WEEK 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.

```
import java.util.Scanner;
class Quadratic {
   float d;
   Scanner sc = new Scanner(System.in);
   void solver()
        System.out.println("enter the values of a,b, and c");
        int a = sc.nextInt();
        int b = sc.nextInt();
        int c = sc.nextInt();
        if (a == 0) {
            System.out.println("invalid equation");
        else{
            d= b*b - 4*a*c;
            System.out.println(d);
            System.out.println("the solutions are");
            if(d>0){
                System.out.println("roots are unique ");
                double r1 = (-b+Math.sqrt(d))/(2*a);
                double r2 = (-b-Math.sqrt(d))/(2*a);
                System.out.println(r1 +" " + r2);
            if(d==0){
                System.out.println("roots are equal ");
                double r = -b/(2*a);
                System.out.println(r);
            if(d<0){
                System.out.println("There are no real roots" );
```

```
public class QE {
   public static void main(String[] args) {
      Quadratic q1 = new Quadratic();
      q1.solver();
}
```

```
Microsoft Windows [Version 10.0.26100.2605]
(c) Microsoft Corporation. All rights reserved.

C:\java>javac QE.java

C:\java>java QE
enter the values of a,b, and c
3 4 7
-68.0
the solutions are
There are no real roots

C:\java>javac QE.java

C:\java>java QE
enter the values of a,b, and c
1 2 1
0.0
the solutions are
roots are equal
-1.0

C:\java>javac QE.java

C:\java>javac QE.java
```

```
Quadratic ego print all read solo of eyn. 0002
ax + 6x+C =0. Read a, bic. and un opposition formula.
import java. util. scanner;
class quadratic
  float d;
  Scanner Sc = new Scanner (systemin),
 vold check ()
  System-out-println("Enter the values of a, b, and c");
   Enla = Sc. next(nt();
   Pro b = sc. nextInt();
   Ent c = SconextInt();
   91 (a = = 0)
   system.out.println("Envalid equation");
    else
       d= b* 6- H*a*C;
      Sylmout Poent In (d)",
       System.out Possella "the solution are");
      (0<P) P2
        System. out. printing 10 roots ure unaque ");
        double 71 = (-6 + Math. sqrt (d))/(2+a),
         syltem out prenting;
       26(970)
       d system out o print in ( a roots are 2 maginary ")",
        double 82 = malh squrt(-d)/(200);
        double 72 = (6) [6 = a);
        System " out. printles( 32 + 11 + 1" + 81+ 4 + 72+ 11 - 1" + 3 );
```

```
Public class Maln

Public static void main(string[] args)

devadratic ap = new quadratic();

apr.check();

2

OUTPOT:

Enter the value of 0,b, and C enter the value of 0,b, c

1 -3 2

1.0

the Solution are

roots are unlique

roots are imaginary

1+0+11. Here -1.0-11.404-
```

WEEK 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 {
    String usn;
    String name;
    int numSubjects;
    int[] credits;
    int[] marks;
    double sgpa;
    public void acceptDetails() {
        Scanner sc = new Scanner(System.in);
        System.out.print("Enter USN: ");
        usn = sc.nextLine();
        System.out.print("Enter Name: ");
        name = sc.nextLine();
        System.out.print("Enter the number of subjects: ");
        numSubjects = sc.nextInt();
        credits = new int[numSubjects];
        marks = new int[numSubjects];
        for (int i = 0; i < numSubjects; i++) {</pre>
            System.out.print("Enter credits for subject " + (i + 1) + ": ");
            credits[i] = sc.nextInt();
            System.out.print("Enter marks for subject " + (i + 1) + ": ");
            marks[i] = sc.nextInt();
    public void displayDetails() {
        System.out.println("\nStudent Details:");
```

```
System.out.println("USN: " + usn);
        System.out.println("Name: " + name);
        System.out.println("Subjects and Marks:");
        for (int i = 0; i < numSubjects; i++) {</pre>
            System.out.println("Subject " + (i + 1) + ": Marks = " + marks[i]
+ ", Credits = " + credits[i]);
    public void calculateSGPA() {
        int totalCredits = 0;
        int totalGradePoints = 0;
        for (int i = 0; i < numSubjects; i++) {</pre>
            int grade = calculateGrade(marks[i]);
            totalGradePoints += grade * credits[i];
            totalCredits += credits[i];
        sgpa = (double) totalGradePoints / totalCredits;
    private int calculateGrade(int marks) {
        if (marks >= 90) {
            return 10;
        } else if (marks >= 80) {
            return 9;
        } else if (marks >= 70) {
            return 8;
        } else if (marks >= 60) {
            return 7;
        } else if (marks >= 50) {
            return 6;
        } else if (marks >= 40) {
            return 5;
        } else {
            return 0;
    public void displaySGPA() {
        System.out.printf("SGPA:" + sgpa);
```

```
public static void main(String[] args) {
    Student student = new Student();
    student.acceptDetails();
    student.displayDetails();
    student.calculateSGPA();
    student.displaySGPA();
}
```

```
C:\Windows\System32\cmd.e X
Microsoft Windows [Version 10.0.26100.2605]
(c) Microsoft Corporation. All rights reserved.
C:\java>javac Student.java
C:\java>java Student
Enter USN: 1bm23cs347
Enter Name: sujan
Enter the number of subjects: 3
Enter credits for subject 1: 4
Enter marks for subject 1: 80
Enter credits for subject 2: 3
Enter marks for subject 2: 68
Enter credits for subject 3: 3
Enter marks for subject 3: 78
Student Details:
USN: 1bm23cs347
Name: sujan
Subjects and Marks:
Subject 1: Marks = 80, Credits = 4
Subject 2: Marks = 68, Credits = 3
Subject 3: Marks = 78, Credits = 3
SGPA:8.1
C:\java>
```

```
Develop a stove mog- to creede a class student with member
1 Capa: usn, name, credit overay, gradepoint oming, cal
   SGIPA .
Emport Lava util Swanner;
class student
 £
 ProEvate strong usno
 Prevall shing name;
 Prograte selentij crediti;
 Prevale double [] marks;
Public 5 feedent (Ent num Subjects)
   credits = new ent [numsubjects];
  marks = new double[numbubjects];
Rublic word accept Details()
   Scanner Sc = new Scanner ( syllin . En);
  System. Out. Drintly Enter USN");
  usn = Sc. next lene ()°,
   Sytum rout. Println ("enter name");
   name = sc. nextlenel);
  for (Ent ?= 0; & credits. length o, 2++)
    Suplem. out. Posent ("Enter credits for Subject" + (E+1) +15, v);
    Credity [i] = SconextInt ();
    System out. Point ("Entry gradepoints for subject" + (EH) + (EH) + (EH)
    manks[i] = Sc. neot/Double ();
```

```
Public vold desplay Details()
   Scytem. Oct . Prentln ("Usmi" + Usn);
   System. Out . prontln ("Name"+name";
    for lent 8-0; 82 credets. length , 9++).
       Scylim . Ocal - Print In ("subject + + (8+1) + "- credits:" + Credits [i]+
         ", grade points; " + morki [i]);
    Public double calculatisapa ()
       double total Poents = 0;
        ent. total credit 1 = 0°,
       for (Ent ?= 0 , ? credits · length , ?++)
          totalPoints += (montas [:) x (sedik[i]);
          -totalcredit+ = (redft [i];
     return total Points / total (recloss,
  4
                           TO COUNTY W. GOOD Plant
Public Static Mainsgpa.
    'public; talic roid main (strings [ ] args)
       Scannes Sc = new Scannes (Syntamin);
       Seyeter out. Prosition l'Enter the no. of subjects");
       Ent num Subjects = Sc. next Int();
       Suturt Suldet = new Student (num Subjects);
       5 wholet. occept Delce b();
```

```
Septem. oul Possolu ( " Hecled Delech");
     Steedent. display Detects ();
    double sgpa = steeded . chalculate sqpa(1;
    System coul - Posind In ("SUPP" + 140A);
    sc. dosels:
OUT PUT
  Enter number of subjects 2
  tates
        USh = 20
  Cuti
         name : ABC
         credit for subjet 1: 20 days
   entes
         Grade ponts for subjet 1:9
  Gutr
       Credit for subject 2:4
  Cutes
       gradpoints for subject 2: 7
  Enter
 Stutedat delails.
 USN: 20
 Name : ABC
Subject 1 - Credl : 2, grad ponti. 9
Subjet 2 - credits: 4, good pout: 7
 SGPA = 7-66.
```

WEEK 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.

```
import java.util.Scanner;
class Book {
   int price;
   String author;
   String name;
   int pages;
   public Book(int price, String author, String name, int pages) {
        this.price = price;
        this.author = author;
        this.name = name;
        this.pages = pages;
    public void setter() {
        System.out.println("enter the price, author, name and pages of the book");
        Scanner sc = new Scanner(System.in);
        this.price=sc.nextInt();
        this.author= sc.next();
         this.name=sc.next();
         this.pages=sc.nextInt();
    public void getter() {
        System.out.println("Book Details:");
        System.out.println("Price:"+price);
        System.out.println("Author:"+author);
        System.out.println("Name:"+name);
        System.out.println("Pages:"+pages);
   public String toString() {
                return "these are book details";
```

```
public class Pro {
   public static void main(String[] args) {
        Scanner s1 = new Scanner(System.in);
        System.out.println("enter the number of books");
        int n = s1.nextInt();

        Book []b1 = new Book[n];

        for(int i=0;i<n;i++){
            b1[i] = new Book(200,"sachin","The Pride",111);
            b1[i].getter();
            b1[i].setter();
            b1[i].getter();
        System.out.println(b1[i]);
        }
    }
}</pre>
```

```
enter the number of books
Book Details:
Price:200
Author:sachin
Name:The Pride
Pages:111
enter the price,author,name and pages of the book
150
virat
TheCentury
120
Book Details:
Price:150
Author:virat
Name:TheCentury
Pages:120
these are book details
```

```
ereate a class which contains member name author, price numpuye, of include a constructor, a setter a a getter include a strong
 method w.A. A. P to creal n book objects
us
  class Book
   Prévate Strengename;
   Prevate streng author,
   Pravade String price;
   Prévale ent num pages;
  Public Book (string name, string author, double price, int num Pagus)
     this name = name =
     this author = author;
     this. Price = price;
     thes. humpages = numpages;
  Public void selter (string name, string author, double price,
      Int num Pages)
     2
       this name = name;
       this boundless = authors,
       thes. price = price.
      this numpages = numpages;
   Public String getter()
      return to string ();
   Public String to String()
     return " Book Name: " + name + "; Author": + author + ", Price
         ers" + Price + ", Pages " + num Pager;
   3
  3
```

```
Riblec class Bookmain
 Public States vold muln (strang [] angs)
   Scanners Sx = new Scanner (Syptem. 9n);
   System - out . Prentl A ( " Enter no. of books");
         h = Sx onext Int ();
   Ent
  Book [] books = new 1300 k [n];
 for ( Put 9=0; 92n; 9++)
 System. Out. Println 1" Enter delails of book" + (EH));
System out . Println l' Enter name, author, price, no of pagen);
          String name = sx.nextline();
          Strong author = sx. nextlenel);
          double - price = sx. nextDouble ();
          Int numpages = sx. nextInt();
  books [i] = new Book [name, author, price, numpages);
  System. out. posintln (books[i] getteres);
    Sx. close ();
```

OUTPUT : - BOOK :

Enter the number of books: 2 Enter name of books: ABC

Enter author of book 1: x42

Enter price of books: 99

Enter number of Pages in book 1 = 150

Enter the name of books: abc

Enter author of book 2: xyz

Enter profice of book 2: 199

Enter number of page in book 2 = 200

Book Deteils:

Book name : ABC

Author name: XYZ

Price: 99

Number of Page : 990

Book name ; abc

Author name: 5043

Pronce : 199

number of pages: 200

WEEK 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.

```
abstract class Shape {
    int dim1;
    int dim2;
    abstract void printArea();
class Rectangle extends Shape {
    public Rectangle(int length, int width) {
        this.dim1 = length;
        this.dim2 = width;
    void printArea() {
        int area = dim1 * dim2;
        System.out.println("Area of Rectangle: " + area);
    }
class Triangle extends Shape {
    public Triangle(int base, int height) {
        this.dim1 = base;
        this.dim2 = height;
    void printArea() {
        double area = 0.5 * dim1 * dim2;
        System.out.println("Area of Triangle: " + area);
class Circle extends Shape {
```

```
public Circle(int radius) {
    this.dim1 = radius;
    this.dim2 = 0;
}

void printArea() {
    double area = Math.PI * dim1 * dim1;
    System.out.println("Area of Circle: " + area);
}

public class Main {
    public static void main(String[] args) {
        Shape rectangle = new Rectangle(8,9);
        Shape triangle = new Triangle(8, 6);
        Shape circle = new Circle(14);

        rectangle.printArea();
        triangle.printArea();
        circle.printArea();
}
```

```
Area of Rectangle: 72
Area of Triangle: 24.0
Area of Circle: 615.7521601035994
PS C:\Users\satis\OneDrive\Documents\ooj_lab>
```

```
1 Develop a program for an abstract class shape haveng two
 vargable and an empty method prentareas. proved three
 claim name trangle roce, circle which extends shape,
  print react.
    da Emport java. util. Scanner
    abstract class Shape
    d Port dim 1;
      int dem 2;
      Public Shape ()
        this dims = 0;
       thes. dem 2 = 0;
      Public Shape (Ent dems, Ent dems)
        this. dem 1 = dem 1:
        this. dema = dema;
     Public abstract vold prentAreac);
class Rectangle extends Shape
  Publit Redangle ( int length, Int which)
     dem1 = length;
      dem 2 = width;
  Public Vold Printareal)
     Ent area = dlms + dlm2;
     System. out. Prentin ("Area of Rectanch: "+ area);
3
```

```
Class Preangle extends Shape.
     Public Treangle (Ent base, Ent helight)
           dem 1 = bare;
          dem 2 = helafit;
     Public vold PrintAreal)
      double area = 0.5 × dim 1 × dim 2°,
      System. Out. Prosider ("Area of sle: " + area);
Class DEACLE extends shape
    Public Circle (Ent radius)
    d
       dem1 = radius.
       dem 2 = 0;
   Public void Point Aseal)
      double area = Math.PI * dems * dims ;
  Public dan Shapes
    Public states voed main (Shengy [) args)
       Scanner in = new Scanners (Scrittm. in);
      System. out. prentle ("Enter length & wedth for Rectangle");
      Ent length = En. next Int ();
       ent weath = en. nextInt();
        Shape rectangle . Prohthreas ();
```

```
Septem out . Prenth ("Enter bow & helght for Treangle");
     ent bare = Enonext Int ();
      Put holight - Pro next Int();
      Shape to langle = new Preangle (bow, herett);
      treangle - Prent Area'() ",
     System. Out. Prenten l'Enter rodlus of cerclei);
      Ent radius = EnonextInt();
      Shape cercle = new Cercle (radius);
      cercle . Print Areas ();
       inoclose ();
  3
OUTPUT:
  . onter lingth & width for Rectangle:
     20 30
    Area of Redangle: 600
    that have & height for Priantile:
   30 HO
    Area of Triangle: 400
    Enter radius for cercle:
   40
   Area of cerale : 5026.5482.
```

WEEK 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.

```
import java.util.Scanner;
class Account {
     String customerName;
     int accountNumber;
     String accountType;
     double balance;
    public Account(String customerName, int accountNumber, String accountType) {
        this.customerName = customerName;
        this.accountNumber = accountNumber;
        this.accountType = accountType;
        this.balance = 0.0;
    public void deposit(double amount) {
        if (amount > 0) {
            balance += amount;
            System.out.println("Amount deposited: " + amount);
            System.out.println("Updated balance: " + balance);
```

```
System.out.println("Invalid deposit amount!");
    }
   public void displayBalance() {
        System.out.println("Balance: " + balance);
class SavAcct extends Account {
   private double interestRate;
    public SavAcct(String customerName, int accountNumber, double interestRate) {
        super(customerName, accountNumber, "Savings");
        this.interestRate = interestRate;
    public void computeAndDepositInterest() {
        double interest = balance * (interestRate / 100);
        balance += interest;
        System.out.println("Interest added: " + interest);
        System.out.println("Updated balance: " + balance);
    public void withdraw(double amount) {
        if (amount <= balance) {</pre>
            balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
            System.out.println("Updated balance: " + balance);
        } else {
            System.out.println("Insufficient balance!");
class CurAcct extends Account {
  double minimumBalance;
   double serviceCharge;
    public CurAcct(String customerName, int accountNumber, double minimumBalance,
double serviceCharge) {
        super(customerName, accountNumber, "Current");
        this.minimumBalance = minimumBalance;
        this.serviceCharge = serviceCharge;
```

```
public void withdraw(double amount) {
        if (amount <= balance) {</pre>
            balance -= amount;
            System.out.println("Amount withdrawn: " + amount);
            if (balance < minimumBalance) {</pre>
                imposePenalty();
            System.out.println("Updated balance: " + balance);
            System.out.println("Insufficient balance!");
    private void imposePenalty() {
        balance -= serviceCharge;
        System.out.println("Balance fell below minimum. Service charge imposed: "
+ serviceCharge);
public class Bank {
   public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Choose account type:\n1. Savings Account\n2. Current
Account");
        int choice = scanner.nextInt();
        scanner.nextLine();
        System.out.println("Enter customer name: ");
        String name = scanner.nextLine();
        System.out.println("Enter account number: ");
        int accNum = scanner.nextInt();
        if (choice == 1) {
            System.out.println("Enter interest rate for savings account: ");
            double interestRate = scanner.nextDouble();
            SavAcct savAccount = new SavAcct(name, accNum, interestRate);
            System.out.println("Enter amount to deposit: ");
            double deposit = scanner.nextDouble();
            savAccount.deposit(deposit);
            savAccount.computeAndDepositInterest();
            System.out.println("Enter amount to withdraw: ");
```

```
double withdrawAmount = scanner.nextDouble();
            savAccount.withdraw(withdrawAmount);
        } else if (choice == 2) {
            System.out.println("Enter minimum balance for current account: ");
            double minBalance = scanner.nextDouble();
            System.out.println("Enter service charge for falling below minimum
balance: ");
            double serviceCharge = scanner.nextDouble();
            CurAcct curAccount = new CurAcct(name, accNum, minBalance,
serviceCharge);
            System.out.println("Enter amount to deposit: ");
            double deposit = scanner.nextDouble();
            curAccount.deposit(deposit);
            System.out.println("Enter amount to withdraw: ");
            double withdrawAmount = scanner.nextDouble();
            curAccount.withdraw(withdrawAmount);
        } else {
            System.out.println("Invalid account type selected.");
        scanner.close();
```

Output:

```
Choose account type:
1. Savings Account
2. Current Account
Enter customer name:
sagar
Enter account number:
1234
Enter interest rate for savings account:
Enter amount to deposit:
5000
Amount deposited: 5000.0
Updated balance: 5000.0
Interest added: 150.0
Updated balance: 5150.0
Enter amount to withdraw:
4800
Amount withdrawn: 4800.0
Updated balance: 350.0
```

```
Choose account type:
1. Savings Account
2. Current Account
Enter customer name:
chetan
Enter account number:
9876
Enter minimum balance for current account:
Enter service charge for falling below minimum balance:
150
Enter amount to deposit:
6000
Amount deposited: 6000.0
Jpdated balance: 6000.0
Enter amount to withdraw:
5200
Amount withdrawn: 5200.0
Balance fell below minimum. Service charge imposed: 150.0
Updated balance: 650.0
```

5. Develop a Fava program to creade a clair bank that maintains two hends of account for ets customers, one of them caud sawings account and the others current account. The saverny account provides compound interest and with doount facilities but no cheque book facellity, The current account proveder cheque book facility but no interest current account holder should also malitain a minimum balance and of the balance falls below this level, a service charge is imposed. Create a clair Account that stores culomer name, account number and type of account. From this derive the clauses cur-acet and sav-acet to make them more specific to their requirements. Include the necessary methord en order to achive the following tasks. @ Accept dyposite from curtomer and uptitule the balance 6 D& play the balance @ compute and deposit interest @ Permit withdrawal and update the balance check for the menemen balance, 9 mpose penalty if necessary and update the balance ms Emport Lava. util. Scanner; class Account & stoling curt name; Ent acc-no; strong accetype, Public Account (swing custome, ent account no, swing type Curt-name = cus.name; acc-no = account-no; acce-type = type-acc; balance = 0.0;

```
Public void deposit (double amount)
       ? ( ( amount >0)
            balance = balance taccount;
            System.out-println ("Around dyos ted:" + amount);
            System out printle (" up dated balance: " + balance);
       eluatre
          System . Out. Pointln ("Foralled")"
    4
   Public void displaybalance ()
       System. Out pointle ("Balance"+ balance);
Clair Savacet extend Account
          double EnterestRate;
  Public SavAccoul (String Contemes Name
       Super (custoname, ace-no);
        this of nevertrate = Enterestrate;
   3
  Public void DepositIntred()
     double entireil = balance * (entereit Fall /100);
      balance = balane + Enterest;
      System. out . println (" Interest added: " + Enterest);
     System out . println ("up douted balance" " + balance);
```

```
wathdraw (double amount)
  d of (amount == balance)
      d
          balance = balance - amount;
           System - out - println ("Amount withdraw": " + amount);
           Syntim - out - pointly ("applied balance" + balance);
      3 che
          System. out-pointful "Insufficient balance");
     8
   3
class arrent
class curact extends Accounted
 double menemum balance;
 double
           service charge;
 Public Curact (string contrame, ent acoro, double minimuladance,
         double Servicecharge)
      Super (Cutoriname, accho)
      this. Service change;
 Public vold with draw (double amount)
    if (amount c = balance)
       balance e-amount?
       System-out pointing " Amount withdrow" + amount);
       Tot balance a menemum balance)
        d imposepenally();
       System-out- println ("updated balance" + balance);
          a
System. oct. Drintin (" In sufficient balance");
    3
```

```
vard PmposeDenally()
      Posvali
         balance = balance - service charge;
         System. Old. println( Balance is mener , service charge imposed + services
Public clau Bank
    Public stedic void main (string Dasgn)
      Scanner Scanner = new Scanner (Systemo in),
      System. ocd . println ("choose account type: in 1. saving accin
      Put choice = scanner next Int();
      Scanner next (enec);
      5 yetem · out · printin ("tolar customor name");
      string name = Scanner . next line();
      System . out . println (" the account numbers");
      Ent ace-noun = Scanner-next (ntc);
      El [chorce = =1)
         Scritanoout. Providin (" finter Entrevit rade for sowing acc");
         double Enterent Pout = Sconner. next Double (19,
         Sou Acet Savoccout = reco 3 au Ace (name, acenum, interestrecte);
         system out printly (" cuts amount to deposition);
         double deposite = 9 comes next couble ();
          Sav Account. Exposets ( deposets);
          San Accen Compute and Deposite Interest ();
         System out opsintin ( o entr ormount to withdraw ");
         double with document = scanner. next Double ();
         Sav Acc. with tocus (with to an Account);
       4
```

```
ette of (chorce == 2)
         System. och printin " till renen balance for corrad aco ",
( ange);
         double men balance = Scanner next double ();
          Syntin · out · println (" Entr service Charge ")",
           double service charg = scanner, newtoudel);
          Curact Curaccount = new curacct (mame, accnown, normbalance,
                                   servicethorge);
        System . Och println " fits amount to ceithdraw 1);
         double withdrawAmound = Scanners.nextdouble ()",
        Cur Acco withdrawl (withdrawtonoust);
       2
         elre
           System · Ocot-porteln (" Invalid");
         Scanniero clareco;
    4
    OUTPUT .
        choose account type:
          1. Savengs Account
          2. current account
                                             culquishames
                                       enter
          Enter curtomer name:
                                        ontrace-no;
           ABC
                 acc-no %
           enter
           Enter Enterest rate for savings account:
                                        Enter men balance for current acc
                                          1000
                                          outr service charge for falling
            Enter amount to deposite :
                                                   below non balant:
            Amount deposted: 1000
            1000
            opdated balance: 1000
                                          onto amont to deposite.
                                           200
            Interest added : 60
                                           500
             update salance: 1060
                                           Amous deposite: 500:0
                                           opdates balance: 500.0
            Amount wit
             Enter amount to with draw :
                                          Enter amount to withdraw : 100
                                          Balance fise btelow nim . : 200
            Amount withdraw: 500.0
                                          updatel balance : 200
            updated balance : 560.
```

WEEK 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.

```
import CIE.Internals;
import SEE.External;
import java.util.Scanner;
public class Studentmarks {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.print("Enter number of students: ");
        int n = scanner.nextInt();
        scanner.nextLine();
        Internals[] cieStudents = new Internals[n];
        External[] seeStudents = new External[n];
        for (int i = 0; i < n; i++) {
            System.out.println("Enter details for CIE Student " + (i + 1) + ":
 );
            System.out.print("USN: ");
            String usn = scanner.nextLine();
            System.out.print("Name: ");
            String name = scanner.nextLine();
            System.out.print("Semester: ");
            int sem = scanner.nextInt();
            int[] internalMarks = new int[5];
            System.out.println("Enter internal marks for 5 courses: ");
            for (int j = 0; j < 5; j++) {
                internalMarks[j] = scanner.nextInt();
```

```
cieStudents[i] = new Internals(usn, name, sem, internalMarks);
           scanner.nextLine();
           System.out.println("Enter details for SEE Student " + (i + 1) + ":
);
           System.out.print("USN: ");
           usn = scanner.nextLine();
           System.out.print("Name: ");
           name = scanner.nextLine();
           System.out.print("Semester: ");
           sem = scanner.nextInt();
           int[] externalMarks = new int[5];
           System.out.println("Enter external marks for 5 courses: ");
           for (int j = 0; j < 5; j++) {
               externalMarks[j] = scanner.nextInt();
           seeStudents[i] = new External(usn, name, sem, externalMarks);
           scanner.nextLine();
      System.out.println("\nFinal Marks for all students:");
       for (int i = 0; i < n; i++) {
           cieStudents[i].displayStudentDetails();
           cieStudents[i].displayInternalMarks();
           seeStudents[i].displayStudentDetails();
           seeStudents[i].displayExternalMarks();
           int[] internalMarks = cieStudents[i].getInternalMarks();
           int[] externalMarks = seeStudents[i].getExternalMarks();
           int[] finalMarks = new int[5];
           for (int j = 0; j < 5; j++) {
               finalMarks[j] = internalMarks[j] + externalMarks[j];
          System.out.print("Final Marks: ");
```

```
package CIE;
public class Internals extends Student {
    private int[] internalMarks = new int[5];

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

    public void displayInternalMarks() {
        System.out.print("Internal Marks: ");
        for (int mark : internalMarks) {
            System.out.print(mark + " ");
        }
        System.out.println();
    }

    public int[] getInternalMarks() {
        return internalMarks;
    }
}
```

```
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;
}

public void displayStudentDetails() {
    System.out.println("USN: " + usn + ", Name: " + name + ", Semester: " + sem);
    }
}
```

```
package SEE;
import CIE.Student;

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

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

    public void displayExternalMarks() {
        System.out.print("External Marks: ");
        for (int mark : externalMarks) {
            System.out.print(mark + " ");
        }
        System.out.println();
    }

    public int[] getExternalMarks() {
        return externalMarks;
    }
}
```

Output:

```
Enter number of students: 2
Enter details for CIE Student 1:
USN: 1
Name: sagar
Semester: 2
Enter internal marks for 5 courses:
38 40 41 45 46
Enter details for SEE Student 1:
USN: 1
Name: sagar
Semester: 2
Enter external marks for 5 courses:
39 42 45 50 48
Enter details for CIE Student 2:
USN: 2
Name: chetan
Semester: 3
Enter internal marks for 5 courses:
40 44 46 47 50
Enter details for SEE Student 2:
USN: 2
Name: chetan
Semester: 3
Enter external marks for 5 courses:
40 44 46 47 50
Final Marks for all students:
USN: 1, Name: sagar, Semester: 2
Internal Marks: 38 40 41 45 46
USN: 1, Name: sagar, Semester: 2
External Marks: 39 42 45 50 48
Final Marks: 77 82 86 95 94
USN: 2, Name: chetan, Semester: 3
Internal Marks: 40 44 46 47 50
USN: 2, Name: chetan, Semester: 3
External Marks: 40 44 46 47 50
Final Marks: 80 88 92 94 100
```

```
@ Create a package the having two claves - student & Internals
 the clau Personal has member (8ke Usn, name, sem, the day
 Intermed has an array that stores the Intermal marks coved in face
 courses of the current semester of the student. Create another package
 SEE which has the class external which is derived class of students
This clan has an arry that stores the SEE mortes scored in five
 Courses of the current committee of the steeded. Import the teo
 packages. In a file that declares the final marker of a students
  in all live courses.
us class student
    of public ent osn;
      Public string name;
      public ent sem;
       ent[] "marks = new ent[5];
      Public student (int osn, strong name, int sem)
       d this ousn = usn;
          this, name = name",
          this : Sem = Sem;
         4
      Public vold shows
        System. out opsintin(" ush: "+usn+ "+ " name "+ nam
     package cie;
    class enternal extends student
      Public Enternal (Ent usn istring rame, Ent Sem, Enti] imark)
      Super (usn, name, same);
         this i Emank = Proonk;
```

```
Package SEE;
emport crestadent;
public class external extends Student
 & public ent smark[] = new entis];
  Public external (end usn, streng name, end sem, ent [] smorte
     super (cun, name, sem);
      thus , smark = 5 mark ;
    3
  Emport cre . Poternals,
   Emport see éxitismals;
   Emport java. ulil. Scanners;
Public clantet
~ public static vold moun(shing **[])
  Scanner Sx = new Scanner (System. En)
  Ent [] c mark = neco ent [5];
  Put emork = new Put[5];
  System. out printle (vente number of students");
  Ent n = Scone of Int();
  for ( Pot K=0 ; KCn ; K++)
    Systemooulo prutin("Enter un name, sem");
    ent usn = sc. next Int();
    Strong hame = sxc next(hel);
    -Put sem = sx. next Int();
   System out sportet ( the 5 Subjects mark for Entered )
    for 18nd ? = 0°, 8c5 ·, "++)
        (mark [i] = restInt();
    sixtem.outopointln (" ender see mores of subject");
      to (int 8=0 9, 9 45', 9++)
        d emork[i] = next [ul();
```

```
? = new internal (vsn, name, sem, cmark);
  Internal
   external e1 = new external (usn, name, Sem & mork);
  System out. proutin (" Details); enhours
  for [Pot 9=0; 9co 5; 9++)
      System outoprinth ("Total narks of student");
        el-show();
     System . out-printh("i1. "modt [i] + e1. smork(2);
3 3
OUTPUT
  enter no of students
  entor usn, name, sem
   23
   Robert
    3
  enter 5 Subject mans 9nentunals
   38
   3730
    39
        See morks of 5 subjects.
  enter
   78
   89
   96
   98
 Delais
             name: Robert sem: 3
                 en subject
 Total marks
  77
  78
   63
```

WEEK 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 uses both father and son's age and throws an exception if son's age is >=father's age.

Source Code:

```
import java.util.Scanner;
class WrongAgeException extends Exception {
   public WrongAgeException(String message) {
        super(message);
class SonAgeException extends Exception {
   public SonAgeException(String message) {
        super(message);
class Father {
    int age;
   public Father(int age) throws WrongAgeException {
        if (age <= 0) {
            throw new WrongAgeException("Wrong age");
        this.age = age;
   public int getAge() {
        return age;
class Son extends Father {
    int sonAge;
   public Son(int fatherAge, int sonAge) throws WrongAgeException,
SonAgeException {
        super(fatherAge);
        if (sonAge >= fatherAge) {
```

```
throw new SonAgeException("Son's age cannot be greater than or equal
to father's age");
        if(sonAge <= 0){</pre>
        throw new WrongAgeException("Wrong age");
        this.sonAge = sonAge;
    public int getSonAge() {
        return sonAge;
public class FatherSon{
    public static void main(String[] args) {
            Scanner sc = new Scanner(System.in);
            System.out.print("Enter Father's Age: ");
            int fatherAge = sc.nextInt();
            System.out.print("Enter Son's Age: ");
            int sonAge = sc.nextInt();
            try {
                Son son = new Son(fatherAge, sonAge);
                System.out.println("Accepted Succesfully");
            catch (WrongAgeException e) {
                System.out.println(e.getMessage());
            catch (SonAgeException e) {
                System.out.println(e.getMessage());
```

Output:

```
Enter Son's Age: 26
Accepted Succesfully
PS C:\Users\satis\OneDrive\Documents\ooj_lab> javac FatherSon.
PS C:\Users\satis\OneDrive\Documents\ooj_lab> java FatherSon
Enter Father's Age: 30
Enter Son's Age: 32
Son's age cannot be greater than or equal to father's age
```

Enter Father's Age: 30 Enter Son's Age: 0

Wrong age

OBSERVATION:

```
@ with a program that demostrates handling of exceptions in
   Enherstance tree create about claim in Father clair, Proplimed
   a constructor which take the age and throws the exception
   wrong Age () when the Enput age co. In son clan Empliment a
   Constructor that uses both father and son's agreand throws
  an exception if son's ace is >= fathers age.
ms Emport Lawo. will. scanners,
    class wrong age exception extends exception
      Public Wrong Agrenception (5 hong message)
         Super (merrage);
    Class SonAge Exception extends exception
     Dublic SonAge Exception (string menage)
       & supper (menage),
   Clay Father
     d prevate ent age;
        Public Father (Ent age) throws wrong Age Exception
            d throw new wrong Age Roception ("wrong age");
         dol (ageco)
           thes cage = age;
        Public Ent get Age ()
             & return age;
  claus son extends Fathers
     Public son (Ent fortunary, Ent son Age) throw wrong Age Exception,
    d poevolte ent son Age;
                 son Age Proception
        Super ( Godler Age);
        El (son Age > = footherAge)
          a throw new son Agretaception ("son's erge correct be greater than
                or equal to father's egen);
              3 this . Son Age = Son Age;
```

```
Public Pul ox150nAge()
        & return Son Age ?
Public class Father son
      Public Static void main (shing [] ongs)
        d while ( true)
            Scanner Sc = new Scanner (System . (n);
           Systemoul-possella ("Faler Father's age "")
           End Palles lage = Sc. mext Ind ();
          System .ocal - por weh ("Enter son's Age: ");
          But sonage = sconeol Intile;
         trys
              Son son = new Son (father Age, son Age);
              System occoposation ( * Accepted scacesfully ");
            couch (wrong Agr Exception e)
               System. och opstalln (c. getmenege ());
            3
          catch ( strong SonAge Exception e)
              d System outoprinthn(e.getmenage(1);
          catch (son Age
         System . Oul . prints ("cooyed you leke to se-enter detaile(4 W)"
         Strong Enput = scripto;
         Ef (Enput. equalt grovecou (un 1993
            break?
```

```
CUTPUT :
 Enter Father : 40
 Char Son's Age: 12
 Accepted succeptully
 would you cake to se-enter detech (YIN)
 Enter Father 'Age: -8
  Contin Son's Age: 40
  wrong age
  would you ceke to re-enter details (YIN)
  Enter Fether Age : 5
  enter Son's Age : 14
  son's age connot be greater than or equal to father's age
  would yofteke to re-enter delasts (4 (W)
```

WEEK 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.

Source Code:

```
class ThreadDemo extends Thread{
    public void run(){
    while(true){
    System.out.println("BMS College Of Engineering");
    Thread.sleep(10000);
    catch(InterruptedException e){
    e.printStackTrace();
class CSEThread extends Thread{
   public void run(){
   while(true){
    System.out.println("CSE");
    try{
    Thread.sleep(2000);
    catch(InterruptedException e){
    e.printStackTrace();
public class Demo{
    public static void main(String[] args){
   ThreadDemo t1 = new ThreadDemo();
   CSEThread t2 = new CSEThread();
    t1.start();
    t2.start();
```

Output:

```
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
CSE
CSE
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
CSE
CSE
```

OBSERVATION:

```
Wiste a program which creates two threads. deplay "Bms college
 at engineering " once every ten seconds and anothers displaying
 "ESE" every two seconds,
us class threads 1
     Public states vaid main (strong asops[])
         Thereads threadlosms: new threadlinew ofsplay ams (1);
        Threads threads se = new thread (new psplay csec);
        thread Bms , stadlew;
        thread (se ostart();
   8
   class offlay BMS Pmpliments Runnable !
      public vold punc) s
        try &
             while (true) of
                Sylum. out pointln("Dons college of engg");
thread-skep (10000);
         Ealth (Interrupted Exception e) &
              System-o at printly ("Interrupted" + e.git message();
       3 3
    clair Desplayere emplements Runnable
        public void man() {
           to ay 1
                white (frue) of
                     System out-pointly ("CSE");
                     thread . slep (2000);
         catch (Interrupted Exception e) (
              System - out. mint(n/ Intrerrupted" + e.get munuy (1);
       4
```

OUTPUT! BMS college of engg CSE CSE CSE CSE CSE BMS college of Engg CSE CSE CSE AC C: Tusers I BMSCE | Desktopl + (moad>