:10.0
Area of Circle:12.568

C:\Users\Manoj H A\Documents>
```

LAB 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 Curr-acct and Sav-acct to

- 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

```

void dispBal() {
    System.out.println("Your Balance is : " + this.bal);
}

void withBal (double amt) {
    this.bal -= amt;
}
}

```

```

class AccountMain {
    public static void main (String[] args) {
        Scanner sc = new Scanner (System.in);

        Double amt;
        int flag = 0;
        while (flag == 0) {
            System.out.println("\n 1: Current acc.
            2: Savings acc.");

            int ch = sc.nextInt();
            switch (ch) {
                case 1:
                    curr_acct c = new Curr_acct ("Jacob", 1234567, 50000);
                    System.out.println("\n Current_acct\n");
                    int flag1 = 0;
                    while (flag1 == 0) {
                        System.out.println("1: Add amt 2: Display Balance
                        3: withdraw");

                        int ch1 = sc.nextInt();
                        switch (ch1) {
                            case 1:

```



```

case 1: System.out.println("Enter amt to be added");
        amt = sc.nextDouble();
        c.addBal(amt);
        break;
case 2: c.dispBal();
        break;
case 3: System.out.println("Enter amt to be
        withdrawn");
        amt = sc.nextDouble();
        c.withBal(amt);
        break;
default:
        flag1 = 1;
    }
}
break;

```

```

case 2:
    System.out.println("\n Savings - acct\n");
    Sav - acct s = new Sav - acct ("Sean", 34567891, 4000);
    int flag2 = 0;
    while (flag2 == 0) {
        System.out.println("1: Add Bal\n 2: display Bal\n 3: Withdraw");
        int ch2 = sc.nextInt();
        switch (ch2) {
            case 1: System.out.println("Enter amt to be added:");
                    amt = sc.nextDouble();
                    s.addBal(amt);
                    break;

```

```
case 2:
    s.dispBal();
    break;
```

```
case 3:
```

```
System.out.println("Enter amt to be withdrawn:");
amt = sc.nextDouble();
s.withBal(amt);
break;
```

```
default:
    flag = 1;
}
```

```
}
break;
```

```
default:
    flag = 1;
```

```
}
}
}
}
```

```

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C:\Users\Manoj H A>cd documents

C:\Users\Manoj H A\Documents>javac Account.java

C:\Users\Manoj H A\Documents>java AccountMain
1:Current acc.
2:Savings acc.
?
Savings_acct
name: Sean      accno: JAS67891 bal: 4000.0      type: Savings
1:AddBal
2:displayBal
3:withdraw
?
enter amt to be added:
4000
1:AddBal
2:displayBal
3:withdraw
?
enter amt to be withdrawn:
500
1:AddBal
2:displayBal
3:withdraw
?
Your balance is: 5500.0
1:AddBal
2:displayBal
3:withdraw
?
enter amt to be withdrawn:
5000
1:AddBal
2:displayBal
3:withdraw
?
Your balance is: 500.0
1:AddBal
2:displayBal
3:withdraw
?

```