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LAB REPORT
on
Java Programming

Submitted by

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in partial fulfilment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING



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**B. M. S. College of Engineering,
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(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering



CERTIFICATE

This is to certify that the Lab work entitled “Java Programming” carried out by **Pulkit Raina (1BM21CS148)**, who is bonafide student of **B. M. S. College of Engineering**. It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2022. The Lab report has been approved as it satisfies the academic requirements in respect of a **Object Oriented Java Programming Lab - (22CS3PCOOJ)** work prescribed for the said degree.

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1. Quadratic Equation

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.

Code:

```
File - C:\Users\Pamposh\deaProjects\Quadratic.java\src\Lab1Quadratic.java
1 import java.util.Scanner;
2
3 public class Lab1Quadratic {
4     public static void main(String args[]){
5         Scanner s = new Scanner(System.in);
6         float a, b, c;
7         try {
8             while(true) {
9                 System.out.print("Enter the values of
a, b, c: ");
10                a = s.nextFloat();
11                b = s.nextFloat();
12                c = s.nextFloat();
13                float d = b * b - 4 * a * c;
14                if (d < 0) {
15                    System.out.println("There are no
real solutions!");
16                } else if (d == 0) {
17                    System.out.println("Solutions are
real and equal to: " + (-b) / 2 * a);
18                } else {
19                    System.out.println("Solutions are
unique and real!");
20                    float e = -b / (2 * a);
21                    float f = (float) Math.sqrt(d
) / (2 * a);
22                    System.out.println("Roots are "
+ (e + f) + (e - f));
23                }
24            }
25        }
26        catch(Exception e){
27            System.out.println("Thanks! Code run
successfully!");
28        }
29    }
30 }
31 }
```

Output:

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program F
Enter the values of a, b, c! Enter letter to end: 1 2 1
Solutions are real and equal to: -1.0
Enter the values of a, b, c! Enter letter to end: 1 -1 -12
Solutions are unique and real!
Roots are 4.0 and -3.0
Enter the values of a, b, c! Enter letter to end: 1 4.4 5.7
There are no real solutions!
Enter the values of a, b, c! Enter letter to end: -1.345 5.65 4.78
Solutions are unique and real!
Roots are -0.7219436 and 4.9226875
Enter the values of a, b, c! Enter letter to end: q
Thanks! Code run successfully!

Process finished with exit code 0
```

Observation:

1) Quadratic Eqn's Java $\rightarrow b \neq 0$

Program to find roots of Quadratic Eqn

```
import java.util.Scanner;
import java.lang.Math;
class Quadratic {
    public static void main(String args[]) {
        Scanner s = new Scanner(System.in);
        int a, b, c;
        double d, r1, r2;
        System.out.println("Enter coefficients a,b,c:");
        a = s.nextInt();
        b = s.nextInt();
        c = s.nextInt();
        if (a == 0)
            System.out.println("Invalid Equation");
        else {
            d = b*b - 4*a*c;
            if (d == 0) {
                System.out.println("Real and equal roots");
                System.out.println("r1=r2=" + (-b/(2*a)));
            }
            else if (d > 0) {
                r1 = ((-b + Math.sqrt(d))/(2*a));
                r2 = ((-b - Math.sqrt(d))/(2*a));
                System.out.println("Real and distinct roots");
                System.out.println("r1=" + r1 + " r2=" + r2);
            }
            else {
                System.out.println("Imaginary roots");
                System.out.println("r1=" + r1 + " r2=" + r2);
            }
        }
    }
}
```

$r1 = (-b/(2*a));$

$r2 = \text{Math.sqrt}(-d)/(2*a);$

`System.out.println("r1= " + r1 + " " + r2 + " ");`

`System.out.println("r2= " + r1 + " " + r2 + " ");`

}

}

}

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2. Student Form

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:

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab2StudentForm.java

```
1 import java.util.Scanner;
2
3 public class Lab2StudentForm {
4     public static void main(String[] args) {
5         Scanner s = new Scanner(System.in);
6         int choice;
7         Student s1 = new Student();
8         System.out.print("Enter USN: ");
9         s1.usn = s.nextInt();
10        s.nextLine();
11        System.out.print("Enter name: ");
12        s1.name = s.nextLine();
13        do{
14             System.out.print("Enter\n1. Set Marks 2.
Set Credits 3. Display SGPA 4. Display Details 5.
Exit: ");
15             choice = s.nextInt();
16             switch(choice){
17                 case 1:
18                     s1.setMarks();
19                     break;
20                 case 2:
21                     s1.setCredits();
22                     break;
23                 case 3:
24                     s1.sgpaCalc();
25                     break;
26                 case 4:
27                     s1.displayDetails();
28                     break;
29                 default:
30                     System.out.println("INCORRECT
CHOICE!");
31                     break;
32             }
33         }while(choice!=5);
34     }
35 }
36
37 class Student {
38     Scanner s = new Scanner(System.in);
```

```
39     int usn;
40     String name;
41     int credits[] = new int[6];
42     int marks[] = new int[6];
43     int creditScore[] = new int[6];
44
45     void setMarks() {
46         for (int i = 1; i <= 6; i++){
47             System.out.print("Enter marks of subject
48 " + i + ": ");
49             marks[i - 1] = s.nextInt();
50         }
51     }
52
53     int[] getMarks() {
54         return marks;
55     }
56
57     void setCredits() {
58         for (int i = 1; i <= 6; i++){
59             System.out.print("Enter credits of
subject " + i + ": ");
60             credits[i - 1] = s.nextInt();
61         }
62     }
63
64     int[] getCredits() {
65         return marks;
66     }
67
68     void setCreditScore(){
69         for(int i = 0; i<6; i++) {
70             if (marks[i] >= 90)
71                 creditScore[i] = 10;
72             else if (marks[i] >= 80)
73                 creditScore[i] = 9;
74             else if (marks[i] >= 70)
75                 creditScore[i] = 8;
76             else if (marks[i] >= 60)
77                 creditScore[i] = 7;
```

```

File - C:\Users\Pampush\IdeaProjects\Quadratic.java\src\Lab2StudentForm.java
78             else if (marks[i] >= 50)
79                 creditScore[i] = 6;
80             else if (marks[i] >= 40)
81                 creditScore[i] = 5;
82             else
83                 creditScore[i] = 0;
84         }
85     }
86
87     void sgpaCalc(){
88         this.setCreditScore();
89         Float sgpa = 0f;
90         int cred = 0;
91         for(int i = 0; i<6; i++)
92             cred = cred + credits[i];
93         for(int i = 0; i<6; i++){
94             sgpa = sgpa + credits[i]*creditScore[i];
95         }
96         System.out.println("SGPA is " + (Float)sgpa/
    cred);
97     }
98
99     void displayDetails(){
100        System.out.println("Details of USN: " + usn
    );
101        System.out.println(name);
102        for(int i = 0; i<6; i++){
103            System.out.println("Marks of subject "
    + (i+1)+ "is = " + marks[i]);
104        }
105        sgpaCalc();
106    }
107 }

```

Output:

```

"C:\Program Files\Java\jdk-19\bin\jav
Enter marks of subject 1: 67
Enter marks of subject 2: 89
Enter marks of subject 3: 95
Enter marks of subject 4: 67
Enter marks of subject 5: 45
Enter marks of subject 6: 34
Enter credits of subject 1: 1
Enter credits of subject 2: 2
Enter credits of subject 3: 3
Enter credits of subject 4: 4
Enter credits of subject 5: 5
Enter credits of subject 6: 6
SGPA is 5.142857

Process finished with exit code 0

```

Observation:

2) SGPA

```
import java.util.Scanner;  
class Student {  
    String USN;  
    String name;  
    int[] credits = new int[20];  
    int[] marks = new int[20];  
    public void input(int n) {  
        Scanner s = new Scanner(System.in);  
        System.out.print("Enter Student USN: ");  
        USN = s.nextLine();  
        System.out.print("Enter Student Name: ");  
        name = s.nextLine();  
        for (int i=0; i<n; i++) {  
            System.out.print("Enter subject " + (i+1) + " marks  
            and credits respectively: ");  
            marks[i] = s.nextInt();  
            credits[i] = s.nextInt();  
        }  
        public float calculate(int n)  
        {  
            int sum_of_credits = 0;  
            float result = 0.0f;  
            for (int i=0; i<n; i++)  
            {  
                sum_of_credits += credits[i];  
                if (calculate_grade_point(marks[i]) == -1)  
                    return -1.0f;  
                else  
                    result += (float)(calculate_grade_point  
                        (marks[i])) * credits[i];  
            }  
            return (result / sum_of_credits);  
        }  
}
```

```
public int calculate_grade_point (int marks)
{
    if (marks >= 90)
        return 10;
    else if ((marks >= 80) && (marks < 90))
        return 9;
    else if ((marks >= 70) && (marks < 80))
        return 8;
    else if ((marks >= 60) && (marks < 70))
        return 7;
    else if ((marks >= 50) && (marks < 60))
        return 6;
    else if ((marks >= 40) && (marks < 50))
        return 5;
    else
        return -1;
}
```

```
public void display (int n float result )
{
    System.out.println ("\n");
    System.out.println ("Student Details");
    System.out.println ();
    System.out.println ("Student USN:" + USN);
    System.out.println ("Student name:" + Name);
    System.out.println ("Student marks and credits");
    for (int i = 0; i < n; i++)
        System.out.println ("Subject" + (i + 1) +
                           " --> Marks:" + marks[i] + " Credits:" +
                           credits[i]);
}
```

```
System.out.println ("SGPA : " + result);  
}  
  
public class SGPA  
{  
    public static void main (String [] args)  
    {  
        Scanner s = new Scanner (System.in);  
        Student s1 = new Student ();  
        System.out.print ("Enter the no. of subjects: ");  
        int n = s.nextInt ();  
        s1.input (n);  
        float result = s1.calculate ();  
        if (result == -1.0f)  
        {  
            System.out.println ();  
            System.out.println ("Student has failed in  
a subject. SGPA can't be calculated!");  
            System.exit (0);  
        }  
        s1.display (n, result);  
    }  
}
```

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3. Book Form

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:

```
File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab3BookForm.java
1 import java.util.Scanner;
2
3 public class Lab3BookForm {
4     public static void main(String[] args) {
5         Scanner s = new Scanner(System.in);
6         int n;
7         System.out.print("Enter number of books: ");
8         n = s.nextInt();
9         Book b[] = new Book[n];
10        for(int i = 0; i<n; i++){
11            s.nextLine();
12            System.out.print("Enter name of object "
13 + (i+1) + " : ");
14            String name = s.nextLine();
15            System.out.print("Enter author of object "
16 + (i+1) + " : ");
17            String author = s.nextLine();
18            System.out.print("Enter price of object "
19 + (i+1) + " : ");
20            int price = s.nextInt();
21            System.out.print("Enter number of pages
22 of object " + (i+1) + " : ");
23            int num_pages = s.nextInt();
24            b[i] = new Book(name, author, price,
25            num_pages);
26        }
27        int choice;
28        System.out.print("Enter\n1. Display Details
29 of a book 2. Exit: ");
30        do{
31            choice = s.nextInt();
32            switch (choice){
33                case 1:
34                    System.out.print("Enter book
35 whose details you need: ");
36                    int j = s.nextInt();
37                    if(j>n)
38                        System.out.println("BOOK
39 DOESN'T EXIST");
40                    else
41                        b[j-1].toString();
42            }
43        }
44    }
45}
```

```
34         }
35
36     }while(choice!=2);
37 }
38 }
39
40 class Book{
41     String name, author;
42     int price, num_pages;
43     Book(String name, String author, int price, int
44         num_pages){
45         this.name = name;
46         this.author = author;
47         this.price = price;
48         this.num_pages = num_pages;
49     }
50     void setName(String name){
51         this.name = name;
52     }
53     void setAuthor(String author){
54         this.author = author;
55     }
56     void setPrice(int price){
57         this.price = price;
58     }
59     void setNum_pages(int num_pages){
60         this.num_pages = num_pages;
61     }
62     String getName(){
63         return name;
64     }
65     String getAuthor(){
66         return author;
67     }
68     int price(){
69         return price;
70     }
71     int num_pages(){
72         return num_pages;
73     }
```

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab3BookForm.java

```
74
75     void toString(int n){
76         System.out.println("Name of book: " + name);
77         System.out.println("Author: " + author);
78         System.out.println("Price is: " + price);
79         System.out.println("Num Pages is: " +
80             num_pages);
80     }
81 }
```

Output:

```
C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:D:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\lib\idea_rt.jar=5434:C:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\bin" -Dfile.encoding=UTF-8 Lab3BookForm
Enter number of books: 3
Enter name of object 1 : Book 1
Enter author of object 1 : Pulkit 1
Enter price of object 1 : 324
Enter number of pages of object 1 : 31
Enter name of object 2 : Book 2
Enter author of object 2 : Pulkit 2
Enter price of object 2 : 450
Enter number of pages of object 2 : 235
Enter name of object 3 : Book 3
Enter author of object 3 : Pulkit 3
Enter price of object 3 : 560
Enter number of pages of object 3 : 532
Enter
1. Display Details of a book 2. Exit: 1
Enter book whose details you need: 3
Name of book: Book 3
Author: Pulkit 3
Price is: 560
Num Pages is: 532
1
Enter book whose details you need: 1
Name of book: Book 1
Author: Pulkit 1
Price is: 324
Num Pages is: 31
1
Enter book whose details you need: 4
BOOK DOESN'T EXIST
2

Process finished with exit code 0
```

Observation:

3. Book Details

```
import java.io.*;
import java.util.*;

class Book
{
    String title, author;
    double price;
    int numPages;
    Book()
    {
        title = "Default";
        author = "Default";
        price = 0.0;
        numPages = 0;
    }
    void setTitle(String t)
    {
        title = t;
    }
    void setAuthor(String a)
    {
        author = a;
    }
    void setPrice(double p)
    {
        price = p;
    }
    void setPages(int np)
    {
        numPages = np;
    }
    public String toString()
    {
        return title + " " + author + " " + price + " "
               + numPages + "\n";
    }
}
```

```
class bookdetails {
    public static void main (String args[]) {
        String t, a;
        double p;
        int np, n;
        Scanner sc = new Scanner (System.in);
        System.out.println ("Enter the number of Books");
        n = sc.nextInt();
        Book b[] = new Book[n];
        for (int i=0; i<n; i++) {
            System.out.println ("Enter title of books");
            t = sc.next();
            System.out.println ("Enter author : ");
            a = sc.next();
            System.out.println ("");
            System.out.println ("Enter the Price of Books");
            p = sc.nextDouble();
            System.out.println ("");
            System.out.println ("Enter no. of pages : ");
            np = sc.nextInt();
            System.out.println ("");
            b[i] = new Book();
            b[i].setTitle (t);
            b[i].setAuthor (a);
            b[i].setPrice (p);
            b[i].setPages (np);
        }
    }
}
```

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O/P Sheet

System.out.println ("Title \t Author \t Price
 \t Pages \n");
for (int i=0; i<n; i++)
 System.out.println (b[i]);

4. Shape Areas

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:

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab4ShapeAreas.java

```
1 import java.util.Scanner;
2
3 public class Lab4ShapeAreas {
4     public static void main(String[] args) {
5         Scanner s = new Scanner(System.in);
6         System.out.print("Enter for area of 1.
7             Rectangle 2. Triangle 3. Circle 4. Exit: ");
8         int choice;
9         do{
10             choice = s.nextInt();
11             switch (choice){
12                 case 1:
13                     Shape r = new Rectangle();
14                     r.printArea();
15                     break;
16                 case 2:
17                     Shape t = new Triangle();
18                     t.printArea();
19                     break;
20                 case 3:
21                     Shape c = new Circle();
22                     c.printArea();
23                     break;
24             }
25         }while(choice!=4);
26     }
27
28 abstract class Shape{
29     Scanner s = new Scanner(System.in);
30     int i, j;
31     abstract void printArea();
32 }
33
34 class Rectangle extends Shape{
35     void printArea(){
36         System.out.print("Enter dimensions of
37             rectangle: ");
38         i = s.nextInt();
39         j = s.nextInt();
40         System.out.println("Area is " + i*j);
41     }
42 }
```

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab4ShapeAreas.java

```
40     }
41 }
42
43 class Triangle extends Shape{
44     void printArea(){
45         System.out.print("Enter dimensions of
46             Triangle: ");
47         i = s.nextInt();
48         j = s.nextInt();
49         System.out.println("Area is " + (Float)(0.5f*
50             i*j));
51     }
52 }
53 class Circle extends Shape{
54     void printArea(){
55         System.out.print("Enter readius of Circle: "
56             );
57         i = s.nextInt();
58         System.out.println("Area is " + (Math.PI*i*i
59             ));
60     }
61 }
```

Output:

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program
Enter for area of 1. Rectangle 2. Triangle 3. Circle 4. Exit: 1
Enter dimensions of rectangle: 3 4
Area is 12
2
Enter dimensions of Triangle: 42
6
Area is 12.0
3
Enter readius of Circle: 3
Area is 28.274333882308138

2
Enter dimensions of Triangle: 3
8
Area is 12.0
4

Process finished with exit code 0
```

5. Bank Accounts

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:

```
File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab5BankAccounts.java
1 import java.util.Scanner;
2 public class Lab5BankAccounts {
3     public static void main(String[] args) {
4         Scanner s = new Scanner(System.in);
5         Curr_acct cur = new Curr_acct();
6         Sav_acct sav = new Sav_acct();
7         System.out.print("Enter your type of account\
n'c' for current and 's' for savings and 'e' to exit
: ");
8         char t = s.next().charAt(0);
9         int choice;
10        if(t == 's') {
11            System.out.print("Enter name and account
number: ");
12            s.nextLine();
13            String name = s.nextLine();
14            int acc_num = s.nextInt();
15            sav.setAcc_num(acc_num);
16            sav.setName(name);
17            sav.setAcc_type("Savings");
18            do {
19                System.out.print("1.Deposit 2.
Withdraw 3.Check Balance 4.Check Interest 5.Show
Account Details 6.Exit: ");
20                choice = s.nextInt();
21                switch(choice){
22                    case 1:
23                        sav.deposit();
24                        break;
25                    case 2:
26                        sav.withdrawal();
27                        break;
28                    case 3:
29                        System.out.println("Balance
is: " + sav.getBalance());
30                        break;
31                    case 4:
32                        sav.calcInterest();
33                        break;
34                    case 5:
35                        sav.display();
```

```
36                     break;
37                 }
38             } while (choice!=6);
39         }
40     else if(t == 'c'){
41         System.out.print("Enter name and account
42 number: ");
43         s.nextLine();
44         String name = s.nextLine();
45         int acc_num = s.nextInt();
46         cur.setAcc_num(acc_num);
47         cur.setName(name);
48         cur.setAcc_type("Current");
49         do {
50             System.out.print("1.Deposit 2.
51 Withdraw 3.Check Balance 4.Show Account Details 5.
52 Exit: ");
53             choice = s.nextInt();
54             switch(choice){
55                 case 1:
56                     cur.depositCurrent();
57                     break;
58                 case 2:
59                     cur.withdrawal();
60                     break;
61                 case 3:
62                     System.out.println("Balance
63 is: " + cur.getBalance());
64                     break;
65             } while (choice!=5);
66         }
67     else
68         System.out.println("INCORRECT INPUT!");
69     }
70 }
71
72 class Account{
```

```
73     Scanner s = new Scanner(System.in);
74     String name, acc_type;
75     int acc_num;
76     void setName(String name){
77         this.name = name;
78     }
79     void setAcc_type(String type){
80         this.acc_type = type;
81     }
82     void setAcc_num(int acc_num){
83         this.acc_num = acc_num;
84     }
85 }
86
87 class Curr_acct extends Account{
88     float bal;
89     int minChecker(){
90         if(bal<1000) {
91             System.out.println("Penalty of "+ (0.1)*
92             bal + " imposed!");
93             bal = bal - (float) 0.1 * bal;
94             return 0;
95         }
96         else
97             return 1;
98     }
99     void depositCurrent(){
100         float dep;
101         System.out.print("Enter amount to deposit: "
102 );
102         dep = s.nextFloat();
103         bal = bal + dep;
104     }
105
106     float getBalance(){
107         return bal;
108     }
109
110     void withdrawal(){
111         float x;
```

File - C:\Users\Pamposhi\IdeaProjects\Quadratic.java\src\Lab5BankAccounts.java

```
112     System.out.print("Enter amount to withdraw  
113         : ");  
114         x = s.nextFloat();  
115         if(minChecker() != 1 || bal<x) {  
116             System.out.println("WITHDRAWAL NOT  
117             ALLOWED!");  
118         }  
119         else{  
120             System.out.println("Withdrawal of " + x  
121             + " permitted!");  
122             bal = bal - x;  
123             System.out.println("New Balance is " +  
124             bal);  
125         }  
126     }  
127  
128     void display(){  
129         System.out.println("Name is: " + name);  
130         System.out.println("Account type is: " +  
131             acc_type);  
132         System.out.println("Account number is: " +  
133             acc_num);  
134         System.out.println("Current balance is: " +  
135             getBalance());  
136     }  
137  
138 class Sav_acct extends Account{  
139     float bal;  
140     void deposit(){  
141         System.out.print("Enter amount to deposit: "  
142             );  
143             float dep = s.nextFloat();  
144             bal = bal + dep;  
145             System.out.println("New balance is " + bal);  
146         }  
147         void calcInterest(){  
148             System.out.print("Enter time in years and  
149             rate of interest: ");  
150             float t = s.nextFloat();  
151             float r = s.nextFloat();
```

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab5BankAccounts.java

```
144         float in = bal*(float)Math.pow((1 + r/100),
145             t);
145         System.out.println("Account balance is: " +
146             bal + " interest is: " + in);
146         bal = bal + in;
147     }
148     float getBalance(){
149         return bal;
150     }
151     void withdrawal(){
152         float x;
153         System.out.print("Enter the amount to
154             withdraw: ");
154         x = s.nextFloat();
155         if(bal<x){
156             System.out.println("WITHDRAWAL NOT
156             ALLOWED!");
157         }
158         else{
159             bal = bal-x;
160             System.out.println("Balance is: " + bal
161         );
161         }
162     }
163     void display(){
164         System.out.println("Name is: " + name);
165         System.out.println("Account type is: " +
165             acc_type);
166         System.out.println("Account number is: " +
166             acc_num);
167         System.out.println("Current balance is: " +
167             getBalance());
168     }
169 }
```

Output:

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\  
Enter your type of account  
'c' for current and 's' for savings and 'e' to exit: c  
Enter name and account number: Pulkit Current  
23  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 1  
Enter amount to deposit: 4000  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 2  
Enter amount to withdraw: 300  
Withdrawal of 300.0 permitted!  
New Balance is 3700.0  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 4  
Name is: Pulkit Current  
Account type is: Current  
Account number is: 23  
Current balance is: 3700.0  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 2  
Enter amount to withdraw: 3000  
Withdrawal of 3000.0 permitted!  
New Balance is 700.0  
  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 2  
Enter amount to withdraw: 19  
Penalty of 70.0 imposed!  
WITHDRAWAL NOT ALLOWED!  
1.Deposit 2.Withdraw 3.Check Balance 4.Show Account Details 5.Exit: 5  
  
Process finished with exit code 0
```

```
"C:\Program Files\Java\jdk-19\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\lib\idea_rt.jar=54074:C:\Program Files\JetBrains\IntelliJ IDEA 2023.2.1\bin"
Enter your type of account
'c' for current and 's' for savings and 'e' to exit: s
Enter name and account number: Pulkit Savins
123
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 1
Enter amount to deposit: 20000
New balance is 20000.0
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 2
Enter the amount to withdraw: 1000
Balance is: 19000.0
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 4
Enter time in years and rate of interest: 34
2.5
Account balance is: 19000.0 interest is: 43991.086
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 3
Balance is: 62991.086
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 5
Name is: Pulkit Savins
Account type is: Savings
Account number is: 123
Current balance is: 62991.086
1.Deposit 2.Withdraw 3.Check Balance 4.Check Interest 5.Show Account Details 6.Exit: 6
```

6. Division Interface

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 ArithmeticException. Display the exception in a message dialog box.

Code:

```
File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab6DivisionInterface.java
1 import java.util.Scanner;
2
3 public class Lab6DivisionInterface {
4     public static void main(String[] args) {
5         Division d = new Trial();
6         d.division();
7     }
8 }
9
10 interface Division{
11     Scanner s = new Scanner(System.in);
12     int a = 45;
13     void division();
14 }
15
16 class Trial implements Division{
17     int num1, num2;
18     public void division(){
19         try{
20             System.out.print("Enter num1: ");
21             num1 = s.nextInt();
22             System.out.print("Enter num2: ");
23             num2 = s.nextInt();
24         }
25         catch(Exception e){
26             try {
27                 throw new NumberFormatException();
28             }
29             catch(Exception f){
30                 System.out.println(f);
31                 System.exit(0);
32             }
33         }
34         if(num2 == 0){
35             try {
36                 throw new ArithmeticException();
37             }
38             catch(Exception e){
39                 System.out.println(e);
40             }
41         }
42     }
43 }
```

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab6DivisionInterface.java

```
42         else{
43             System.out.println("Result is: " + (float
44                 )num1/num2);
45         }
46 }
```

Output:

```
"C:\Program Files\Java\
Enter num1: 34
Enter num2: 3
Result is: 11.333333

Process finished with exit code 0
```

```
"C:\Program Files\Java\jdk-19\
Enter num1: 34
Enter num2: 0
java.lang.ArithmetricException

Process finished with exit code 1
```

```
"C:\Program Files\Java\jdk-19\bin\
Enter num1: 35
Enter num2: f
java.lang.NumberFormatException

Process finished with exit code 0
```

7. Inheritance Exception

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:

```
File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab7InheritanceException.java
1 import javax.crypto.spec.PSource;
2 import java.util.Scanner;
3
4 public class Lab7InheritanceException {
5     public static void main(String[] args) {
6         Son s = new Son();
7     }
8 }
9
10 class WrongAge extends Exception{
11     public String toString() {
12         return "Wrong Age";
13     }
14 }
15
16 class Father{
17     Scanner s = new Scanner(System.in);
18     int age;
19     Father(){
20         System.out.print("Enter the age of father: ");
21     }
22     try{
23         age = s.nextInt();
24         if(age<0)
25             throw new WrongAge();
26     }
27     catch(Exception e){
28         System.out.println(e);
29         System.exit(0);
30     }
31 }
32
33 class Son extends Father{
34     int age_son;
35     Son(){
36         super();
37         System.out.print("Enter the age of the son: ");
38     }
39     age_son = s.nextInt();
40     try{
```

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab7\InheritanceException.java

```
40         if(age_son>=age)
41             throw new WrongAge();
42         else
43             System.out.println("Makes Sense!");
44     }
45     catch(Exception e) {
46         System.out.println(e);
47     }
48 }
49 }
```

Output:

```
"C:\Program Files\Java\jdk-19\
Enter the age of father: 33
Enter the age of the son: 11
Makes Sense!

Process finished with exit code
```

```
"C:\Program Files\Java\jdk-19\
Enter the age of father: 33
Enter the age of the son: 33
Wrong Age

Process finished with exit code
```

```
"C:\Program Files\Java\jdk-19\
Enter the age of father: 33
Enter the age of the son: 56
Wrong Age

Process finished with exit code
```

```
"C:\Program Files\Java\jdk-19\
Enter the age of father: -2
Wrong Age

Process finished with exit code
```

8. Multithreading Code

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:

File - C:\Users\Pamposh\IdeaProjects\Quadratic.java\src\Lab8MultithreadingCode.java

```
1 public class Lab8MultithreadingCode {
2     public static void main(String[] args) {
3         BMS b = new BMS();
4         CSE c = new CSE();
5         b.start();
6         c.start();
7     }
8 }
9
10 class BMS extends Thread{
11     public void run(){
12         try{
13             for(int i = 0; i<4000; i++) {
14                 System.out.println("BMS College of
Engineering");
15                 Thread.sleep(10000);
16             }
17         }
18         catch(Exception e){
19             System.out.println(e);
20         }
21     }
22 }
23
24 class CSE extends Thread{
25     public void run(){
26         try {
27             for(int i= 0; i<20000; i++) {
28                 System.out.println("CSE");
29                 Thread.sleep(2000);
30             }
31         }
32         catch(Exception e){
33             System.out.println(e);
34         }
35     }
36 }
```

Output:

```
"C:\Program Files\Java\jdk-19\bin  
BMS College of Engineering  
CSE  
CSE  
CSE  
CSE  
CSE  
BMS College of Engineering  
CSE  
CSE  
CSE  
CSE  
CSE  
BMS College of Engineering  
CSE  
CSE  
CSE  
  
Process finished with exit code 1
```