**Main Method():**

import java.util.\*;

import java.lang.\*;

import java.util.Arrays;

public class OOP\_Lab3{

        public static void main(String[] args){

        account a1 = new account();

        a1.display();

        account a2 = new account(2345345);

        a2.display();

        account a3 = new account(2345345, 1995, 363024123);

        a3.display();

discriminant d1 = new discriminant();

d1.display();

account d2 = new account(4, 5, 7);

d2.display();

book b1 = new book();

String[] array = {"Flag", "Flag", "Flag", "Flag", "Flag"};

b1.set\_values("Aam", array);

b1.display();

System.out.println(b1.checkIfAuthorStartsWithA());

System.out.println(b1.searchChapter("Flag"));

student s1 = new student();

String[] array = {"Math", "OOP", "DSA", "Calculus", "Science"};

s1.set\_values("Sam", array, 3.3, "theArtistSam@gmail.com");

s1.display();

System.out.println(s1.checkProbStatus());

System.out.println(s1.searchSubject("DSA"));

System.out.println(s1.validateEmail());

String[] array = new String[20];

array[0] = "CS";

array[1] = "SE";

array[2] = "EE";

array[3] = "BBA";

array[4] = "AI";

university u1 = new university("Comsats", array, "Islamabad", "Anwar");

u1.display();

System.out.println(u1.checkIfLocationIsInCaptial());

System.out.println("Enter elements! Press [0] to Exit");

while(true){

String user = input.next();

if(user.equals("0")){

break;

}

else{

u1.addDepartments(user);

}

}

u1.display();

        }

}

**Question1:**

class account{

        int balance;

        int yearOfOpening;

        long cnic;

        // default constructor

        public account(){

        }

        // one argument constructors

        public account(int money){

                if(money < 0){

                        System.out.println("You cannot put negative money");

                }

                else{

                        this.balance = money;

                }

        }

        // three argument constructor

        public account(int money, int year, long cnic\_numeber){

                // check for money

                if(money < 0){

                        System.out.println("You cannot put negative money");

                }

                else{

                        this.balance = money;

                }

                // check for cnic number

                if(cnic\_numeber == 13){

                        this.cnic\_numeber = cnic;

                }

                else{

                        System.out.println("Invalid CNIC number");

                }

                this.yearOfOpening = year;

        }

        void set\_values(int money, int year, long cnic\_numeber){

                // check for money

                if(money < 0){

                        System.out.println("You cannot put negative money");

                }

                else{

                        balance = money;

                }

                // check for cnic number

                if(cnic\_numeber == 13){

                        cnic\_numeber = cnic;

                }

                else{

                        System.out.println("Invalid CNIC number");

                }

                yearOfOpening = year;

        }

        void withDraw(int money){

                // check for money

                if(money < balance){

                        System.out.println("You don't have this much money! Try filling up the bucket!");

                }

                else{

                        int remaining\_balance = balance - money;

                        System.out.println("Your remaining balance is: " + remaining\_balance);

                }

        }

        void deposit(int money){

                // check for money

                if(money < 0){

                        System.out.println("You cannot put -ve money! Try entering the right amount");

                }

                else{

                        int remaining\_balance = balance + money;

                        System.out.println("Your remaining balance is: " + remaining\_balance);

                }

        }

        int age(){

                int ageOfAccount = 2022 - yearOfOpening;

                return ageOfAccount;

                //System.out.println("Your account age is: " + ageOfAccount);

        }

        void display(){

                System.out.println("Your Balance is: " + balance);

                System.out.println("Your Year of opening is: " + yearOfOpening);

                System.out.println("Your CNIC Number is: " + cnic);

        }

}

**Question2:**

// default constructor

public discriminant(){

}

// three argument constructor

public discriminant(double value\_a, double value\_b, double value\_c){

// check for a

if(a < 0){

System.out.println("You cannot put negative value");

}

else{

this.a = value\_a;

}

// check for b

if(b < 0){

System.out.println("You cannot put negative value");

}

else{

this.b = value\_b;

}

// check for c

if(c < 0){

System.out.println("You cannot put negative value");

}

else{

this.c = value\_c;

}

}

void set\_values(double value\_a, double value\_b, double value\_c){

// check for a

if(a < 0){

System.out.println("You cannot put negative value");

}

else{

a = value\_a;

}

// check for b

if(b < 0){

System.out.println("You cannot put negative value");

}

else{

b = value\_b;

}

// check for c

if(c < 0){

System.out.println("You cannot put negative value");

}

else{

c = value\_c;

}

}

double getDiscriminant(){

double discriminant = b \* b - 4.0 \* a \* c;

return discriminant;

}

boolean checkIfDiscriminantIsGreaterThan100(){

if(getDiscriminant() > 100){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("Value of A is: " + a);

System.out.println("Value of B is: " + b);

System.out.println("Value of C is: " + c);

}

}

**Question3:**

class rectangle{

int width;

int length;

// default constructor

public rectangle(){

}

// three argument constructor

public rectangle(int value\_width, int value\_length){

// check for a

if(value\_width < 0){

System.out.println("You cannot put negative value");

}

else{

this.width = value\_width;

}

// check for b

if(value\_length < 0){

System.out.println("You cannot put negative value");

}

else{

this.length = value\_length;

}

}

void set\_values(int value\_width, int value\_length){

// check for a

if(value\_width < 0){

System.out.println("You cannot put negative value");

}

else{

width = value\_width;

}

// check for b

if(value\_length < 0){

System.out.println("You cannot put negative value");

}

else{

length = value\_length;

}

}

int calculateArea(){

int area = width \* length;

return area;

}

boolean checkSquare(){

if(length == width){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("Width of rectangle is: " + width);

System.out.println("Length of rectangle is: " + length);

}

}

**Question 4:**

class point{

int x;

int y;

// default constructor

public point(){

}

// three argument constructor

public point(int value\_x, int value\_y){

this.x = value\_x;

this.y = value\_y;

}

void set\_values(int value\_x, int value\_y){

x = value\_x;

y = value\_y;

}

void move(int value\_x, int value\_y){

x = x + value\_x;

y = y + value\_y;

}

boolean checkOrigin(){

if(x == 0 && y == 0){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("Value of x coordinate is: " + x);

System.out.println("Value of y coordinate is: " + y);

}

}

**Question 5:**

class book{

String author;

String[] chapterName = new String[5];

// default constructor

public book(){

}

// three argument constructor

public book(String writer, String[] array){

this.author = writer;

this.chapterName = array;

}

void set\_values(String writer, String[] array){

author = writer;

chapterName = array;

}

boolean checkIfAuthorStartsWithA(){

char check = author.charAt(0);

if(check == 'A'){

return true;

}

else{

return false;

}

}

boolean checkIfAuthorStartsWithA(String chapter\_name){

boolean check = true;

for(int i = 0; i < chapterName.length; i++){

if(chapterName[i].equals(chapterName)){

check = true;

}

else{

check = false;

}

}

if(check == true){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("The name of the author is: " + author);

System.out.println("Chapter names are");

for(int i = 0; i < chapterName.length; i++){

System.out.print(chapterName[i] + " ");

}

System.out.println();

}

}

**Question 6:**

class student{

String name;

double gpa;

String email;

String[] subject = new String[5];

// default constructor

public student(){

}

// three argument constructor

public student(String student, String[] array, double grades, String email\_address){

this.name = student;

this.gpa = grades;

this.email = email\_address;

this.subject = array;

}

void set\_values(String student, String[] array, double grades, String email\_address){

name = student;

gpa = grades;

email = email\_address;

subject = array;

}

boolean checkProbStatus(){

if(gpa < 2){

return true;

}

else{

return false;

}

}

boolean searchSubject(String subject\_name){

boolean check = false;

for(int i = 0; i < subject.length; i++){

if(subject[i].equals(subject\_name)){

check = true;

break;

}

}

if(check == true){

return true;

}

else{

return false;

}

}

boolean validateEmail(){

boolean check = false;

if(email.contains("@") && email.contains(".com")){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("The name of the student is: " + name);

System.out.println("GPA of the student is: " + gpa);

System.out.println("The email of the student is: " + email);

System.out.println("Subject names are");

for(int i = 0; i < subject.length; i++){

System.out.print(subject[i] + " ");

}

System.out.println();

}

}

**Question 7:**

class university{

String uniName;

String location;

String rectorName;

String[] departments = new String[20];

// default constructor

public university(){

}

// two argument constructor

public university(String name, String rector\_name){

if(name.length() > 2){

this.uniName = name;

}

else{

System.out.println("Small in length. Add right user name!");

}

if(rector\_name.length() > 2){

this.rectorName = rector\_name;

}

else{

System.out.println("Small in length. Add right user name!");

}

}

// all argument constructor

public university(String name, String[] array, String place, String rector\_name){

if(name.length() > 2){

this.uniName = name;

}

else{

System.out.println("Small in length. Add right user name!");

}

if(array.length >= 20){

this.departments = array;

}

else{

System.out.println("Size is smaller!");

}

if(place.length() > 2){

this.location = place;

}

else{

System.out.println("Small in length. Add right user name!");

}

if(rector\_name.length() > 2){

this.rectorName = rector\_name;

}

else{

System.out.println("Small in length. Add right user name!");

}

}

void set\_values(String name, String[] array, String place, String rector\_name){

if(name.length() > 2){

uniName = name;

}

else{

System.out.println("Small in length. Add right user name!");

}

if(array.length >= 20){

departments = array;

}

else{

System.out.println("Size is smaller!");

}

if(place.length() > 2){

location = place;

}

else{

System.out.println("Small in length. Add right user name!");

}

if(rector\_name.length() > 2){

rectorName = rector\_name;

}

else{

System.out.println("Small in length. Add right user name!");

}

}

void addDepartments(String abc){

for(int i = 0; i < departments.length; i++){

if(departments[i] == null){

departments[i] = abc;

break;

}

}

}

boolean checkIfLocationIsInCaptial(){

if(location.equalsIgnoreCase("islamabad")){

return true;

}

else{

return false;

}

}

void display(){

System.out.println("The name of the university is: " + uniName);

System.out.println("Location of university is: " + location);

System.out.println("Rector name is: " + rectorName);

System.out.println("Departments names are and its length is " + departments.length);

for(int i = 0; i < departments.length; i++){

if(departments[i] == null){

continue;

}

System.out.print(departments[i] + " ");

}

System.out.println();

}

}