B.M.S COLLEGE OF ENGINEERING BENGALURU

Autonomous Institute, Affiliated to VTU



Submitted in partial fulfillment of the requirements for record of

OBJECT ORIENTED JAVA PROGRAMMING

(23CS3PCOOJ)

Submitted by:

SIRIGIREDDY PRANAV REDDY 1BM22CS281

Faculty incharge:

Dr Seema Patil

Department of Computer Science and Engineering B.M.S College of Engineering Bull Temple Road, Basavanagudi, Bangalore 560 019

B.M.S COLLEGE OF ENGINEERING DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Name: SIRIGIREDRY PRANAU FERRY

Section: 3E

USN: 184220281

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12/12/23 LAB-1 IRA 12-12-22 - Develope a sava program that prints all real solutions to the quadratic equations on't but c=0. Read in a, b, c & use the readratic formula. If The discuminate bi- 4 ac is negative display a manage stating that there are no real solutions. I P: import java . util . scanner . class Quadratic int a, b, c; double ri, rz, d; void getal) Scanner Sc= new Scanner (System. in). . System out printin ("Enter coepsiciente a, b, c"); b= sc-next Int(); c = screet Inter; () stugness 6:00 whâle (== =0) System.out. printin ("Not a guadratic excention"); System out proutin ("Fater a non zero value for a:");

```
Sconner SC= new Scorner (Systemin);
          a= s-next Int();
     d=b"b-4"a"c;
     if (d==0)
        Y = (5) / (2°a);
        System out printin ( "Rooks are real and excel").
       System out printin ("Root 1 = Poot 2=" + 1).
     3
  COX if (2>0)
     1, of (b) + (mars sprt (d))) (double) (2°0);
     1. (1-b) - (Math = sqrt (d)) (double) (2 + a);
     System.out println (" Poots are real and distinct)
     System-out. printly ("Roots = + + 12)
exe of (dco)
         System out. Printin ( Rooks are imaginary")
         Y1= (- b) 1(20);
         12 = Hath - sqxt (-d) ((2°a);
        System cont. Printen ("Rocti = "tr, +" + i" + re)
         Syskmoit fronts (" Poots = "+ v, + " = " + v =
```

```
class Quadratic Main
                        new Quedratic ().
          q. gerd (7)
          a compect?
         & Systemand. promitin ("S. promar Reddy - 1BM 22CS 281");
1) Enter coefficients
                     a, b, c // // //
             10 - 10 - 10
   - Roots are real and equal
    Root 1 - Root 2 - - 1
    S. Pranov Reddy - 1BM2263281
 2) Enter cognient a, b, c
      Rosk are imaginary
      Roott 1 - - 1 + 1-4 19 21 35 62373 (i
```

Root x = -1=1.4142135623731i

S. Pronau Reddy - IBMZZESO 81

3) From Loophelents a.b. " Roots are imaginary Root = -0.75+1.16124949959967 ROOTI = -075-186124749959961 it books wrogaten S. Pronov Reddy - IBM 22C5281 Enter coepiecions a, b, l foots are feel and distinct Post 1 = -0,2679491924311221 Roota = -3.732010807568877 S. Pronov Reddy - (BHULESER) lab-2 -) develope a Java programme to create a class student w members usn, name, an array undits and and an array marks. Include merhods to occupt and display details and a memod to calculate supply of a student SGPA : ZI[(course credity) (Grade points)].
Zi [course credity]

4A19-12-23 import java util- scanner; clan Subject & int marks ; int credits; The first of the second class Student (Subject[] Subject; string name; string usn; double Sapas Scanner be; Public Student () { in tal subjects = new subject [9]; Por (1=0; 129; 1++) Subjects [i.] = new subject(); SC: new xanner (system in); 4 Rublic void Impuddetails(1) { System. out Println ("Enter Student name: "); name = sc. nextline();

```
System out print ("Frite student USD.");
USn = 6c. next Line ()
for (in 1=0; 127; 1++) {
    Subject [i] = new subject();
    System. out. println (" fine details for subject" + (1+1)
    System out printle ("Fine marks for the subject: ").
    Suggests[i].marks = Sc. nextInt();
    System out print ("Phyer credits too the subject:
    Subjects [i] · credity = sc.nextInt();
   4
 Private int calculatepoints (int morks) {
      if (marks > 90) {
             return 10;
         4 else if (marks > 80) }
              return 9:
         gely if (marks > 70) (
             return 8;
          YOU IF (MOTES > 60) {
               return 7;
          4 else it (marks > 40) {
               return 6;
          3 exx (
               return 0;
```

```
Putic void calculates GPA() {
      double total (redits = 0:
      double weighted sum = 0;
      for (int 1=0; 129; i++) {
          total (redits += subjects (i). (redits;
          subjects, (i). points - calculatepoints (subjects (i).
    weighted sum + = subject filteredity + subjects [i] points
  P
   Sgpa = weighted sum I total credits;
   Public void display Resput () {
     System out printer ("Student Nam" + name );
     System out point ( " student USN: " + USD);
    System out prist- ("SGPA: " + 19Pa):
  Public class Main f
       Public Static void main ( String (7 args) ) {
           Student Student: new student ();
           Student input Details ();
            Chudent calculate SGPA();
```

9/10

Enter student name: framav Enter Student USN: 1BH2219181 Fire details for student? Enter marks for the subject: 89 Friter credits for the subject : 4 Enra details for student 2 Enter marks for the subject: 89 Enter cradits for the subject: 3 Enter details got student 3. Enki marks for the stubject :99 Enter credits for the subject: 3 Enter details for Student 4 Fire marks for the subject: 87 Gule credits for no subject: 3 Fire was details for student 5. Enter morks for the subject: 78 Enter credit for the subject 3. Enter details for student 6 Enter marks for the Subject: 80

Forther Credition for the Subject; 3

Forther details for the Subject: 88

Enter marks for he Subject: 1

Forther Credition for he Subject: 1

Forther marks for he subject: 90

Forter marks for he subject: 91

Forther details for he subject: 91

Forther details for he subject: 90

Forther marks for the subject: 90

Forther marks for the subject: 90

Forther marks for the subject: 90

Forther credits for the subject: 90

Student Name: praner
Student USN: 1BM2285281
SGPA: 8.862636363

Frice, num-pager include a construction to set the radius for the members include methods to set, and get the details of the obspects, include a toshing (I method that could display the complete details of the book Develop a java program to create to book objects.

7/6:

import java util. Scanner; class books (

Put pice, num pages;

Books (String name, string author, int, price, int numpages)

this name = name;

this rawher = author;

this price = price;

this - nempages = numpages;

Public string tosting (1)

shing name, author price, numpayes,
name. "Book name 1." + this name + " \n";
author "Advar name. " + this author + " \n";
Price = price." I this price + " \n";

Yetur name + a when + Pice + numpages;

class BookMain 9

Public Static void main (String 17 orgs) {

Scanner Sc = new Stames (Jysten In);

int n;

Shing have, author

int pice, rumpages;

System at . prints ("Enter the number of books: ");

n=x.nextint();

Books b[] = new Books [n];

System and prints ("E now Name, author, pice and number

of pages: ");

for (Mt 1=0; izn; i++) {

name = sc. next ();

author oscinent ();

Prile = SC. nex+ Intel;

numpages = sc. nextSnt().

b [i] - New Books (name, author, price numpages);

System at printles (& Book delails "),

Por Cont is of isnited) 1

System-out pointly (50). to shing (1);

Op:

Name: S. Fronov Reddy

OSN: IBM22CS2P1

Enter the number of book:

Enter Name, author, price and number of pages

007

1

Thon

075

1572

Book Details:

Book name: 007

author name: Thon

120 : 750

Number of pages: 1275

GRA 2-1-23

shope that contains two integers and an ompty method named shape that contains two integers and an ompty method named partengle; Triangle & circle such med cach are of the classes extends the class shape.

Ench one of the classes contain only he method print mea() that Rich he area of the green shape.

IIp.

import save. Util. &;
import jave. Util. Scenner;
abstract class Shape {
 int length;
 int winth;
 public abstract void printaneel);
}

class Rectangle extend shape t

int aree;

Public Rectangle (int length, At wisth) {

this. leight = leight; this. widon = widon; this. area = leight widon,

Public void printance () {

System.o.d. println (Aree of rectangle is" a aree);

```
class maybe extends shape &
      int area ;
    Redice Triangle (but length, ind water) of
      This length = langth;
            this width = width ;
          This area = (leight a width) 12;
         Jublic void printagea () {
              System. out. Println ("Area of trough is" + area
   class circle extends shope of
                double are;
            Public deirch (ht layer) of
                 this length - length;
                  Mis. width = 0;
                  this area = 3.14 " length " longton)
         public void printarealité
               sylun. o.d. pritta ( hree of wireli" + area);
            Public class Maps &
                public static void main (String () args) {
```

```
N 0,5,1;
Stonner St: new Stonner ( System in );
Systemoch pridle ("Free length & width and radius").
 a = S(. next Ins())
 D= Sc. next 2-1();
 V= Scrent Int();
 Rectangle recenew Rectanglela, b);
 Triangle tris new Triangle (a, 5);
  circle circ new circle(1);
  rec. printores ();
  his print area (1);
  Cir pristorea ();
```

Tovelop a jova program to creek a class Bank that maide two kinds of account for it customers, one called sorings account. The sorings account the sorings account of produces to be sort of account provides cheque book of account provides cheque book out no interest carent account holders should also provides and last consist a few bodones tolders should also provides and last bodones tolders should also provides a service to imposed. Create a class second took stores customers name, mumber and type of account from this device the classes customer and ond sav-acct to make them them more perific to their requires sorted he receiving methods in order to accept to their requires of accept deposit from customers of guptidate belonce

10) Display the balance

c) compute 9 deposite interest

d') Permit windrawal and update the belonce

e) that for he minimum beforce, impose pendly if receiving and of

I/P.

import jave white storner;

1 string none,
int acces;
String type;
double belong;
account (String none, but acces, string type, double traterial

```
This make i make
this acces acces;
this type = type;
mis. bulance = belonce;
void deposite (doubte amount)
belove + = amount;
 void windrawl double amount)
  1/( belonce - amound )> co)
    bolance - = amount.
olse
I system. out pointly ("insupricional belance, court windres").
Void displayer
  5-85em. a.d. pristln ("none: " + name + "acuno: " + accnot "type
                     "belonce: "it belonce),
 class schacet extends account
    private State doubt rote = 5;
    Swall ( string name, int acono, double balonce)
```

```
Super (name, aring "Saning" belove);
Upid Interest (1
 4
     bala-11 + = balang * (ret) 100;
     System out pritty ( "belong " + balong ).
    class confect extends account
     1
       Prireti dauth missel = 500.
       Private doubt service charges = 10.
      Currect (string new, but accord, double belonce)
       Super (none, access "current" belonge).
     Unid Crackmains
      in ( bolance can a Ball)
       Systematipandla (" balance is less than m's balance, sevile
        charges apposed + senice charges);
      palone - serve Changes !
        System out printing ("balana 13." + balance);
        Low Hoin
```

```
Public State vold main ( Shing all)
  Scenner & = new Scanner (system. in ).
  system out prind by (" Forke to more. ");
   shing name = s - next ( ).
   System. Out. println (" Forter he account number: ");
    int accross next Ent ();
   System out pointly ( "Enter the onited balance: ");
    donute belonce = sinext boutels.
    int ch ?
    double arount, arount2)
    account all = new alland ( nome, a ceno, type, balonce);
    SavAcet Sa = new sevAcet (nome, aceno, balance);
    (withcut ca = new curacet (name, accno, balonce);
   while ( hue )
   ir love hype equals ("sarrys"))
      Systemat-println ("menu 1. deposit 2. withdraw 3. confet
        4 display );
     system out-println ("enter the choice");
     CA = s. nextent();
     switch (ch)
         case 1: System out println ("enter the amount");
          omong 1 = znextilet ( );
```

```
Son deposit ( amount 1)
 Deale .
 care ? System out putte ( "Enter the around")
a and 3 = smell ful (1-
 Sa would dre wo (arrould)
 breat.
 case & saidprest ()
 break :
 (av 4: Sa display 1)
 break,
case 5 syskm extr(0)
default: Sperm. out prottin ("involid input").
break .
die same (al)
 can " your out point in (" Firks the amount");
 no- 11 - wester 1)
 ( a deposite ( amount ):
bucat
can a Syller and poster ("The ke the around");
 () Lette & - & kelled ()
```

```
(a with Draw (amou 12)
 Co-crackmin(1
 p. c. V
care 3 ca. display (1
 prent;
 case 4: system cx 18(0)
 depart : system out print no "involid ingst");
  break;
0/1
  Take the name : proner
  Enter the type ( went I savings ):
   aurent
   Fater the account number:
   1217776
   Enter remitted belonce.
   10000
   meny
   I deposite 2. windrew 3 diglo.
   cape choice
   3
   have granas acono 1217776 syra coment
```

balance appool many 1 deposite 2 wire draw 3 daptey enter the Choicei Enter one more: pranav Enter he type (arrest | sovings): Souring Enta he account number: 122122 Forter tu Mittal balance: 7800 monu 1. deposite 2 situation 3. compute interest 4. dispolar Enter the choice 2 Enter the amount: 1 * T 100 6000 mou 1. deposite 2. windraw 3- compute interest. 4 display Egre tu close. 6 alone : 1890 I deposite 2 withdraw 3 compute interest 4 display e-fer the Choice none : Pravos acero 17/1/12 typo savys balance 1991 1) Demonstrate string length, string literal, string concert

FLP. Public class Main &

Public Shake vold main (Shing () args) }

Sty Str 1 = "Hellow world !";

int length = strileyth()

System of postin ('shing: " + shi);

System. at post of ("length of the stong : " it length)

String Str 2 = "Java":

String SH 3 = Zona";

boolean overfound = (cho 2 = = sk.3);

System-Od-printin (" are sto2 and Is 3 equal?" + ore (que)

String first name = "John")

Stong lastrone = "Doe";

This Acrows = fersenan + " + + family wars."

System. out print in (" full Name: " + full name?

0 10. Shong: Hellow, world!

length of the string: 13

Are Strz and Strs equal? bue

Fell none: Jour ope

2) write a son program to perform contry of numbers trans I round contradol) The import 2000 off. 80 %. Import Saw. Otil. Arrays; · Public Class Number Sating of Public Stable vold man (soing () orgs) } Integer () number - new Integers () of 199, 8,7,6, 5,4,3,2,1 Arrays- lost (numbers) System. out protto ("Sorted Num Sen (Ascending Order): "); Par (Dileger number: num Ders) { systemat pand Crumber + " "): Systemant printer (1) Arrays-soil (numbers, (95) -> 5 compare to (1). System out printin (" Sorted Numbers (pedending order). for (integers number: numbers) (Syllemant finds (auster " ");

```
color Mundon (Mundo goods)
     1 2 2 4 1 1 1 1 1 1 1 1
    some of ment ( nescouling order)
     10 7 8 2 6 7 4 3 7 1
3) write a Java program to create on abstract class Partil win
 anchoel methods My ( ) and trake bound 11. Create Butching of
 Eagle and Harst and extend the Bird Class and implement the
 respective methods to describe how each bird thee and mater
 a Sural
3/2
    abstract class Bird of
      abstract void ply ();
      abstract vois make bundl);
   Class Eagle Carriede Brid &
          Wid My () (
                Special prolle ( tage is some vige in in
                                  Sky . " ).
     21 ) Donuce sound ) &
             System court bet you ( a Easter makes a consential come )
```

```
class How extends Bird (
   no: 9 Halat
          System out pri-11- ( "How's of gliding gonce fully throw
           all .")
  Void make sound V) &
         Systemio + printle ( " Mouse maker a sharp cry . ");
    Retrice class Bard Demot
         Pullic Stabic void main (String (7 orgs) {
          Fagle eagle = new Fagle ();
          Hawk hawk = new Hawk U;
         eagle. $1500;
         cagle, make sound();
         have flyes,
         howk. make bund ();
     Eagle is sorry high in the sky.
     Eagle makes a screeching sound.
```

```
Hawle Pc gliding gracefully through the air
     Hask makes a scarp cry.
a) write a Java program to create agencie class Stack which hold
  Sintegers and S double value
 366:
      class generic Stack (7) {
            Private Object [] Stack Array;
            Private int top = -1.
            Private Stabil final int Max Size of
            problic Croner (Stack ())
                Stack Array & new obscut [ Max-size];
            Prebate voia push ( + value ) q
                if (top L max - size -1) SackArray [++top] = value;
              elx system out provin ("stack is full");
          Oseppron weetings (" orderked")
         brollic abobild
            11 ( top 200)
                  return (3) Share pe strong ( 10 pr -);
              elle g
                    System out printin ( " I fact to amply ")
```

return mel

```
Public boolean is Emply () {
 Puller booken is hall (1)
  clan Hain !
    Protice statice was Hom (thing () quys) }
          Cheneric Stack cintegers Integer stacks new Cremeric stacks
         General Stack charles doubt stack onew Prenew Stack ()
        for ( sub 121; 1 Lat; 1 4+) {
       Por ( double ; = 10; 1 x = 5.0; 1++) {
             do ado stract, puse (1);
         shopen on bigger (, bonsey ender hear the press.)
        we're ( 1 Intogen Stack. 16 Forghy (1) of
               chem of bing ( installer boll)
            System out printing! " poped doubles from the secre!
```

```
write ( · do . No stack of frogg(1) }
          Sylven al public ( double (sect. pop 1 ));
0/8
       2
       1
           In doubles from the stapperet
      1-0
       4.0
       1.0
```

and internals. The clan student has members like Usy, name som. The clan student has members like Usy, name som. The clan internals derived from student has an analy that stores the internals marks scored in five courses of the current sensites of the student. Create another participated which is derived than of student. This class has an array that stores the SEE marks scored in five courses of the current sensites of he sensites of he student are set to find haves of student in factors the see marks.

IP.

11 student java

Package (16; import java. uh) . Scome.

Putile doss student (

Protected string usnonew string ().
Protected String name : new string ().
Protected Int sen;

Partic void mout student person () {

Scorrer scanner : new Scanner (System in)

System out print (" Finer USN");

usn = scenne .next ();

System out fout (" Enter Nam ");

```
name - Scarrer next ()
system out pout (" fate samaster")
Sem = Seamer next got (1.
Public void display Student Octav 611 }
      System. out printle ("usa, " + usa).
     Sypen at Pridle ( "Name: " + mane),
     Systemout println ("Somester" + Jam);
 11 internals jour
  Coros.
  Package (10;
  import Java , with , Scamer;
  Public dan intanals extends student !
        Protected ind marks [] = new ind [1];
      Public Internals() {
            11 constructor for Thereals
    Public void inputite market of
       Scenner scanner : ren scarrer (5810- 10)
        Sagaren out printle ("Fines intered Marks for thomas)
         ) ( + 1 1 1 0 1 c 1 1 1 1 ) ( of
                System of pold ("suger" a (in) a marky").
```

```
martis[1] = Scarrar, ment but ()
11 Externals fava
 Parkage SEE;
 Import CIE internals,
  import fore. Util Scenner;
  Public Class Externals external internals of
        profeshed into marks (3.
       Protected in GradHacks (3)
      Pudro Extends (15
          maries = new (2) (6)
          findrales now ind (1)
     Public void in get SEE to wark 1 19 %
       Scanner Scanner 2 11 - 2 Scanner ( 1 john 1. )
       Systematical forther 1. Contraction to the
       por lite is a see straig
                My coste 11 " com con con con
```

marketis , come well in

2

```
Harley.
[[Main. ] ava
import SEE. Enternal;
 putte Class Main &
    Public Static void make ( string arg s 1) ) {
             int numgstudets = 2,
          External yand Marks () = reis Externals [num of studens ].
        For (It 1=0) 1 k num obstudents; 1+1) {
             final Marks [i] = new Extends ()
             find Marks [:). Input Student petails ();
            System . Ot. Print in (" Ender El E Marks");
          find Marks (:) mg + (1 & malks (1)
          Sylum. Out. prouter ("orsplaying data")
          for ( int 1 = 0; i a numofstuden; i++) {
                 final Mai MS(i) - coloulet Final Mailes (),
                 find Marks [1] display find Marks ().
```

Free USIN I DM22 (528)

For the Name . dal Affab

Friter Somester: T

Enter CIE Marky

On the Internal makes for attentions destribute

Subject 1 malks: 46

Subject 1 mary: 49

surject 3 maily: 48

Subject 4 mal M, 47

Subject & malts: 41

Enter SEE MONTES ?

Enter SEE Marly for director

Subject 1 malks : 68

Subject 1 males : HT

Subject a malin = 89

Stricut of marks : 99

Subject 1 roll - 100

3011/54

swrite a frogram that demonstrate handling of exceptions in suncitance toce. Create a base clair called Fether and desired class colled "Son" which extends the base clay in fether clay implement a long treater which takes the age and troops the exception wrong Age () when the input age co. In son class, implement a constructor that cases both father and son's age and throw an exception it son's age is > = father's age.

5/P:

dans wrong Age continueds Enception of

Public wrong Age () of

super ("Age cannot be negative.");

I can ration of

Private in age;

public Father (: I age) throws woogther of

if (age 20) of

throwiness wrong Age ()

This age = age;

y

public int getAge() {

return age;

y

```
clair son extends frakes of
           Private 1.1 Son Age;
          Patric son (it fatherAge, int son Age) throws wrong Age of
             Super ( rethor Age);
             if (sonAge ) = pathorAge) {
                      Throw new wrong nge ();
                 this sonage = sonage;
              luttic int getson Age (1)
         Public Class Mains
               fublic static void main (string [] args) {
              45.24
                  lather fether = now father (45);
            System and printin ("father's age: "+ jather get Agel)
           for son = new son (45, 20);
         Systemas prosto (sone age "+ conget sample (1)
        son invalidos new son (as, ro)
     System out printer ( " son's age. " + invelidion sol promise
        Let 1. monerale e) {
```

Systema & production ("From: "+ e.get Message ()); Father's age: 45 Gris age: 20 Froor Age cannot be negative in williams or 11 1 28 4 1 . .

displaying "BMS college of Engineering" once every for search

Kullic class Threed Example (

Static class Display BMS implements Rumable (

Putilic void nunc) {

while Chuely

system out part in ("BMS correge of Brysheering"),

bry 1

Threed-sleep (10000);

cerch (Interrupt Exeption e) {

Exprintstrack Track ();

static class poplayest imprements parameter?

public void rune 1 1

shile (lime) 1

gyranget prifin ("CIE");

) catch (renerry trad (neighbor e))

```
public static voice main ( string [ ] angs ) {
      Threat. boms Thread = new Thread (new Display BMS(1);
      Threed . Use Threed = now Threed (new Display (55 (1))
  bmsmread - Start (1)
   S. S. EThreed . Start ( );
   Bus college of Engineery
    CSE
    C365
    (SE
    CSE
    CSE
```

Bris dige)

Cle

lab -10 - Domenstate J. Der process commercelle and deadlock i barleon ochus set falk Synchronized but getting wile (Ivaluesed) hyl Speciment printle ("consumer white "). wait () (atch (Wenupled Exception c) { system out - portin ("Timers upled Exception garget). System at portly ((not : 1 a) value set = palie, System out printle (In Enthrole produced of) Nough, returning gregorised wie pt (it is) we re (value set) Fry 1 system out partial producte ability!) will by by catch (intemped Exception conget).

```
asnen.
 vel - set bug
 Systemand. profit of p. 1 to)
 John D. P. 16. ( Andinote Conscion);
  no-1107(),
Was produce ingleneth Remarks !
  08.
  police (ag) 1
   11.329 9
    ne stread ( nis " poduce" J. sheet ().
    Pullic void rune ? 9
         int 1=0;
         will like to st
          8-12-(141);
Class consume in place its enough of
     consumer (99)
          mentered (and confined ) that () of
```

```
Public void runit ?
     IN : 20)
     while (ILC) {
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lab 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

```
import java.util.Scanner;
class Quadratic {
  int a, b, c;
  double r1, r2, d;
  void getd() {
    Scanner s = new Scanner(System.in);
    System.out.println("Enter the coefficients of a, b, c");
    a = s.nextInt();
    b = s.nextInt();
    c = s.nextInt();
  }
  void compute() {
    while (a == 0) {
       System.out.println("Not a quadratic equation");
       System.out.println("Enter a non-zero value for a:");
       Scanner s = new Scanner(System.in);
       a = s.nextInt();
    }
    d = b * b - 4 * a * c;
    if (d == 0) {
       r1 = (-b) / (2 * (double) a);
       System.out.println("Roots are real and equal");
       System.out.println("Root1 = Root2 = " + r1);
    } else if (d > 0) {
```

```
r1 = ((-b) + (Math.sqrt(d))) / (2 * (double) a);
       r2 = ((-b) - (Math.sqrt(d))) / (2 * (double) a);
       System.out.println("Roots are real and distinct");
       System.out.println("Root1 = " + r1 + "Root2 = " + r2);
    } else if (d < 0) {
       System.out.println("Roots are imaginary");
       r1 = (-b) / (2 * (double) a);
       r2 = Math.sqrt(-d) / (2 * (double) a);
       System.out.println("Root1 = " + r1 + " + i" + r2);
       System.out.println("Root2 = " + r1 + " - i" + r2);
    }
  }
}
class QuadraticMain {
  public static void main(String args[]) {
    Quadratic q = new Quadratic();
    q.getd();
    q.compute();
    System.out.println("Name: Sirigireddy Pranav Reddy\nUSN: 1BM22CS281");
  }
}
```

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 Subject {
```

```
int marks;
  int credits;
  int points; // Added field for points
}
class Student {
  Subject[] subjects;
  String name;
  String usn;
  double sgpa;
  Scanner sc;
  public Student() {
    int i;
    subjects = new Subject[9];
    for (i = 0; i < 9; i++)
      subjects[i] = new Subject();
    sc = new Scanner(System.in);
  }
  public void inputDetails() {
    System.out.print("Enter student name: ");
    name = sc.nextLine();
    System.out.print("Enter student USN: ");
    usn = sc.nextLine();
    for (int i = 0; i < 9; i++) {
      subjects[i] = new Subject();
       System.out.println("Enter details for subject " + (i + 1));
       System.out.print("Enter marks for the subject: ");
       subjects[i].marks = sc.nextInt();
```

```
System.out.print("Enter credits for the subject: ");
    subjects[i].credits = sc.nextInt();
  }
}
private int calculatePoints(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 {
    return 0; // You can modify this based on your specific grading system
  }
}
public void calculateSGPA() {
  double totalCredits = 0;
  double weightedSum = 0;
  for (int i = 0; i < 9; i++) {
    totalCredits += subjects[i].credits;
    subjects[i].points = calculatePoints(subjects[i].marks);
    weightedSum += subjects[i].credits * subjects[i].points;
  }
```

```
sgpa = weightedSum / totalCredits;
  }
  public void displayResult() {
    System.out.println("Student Name: " + name);
    System.out.println("Student USN: " + usn);
    System.out.println("SGPA: " + sgpa);
  }
}
public class Main {
  public static void main(String[] args) {
    Student student = new Student();
    student.inputDetails();
    student.calculateSGPA();
    student.displayResult();
  }
}
```

import java.util.Scanner;

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.

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

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

```
this.author = author;
    this.price = price;
    this.numPages = numPages;
  }
  public String toString() {
    String name, author, price, numPages;
    name = "Book name s: " + this.name + "\n";
    author = "Author name : " + this.author + "\n";
    price = "Price : " + this.price + "\n";
    numPages = "Number of pages : " + this.numPages + "\n";
    return name + author + price + numPages;
  }
}
class BookMain {
  public static void main(String[] args) {
    Scanner sc = new Scanner(System.in);
    int n;
    String name, author;
    int price, numPages;
    System.out.println("Enter the number of books:");
    n = sc.nextInt();
    Books b[] = new Books[n];
    System.out.println("Enter Name,author,price and number of pages:");
    for (int i = 0; i < n; i++) {
      name = sc.next();
      author = sc.next();
      price = sc.nextInt();
      numPages = sc.nextInt();
      b[i] = new Books(name, author, price, numPages);
```

```
}
System.out.println("Book details:");
for (int i = 0; i < n; i++) {
    System.out.println(b[i].toString());
}
}</pre>
```

import java.util.Scanner;

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.

```
class InputScanner {
    Scanner s;

InputScanner() {
    s = new Scanner(System.in);
    }
}

abstract class shape extends InputScanner {
    double a;
    double b;
    double r;

abstract void getInput();

abstract void DisplayArea();
}
```

```
class Rectangle extends shape {
  void getInput() {
    System.out.println("Enter the sides of the rectangle");
    a = s.nextDouble();
    b = s.nextDouble();
  }
  void DisplayArea() {
    System.out.println("The area of the rectangle is " + a * b + "");
  }
}
class Triangle extends shape {
  void getInput() {
    System.out.println("Enter the sides of the triangle");
    a = s.nextDouble();
    b = s.nextDouble();
  }
  void DisplayArea() {
    System.out.println("The area of the triangle is " + (0.5 * a * b) + "");
  }
}
class Circle extends shape {
  void getInput() {
    System.out.println("Enter the radius of the circle");
    r = s.nextDouble();
  }
```

```
void DisplayArea() {
    System.out.println("The area of the circle is " + 3.14 * r * r + "");
  }
}
class Shapemain {
  public static void main(String args[]) {
    Rectangle r = new Rectangle();
    Triangle t = new Triangle();
    Circle c = new Circle();
    r.getInput();
    r.DisplayArea();
    t.getInput();
    t.DisplayArea();
    c.getInput();
    c.DisplayArea();
    System.out.println("Sohan A R-1BM22CS285");
  }
}
* java -cp /tmp/qYrVKCZE0d Shapemain
* Enter the sides of the rectangle
* 6
* 3
* The area of the rectangle is 18.0
* Enter the sides of the triangle
* 5
* 3
* The area of the triangle is 7.5
* Enter the radius of the circle
```

```
* 1
```

- * The area of the circle is 3.14
- * Sohan A R-1BM22CS285

*

*/

Lab 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 Savacct 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 name;
   int accno;
   String type;
   double balance;

account(String name, int accno, String type, double balance) {
    this.name = name;
    this.accno = accno;
    this.type = type;
    this.balance = balance;
}
```

```
void deposit(double amount) {
    balance += amount;
  }
  void withdraw(double amount) {
    if ((balance - amount) >= 0) {
      balance -= amount;
    } else {
      System.out.println("insufficient balance,cant withdraw");
    }
  }
  void display() {
    System.out.println("name:" + name + "accno:" + accno + "type:" + type + "balance:" + balance);
  }
}
class savAcct extends account {
  private static double rate = 5;
  savAcct(String name, int accno, double balance) {
    super(name, accno, "savings", balance);
  }
  void interest() {
    balance += balance * (rate) / 100;
    System.out.println("balance:" + balance);
  }
```

```
}
class curAcct extends account {
  private double minBal = 500;
  private double serviceCharges = 50;
  curAcct(String name, int accno, double balance) {
    super(name, accno, "current", balance);
  }
  void checkmin() {
    if (balance < minBal) {</pre>
      System.out.println("balance is less than min balance, service charges imposed:" +
serviceCharges);
      balance -= serviceCharges;
      System.out.println("balance is:" + balance);
    }
  }
}
class accountMain {
  public static void main(String a[]) {
    Scanner s = new Scanner(System.in);
    System.out.println("enter the name :");
    String name = s.next();
```

```
System.out.println("enter the type(current/savings):");
String type = s.next();
System.out.println("enter the account number:");
int accno = s.nextInt();
System.out.println("enter the intial balance:");
double balance = s.nextDouble();
int ch;
double amount1, amount2;
account acc = new account(name, accno, type, balance);
savAcct sa = new savAcct(name, accno, balance);
curAcct ca = new curAcct(name, accno, balance);
while (true) {
  if (acc.type.equals("savings")) {
    System.out.println("\nMenu\n1.deposit 2.withdraw 3.compute interest 4.display");
    System.out.println("enter the choice:");
    ch = s.nextInt();
    switch (ch) {
      case 1:
        System.out.println("enter the amount:");
        amount1 = s.nextInt();
        sa.deposit(amount1);
        break;
      case 2:
        System.out.println("enter the amount:");
        amount2 = s.nextInt();
        sa.withdraw(amount2);
        break;
      case 3:
        sa.interest();
        break;
      case 4:
```

```
sa.display();
      break;
    case 5:
      System.exit(0);
    default:
      System.out.println("invalid input");
      break;
  }
} else {
  System.out.println("\nMenu\n1.deposit 2.withdraw 3.display");
  System.out.println("enter the choice:");
  ch = s.nextInt();
  switch (ch) {
    case 1:
      System.out.println("enter the amount:");
      amount1 = s.nextInt();
      ca.deposit(amount1);
      break;
    case 2:
      System.out.println("enter the amount:");
      amount2 = s.nextInt();
      ca.withdraw(amount2);
      ca.checkmin();
      break;
    case 3:
      ca.display();
      break;
    case 4:
      System.exit(0);
    default:
```

```
System.out.println("invalid input");
            break;
        }
      }
    }
 }
}
/*
* java -cp /tmp/qYrVKCZE0d accountMain
* enter the name :
* pranav
* enter the type(current/savings):
* current
* enter the account number:
* 654654
* enter the intial balance:
* 100000
* Menu
* 1.deposit 2.withdraw 3.display
* enter the choice:
* 1
* enter the amount:
* 25000
* Menu
* 1.deposit 2.withdraw 3.display
* enter the choice:
* 2
* enter the amount:
* 15000
```

```
* Menu

* 1.deposit 2.withdraw 3.display

* enter the choice:3

* name:pranavaccno:654654type:currentbalance:110000.0

*
```

* Menu

* 1.deposit 2.withdraw 3.displayenter the choice:

*

*/

Lab 6

Create a package CIE which has two classes- Student and Internals. The class Student has members like usn, name, sem. The class Internals derived from Student 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.

```
// Student.java

package CIE;

import java.util.Scanner;

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

public void inputStudentDetails() {
        Scanner scanner = new Scanner(System.in);
```

```
System.out.print("Enter USN: ");
    usn = scanner.next();
    System.out.print("Enter Name: ");
    name = scanner.next();
    System.out.print("Enter Semester: ");
    sem = scanner.nextInt();
  }
  public void displayStudentDetails() {
    System.out.println("USN: " + usn);
    System.out.println("Name: " + name);
    System.out.println("Semester: " + sem);
  }
}
// Internals.java
package CIE;
import java.util.Scanner;
public class Internals extends Student {
  protected int marks[] = new int[5];
  public Internals() {
    // Constructor for Internals
  }
  public void inputCIEmarks() {
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter Internal Marks for " + name);
    for (int i = 0; i < 5; i++) {
```

```
System.out.print("Subject " + (i + 1) + " marks: ");
       marks[i] = scanner.nextInt();
    }
  }
}
// Externals.java
package SEE;
import CIE.Internals;
import java.util.Scanner;
public class Externals extends Internals {
  protected int marks[] = new int[5];
  protected int finalMarks[] = new int[5];
  public Externals() {
  }
  public void inputSEEmarks() {
    Scanner scanner = new Scanner(System.in);
    System.out.println("Enter SEE Marks for " + name);
    for (int i = 0; i < 5; i++) {
      System.out.print("Subject " + (i + 1) + " marks: ");
      marks[i] = scanner.nextInt();
    }
  }
  public void calculateFinalMarks() {
    for (int i = 0; i < 5; i++)
```

```
finalMarks[i] = marks[i] / 2 + super.marks[i];
  }
  public void displayFinalMarks() {
    displayStudentDetails();
    for (int i = 0; i < 5; i++)
       System.out.println("Subject " + (i + 1) + ": " + finalMarks[i]);
  }
}
// Main.java
import SEE.Externals;
public class Main {
  public static void main(String args[]) {
    int numOfStudents = 2;
    Externals finalMarks[] = new Externals[numOfStudents];
    for (int i = 0; i < numOfStudents; i++) {
       finalMarks[i] = new Externals();
       finalMarks[i].inputStudentDetails();
       System.out.println("Enter CIE marks");
       finalMarks[i].inputCIEmarks();
       System.out.println("Enter SEE marks");
      finalMarks[i].inputSEEmarks();
    }
    System.out.println("Displaying data:\n");
    for (int i = 0; i < numOfStudents; i++) {
       finalMarks(i].calculateFinalMarks();
```

```
finalMarks[i].displayFinalMarks();
}
}
```

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=father's age

```
import java.util.Scanner;
// Custom exception class
class WrongAge extends Exception {
  // Parameterized constructor with user-defined message
  public WrongAge(String message) {
    super(message);
  }
}
// Base class
class Father {
  private int fatherAge;
  // Constructor for Father class
  public Father() throws WrongAge {
    Scanner s = new Scanner(System.in);
    System.out.print("Enter father's age: ");
    fatherAge = s.nextInt();
    if (fatherAge < 0)
      throw new WrongAge("Age cannot be negative");
  }
```

```
// Method to display father's age
  public void display() {
    System.out.println("Father's age: " + fatherAge);
  }
}
// Derived class
class Son extends Father {
  private int sonAge;
  // Constructor for Son class
  public Son() throws WrongAge {
    super(); // Call to superclass constructor
    Scanner s = new Scanner(System.in);
    System.out.print("Enter son's age: ");
    sonAge = s.nextInt();
    if (sonAge >= super.fatherAge)
      throw new WrongAge("Son's age cannot be greater than father's age");
    else if (sonAge < 0)
      throw new WrongAge("Age cannot be negative");
  }
  // Method to display son's age
  public void display() {
    super.display(); // Call to superclass method
    System.out.println("Son's age: " + sonAge);
  }
}
// Main class
```

```
public class ExceptionHandlingInheritance {
  public static void main(String[] args) {
    try {
        // Creating Son object
        Son son = new Son();
        // Displaying son's age
        son.display();
    } catch (WrongAge e) {
        // Handling the custom exception
        System.out.println("Error: " + e.getMessage());
    }
}
```

Lab 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.

class DepartmentRunnable implements Runnable {

```
public void run() {
    while (true) {
      try {
        System.out.println("CSE");
        Thread.sleep(2000); // Sleep for 2 seconds
      } catch (InterruptedException e) {
        e.printStackTrace();
      }
    }
  }
}
public class java_lab_8 {
  public static void main(String[] args) {
    // Creating instances of runnables
    Runnable collegeRunnable = new CollegeRunnable();
    Runnable departmentRunnable = new DepartmentRunnable();
    // Creating threads using runnables
    Thread collegeThread = new Thread(collegeRunnable);
    Thread departmentThread = new Thread(departmentRunnable);
    // Starting threads
    collegeThread.start();
    departmentThread.start();
  }
}
```

Lab 9

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 Arithmetic Exception Display the exception in a message dialog box.

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
class SwingDemo {
  SwingDemo() {
    // create jframe container
    JFrame jfrm = new JFrame("Divider App");
    jfrm.setSize(300, 200);
    jfrm.setLayout(new FlowLayout());
    // to terminate on close
    jfrm.setDefaultCloseOperation(JFrame.EXIT ON CLOSE);
    // text label
    JLabel jlab = new JLabel("Enter the divider and dividend:");
    // add text field for both numbers
    JTextField ajtf = new JTextField(8);
    JTextField bjtf = new JTextField(8);
    // calc button
    JButton button = new JButton("Calculate");
    // labels
    JLabel err = new JLabel();
    JLabel alab = new JLabel();
    JLabel blab = new JLabel();
    JLabel anslab = new JLabel();
```

```
// add in order :)
jfrm.add(err); // to display error message
jfrm.add(jlab);
jfrm.add(ajtf);
jfrm.add(bjtf);
jfrm.add(button);
jfrm.add(alab);
jfrm.add(blab);
jfrm.add(anslab);
ActionListener I = new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
    System.out.println("Action event from a text field");
  }
};
ajtf.addActionListener(I);
bjtf.addActionListener(I);
button.addActionListener(new ActionListener() {
  public void actionPerformed(ActionEvent evt) {
    try {
      int a = Integer.parseInt(ajtf.getText());
      int b = Integer.parseInt(bjtf.getText());
      int ans = a/b;
      alab.setText("\nA = " + a);
      blab.setText("\nB = " + b);
      anslab.setText("\nAns = " + ans);
    } catch (NumberFormatException e) {
      alab.setText("");
      blab.setText("");
```

```
anslab.setText("");
           err.setText("Enter Only Integers!");
         } catch (ArithmeticException e) {
           alab.setText("");
           blab.setText("");
           anslab.setText("");
           err.setText("B should be NON zero!");
         }
      }
    });
    // display frame
    jfrm.setVisible(true);
  }
  public static void main(String args[]) {
    // create frame on event dispatching thread
    SwingUtilities.invokeLater(new Runnable() {
      public void run() {
         new SwingDemo();
      }
    });
  }
Lab 10
10.A) \hbox{Demonstrate Inter process Communication and deadlock}\\
class Q {
  int n;
  boolean valueSet = false;
  synchronized int get() {
```

}

```
while(!valueSet)
  try {
  System.out.println("\nConsumer waiting\n");
  wait();
  } catch(InterruptedException e) {
  System.out.println ("Interrupted Exception") \\
  caught");
  }
  System.out.println("Got: " + n);
  valueSet = false;
  System.out.println("\nIntimate Producer\n");
  notify();
  return n;
 }
  synchronized void put(int n) {
    while (valueSet)
      try {
        System.out.println("\nProducer waiting\n");
        wait();
      } catch (InterruptedException e) {
        System.out.println("InterruptedException caught");
      }
    this.n = n;
    valueSet = true
    System.out.println("Put: " + n);
    System.out.println("\nIntimate Consumer\n");
    notify();
  }
}class Producer implements Runnable {
  Qq;
  Producer(Q q) {
```

```
this.q = q;
    new Thread(this, "Producer").start();
  }
  public void run() {
    int i = 0;
    while (i < 15) {
      q.put(i++);
    }
  }
}
class Consumer implements Runnable {
  Qq;
  Consumer(Q q) {
    this.q = q;
    new Thread(this, "Consumer").start();
  }
  public void run() {
    int i = 0;
    while (i < 15) {
      int r = q.get();
      System.out.println("consumed:" + r);
      i++;
    }
  }
}
class PCFixed {
  public static void main(String args[]) {
    Q q = new Q();
   new Producer(q);
  new Consumer(q);
    System.out.println("Press Control-C to stop.");
```

```
}
}
10B) DEADLOCK
class A {
  synchronized void foo(B b) {
  String name =
  Thread.currentThread().getName();
  System.out.println(name + " entered
  A.foo");
  try {
  Thread.sleep(1000);
  } catch(Exception e) {
  System.out.println("A Interrupted");
  }
  System.out.println(name + " trying to
  call B.last()");
  b.last();
  }
  void last() {
```

```
System.out.println("Inside A.last");
  }
}
class B {
  synchronized void bar(A a) {
  String name =
  Thread.currentThread().getName();
  System.out.println(name + " entered
  B.bar");
  try {
  Thread.sleep(1000);
  } catch(Exception e) {
  System.out.println("B Interrupted");
  }
  System.out.println(name + " trying to
  call A.last()");
  a.last();
```

```
}
  void last() {
    System.out.println("Inside A.last");
  }
}
class Deadlock implements Runnable {
  A a = new A();
  Bb = new B();
  Deadlock() {
  Thread.current Thread ().set Name ("M
  ainThread");
  Thread t = new Thread(this,
  "RacingThread");
  t.start();
  a.foo(b); // get lock on a in this
  thread.
  System.out.println("Back in main
```

```
thread");
  }
  public void run() {
  b.bar(a); // get lock on b in other
  thread.
  System.out.println("Back in other
  thread");
  }
  public static void main(String args[]) {
    new Deadlock();
  }
}
```