Object Oriented Programming

Lab Manual 06

Introduction

After a week of rigorous coding, Welcome back!

You have learned all about the Classes, Constructors, and member functions in the previous lab manuals. Let's move on to the next, new, and interesting concepts.

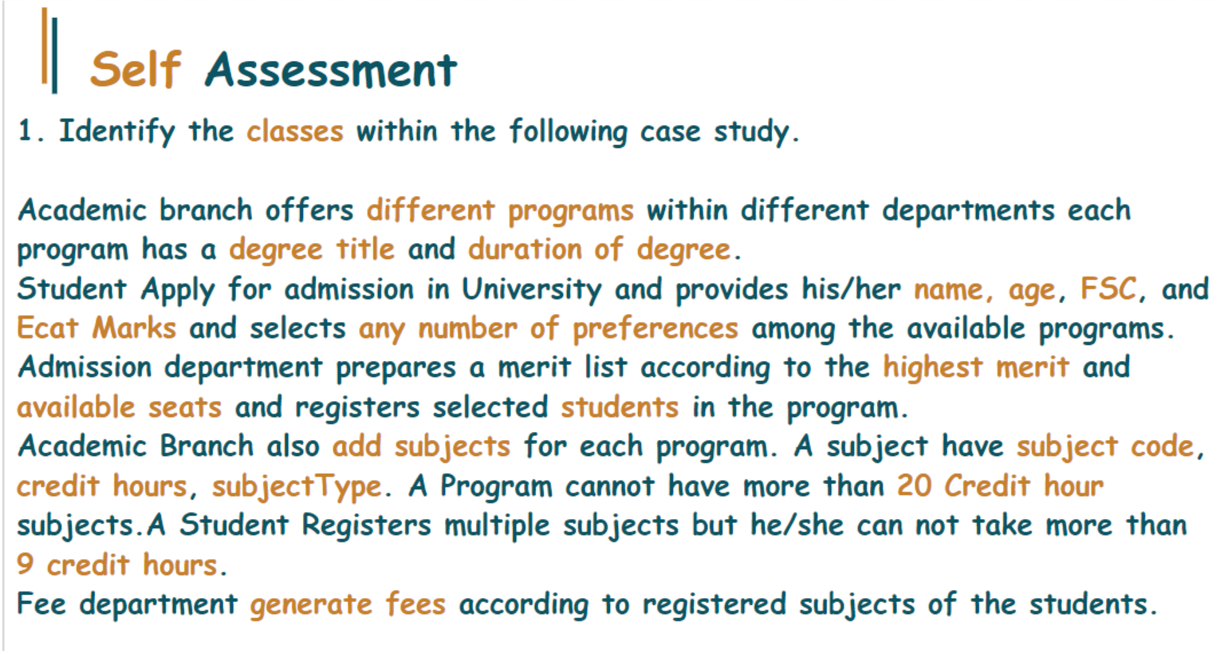
Students, In Object-Oriented Programming, the Class is a combination of data members and member functions. In this Lab, we will learn about the **3 Tier Model** in our program to achieve the object's oriented philosophy.

These coding Layers include

- Business Logic Layer
- User Interface Layer
- Data Logic Layer

University Admission Management System

Read the following question carefully.



Self Assessment

1. Identify the classes within the following case study.

Academic branch offers different programs within different departments each program has a degree title and duration of degree.
Student Apply for admission in University and provides his/her name, age, FSC, and Ecat Marks and selects any number of preferences among the available programs.
Admission department prepares a merit list according to the highest merit and available seats and registers selected students in the program.
Academic Branch also add subjects for each program. A subject have subject code, credit hours, subjectType. A Program cannot have more than 20 Credit hour subjects.A Student Registers multiple subjects but he/she can not take more than 9 credit hours.
Fee department generate fees according to registered subjects of the students.

Try out yourself.

Don’t worry.

There is a solution on the next page.

Identification of Classes

By looking at the above-mentioned self-assessment you can extract the following possible class-like structures from the given statement.

- Student Class
- Subject Class
- Program Class
- Separate DL Classes
- Separate UI Classes

Don’t Worry. There is a solution ahead. First Try out yourself.

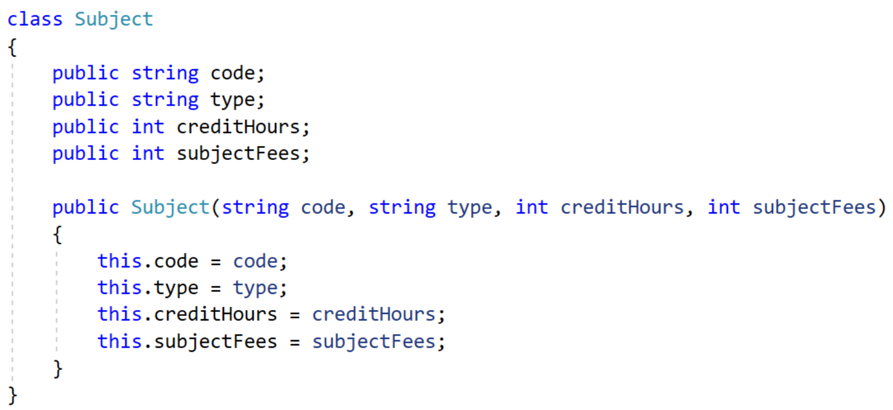
Let's Start with fun coding.

University Admission Management System (Through OOP)

Now that you have identified the classes in your program, it is time to start coding.

Solution:

<table>
<tr><th>Sr. #</th><th>Action</th><th>Description</th></tr>
<tr><td colspan="3">Let us define the code for the <b>BL folder</b>.</td></tr>
<tr><td>1</td><td>

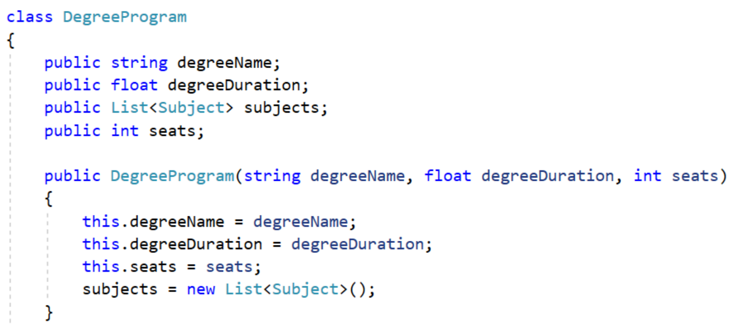


```
class Subject
{
    public string code;
    public string type;
    public int creditHours;
    public int subjectFees;

    public Subject(string code, string type, int creditHours, int subjectFees)
    {
        this.code = code;
        this.type = type;
        this.creditHours = creditHours;
        this.subjectFees = subjectFees;
    }
}
```

</td><td>

- **Subject** Class (BL)

</td></tr>
<tr><td>2</td><td>



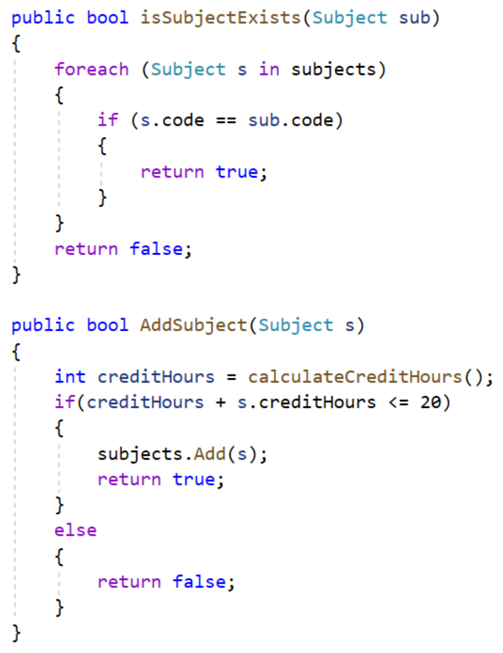
```
class DegreeProgram
{
    public string degreeName;
    public float degreeDuration;
    public List<Subject> subjects;
    public int seats;

    public DegreeProgram(string degreeName, float degreeDuration, int seats)
    {
        this.degreeName = degreeName;
        this.degreeDuration = degreeDuration;
        this.seats = seats;
        subjects = new List<Subject>();
    }
```

</td><td>

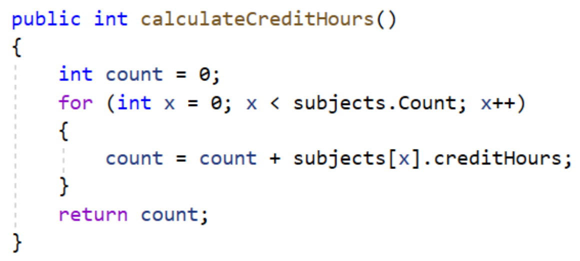
- **DegreeProgram** Class (BL)

</td></tr>
</table>

2(a)



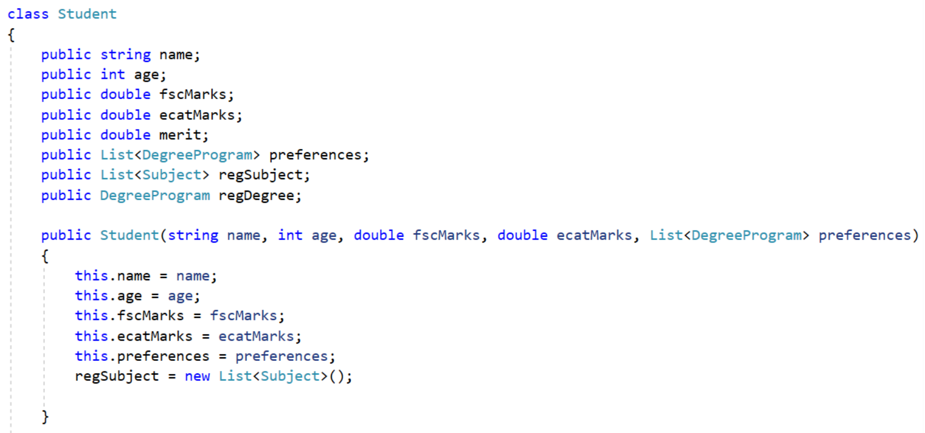
```
public bool isSubjectExists(Subject sub)
{
    foreach (Subject s in subjects)
    {
        if (s.code == sub.code)
        {
            return true;
        }
    }
    return false;
}

public bool AddSubject(Subject s)
{
    int creditHours = calculateCreditHours();
    if(creditHours + s.creditHours <= 20)
    {
        subjects.Add(s);
        return true;
    }
    else
    {
        return false;
    }
}
```



```
public int calculateCreditHours()
{
    int count = 0;
    for (int x = 0; x < subjects.Count; x++)
    {
        count = count + subjects[x].creditHours;
    }
    return count;
}
```

- Member Function in **DegreeProgram** Class (BL)

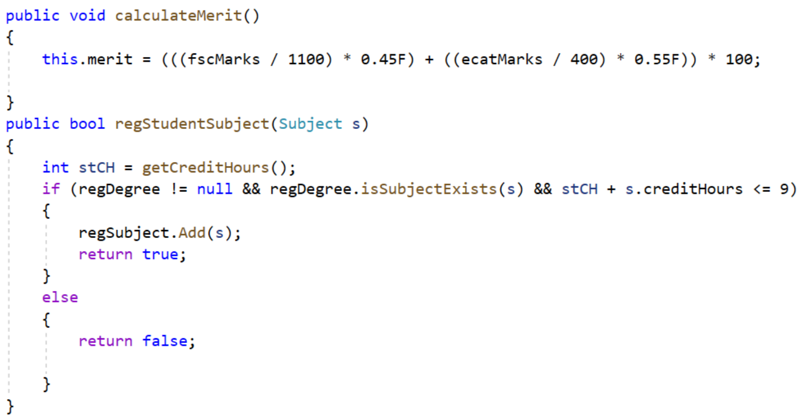
3



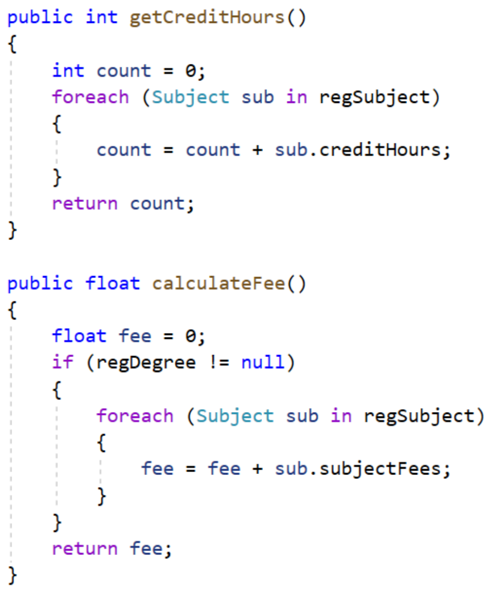
```
class Student
{
    public string name;
    public int age;
    public double fscMarks;
    public double ecatMarks;
    public double merit;
    public List<DegreeProgram> preferences;
    public List<Subject> regSubject;
    public DegreeProgram regDegree;

    public Student(string name, int age, double fscMarks, double ecatMarks, List<DegreeProgram> preferences)
    {
        this.name = name;
        this.age = age;
        this.fscMarks = fscMarks;
        this.ecatMarks = ecatMarks;
        this.preferences = preferences;
        regSubject = new List<Subject>();

    }
```

- **Student** Class (BL)

3(a)



```
public void calculateMerit()
{
    this.merit = (((fscMarks / 1100) * 0.45F) + ((ecatMarks / 400) * 0.55F)) * 100;

}
public bool regStudentSubject(Subject s)
{
    int stCH = getCreditHours();
    if (regDegree != null && regDegree.isSubjectExists(s) && stCH + s.creditHours <= 9)
    {
        regSubject.Add(s);
        return true;
    }
    else
    {
        return false;

    }
}
```

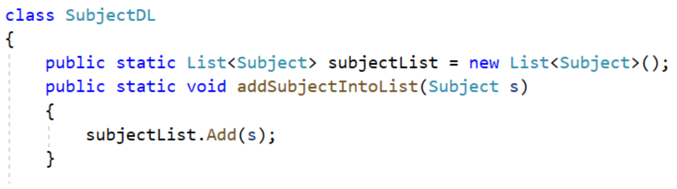


```
public int getCreditHours()
{
    int count = 0;
    foreach (Subject sub in regSubject)
    {
        count = count + sub.creditHours;
    }
    return count;
}

public float calculateFee()
{
    float fee = 0;
    if (regDegree != null)
    {
        foreach (Subject sub in regSubject)
        {
            fee = fee + sub.subjectFees;
        }
    }
    return fee;
}
```

- Member Functions for **Student** Class (BL)

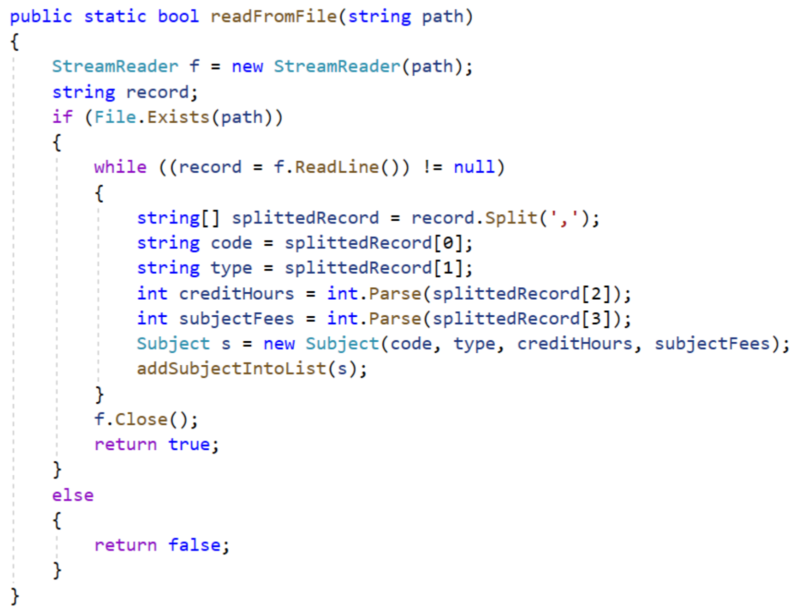
Let us now implement the **Data Logic Layer** (DL folder Classes) for this project.

4.

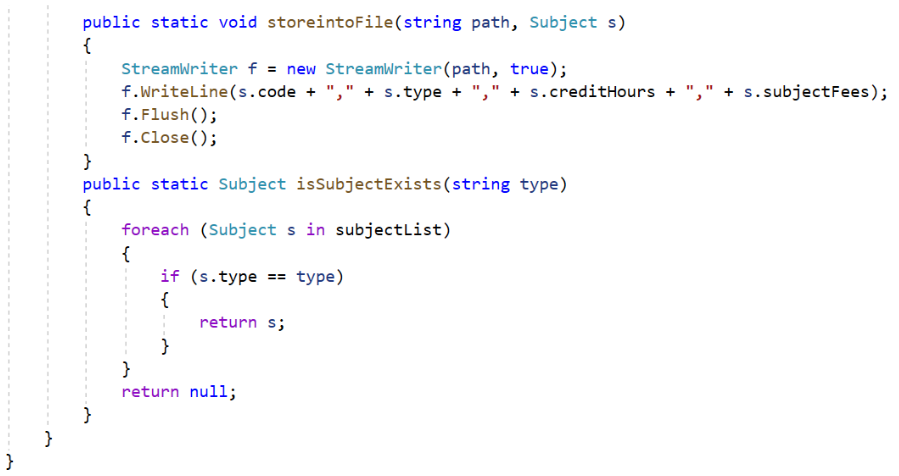


```
class SubjectDL
{
    public static List<Subject> subjectList = new List<Subject>();
    public static void addSubjectIntoList(Subject s)
    {
        subjectList.Add(s);
    }
```

- **SubjectDL** Class
- Member Functions of **SubjectsDL** Class

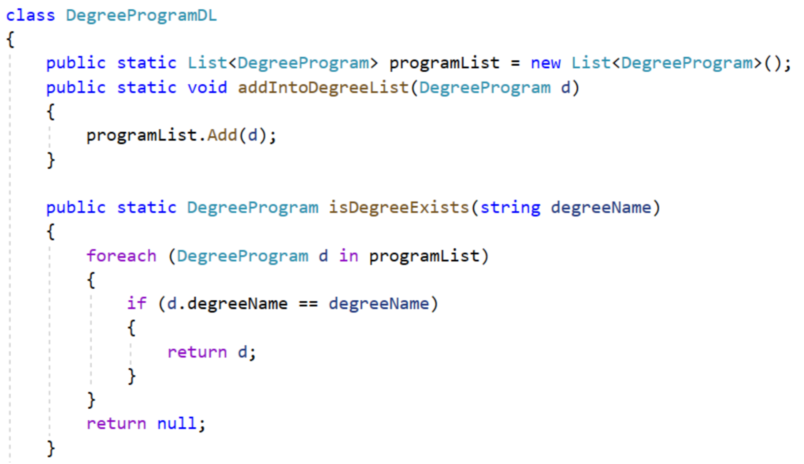


```
public static bool readFromFile(string path)
{
    StreamReader f = new StreamReader(path);
    string record;
    if (File.Exists(path))
    {
        while ((record = f.ReadLine()) != null)
        {
            string[] splittedRecord = record.Split(',');
            string code = splittedRecord[0];
            string type = splittedRecord[1];
            int creditHours = int.Parse(splittedRecord[2]);
            int subjectFees = int.Parse(splittedRecord[3]);
            Subject s = new Subject(code, type, creditHours, subjectFees);
            addSubjectIntoList(s);
        }
        f.Close();
        return true;
    }
    else
    {
        return false;
    }
}
```



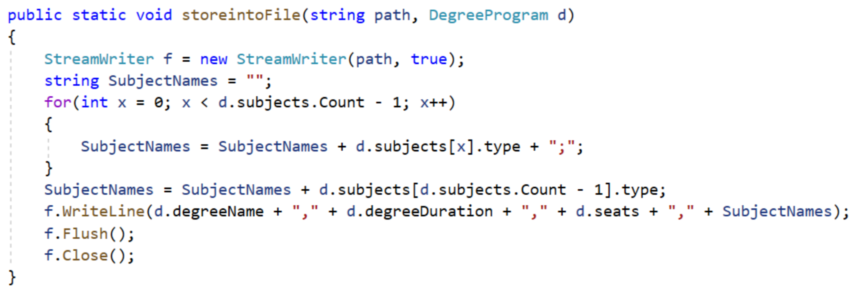
```
        public static void storeintoFile(string path, Subject s)
        {
            StreamWriter f = new StreamWriter(path, true);
            f.WriteLine(s.code + "," + s.type + "," + s.creditHours + "," + s.subjectFees);
            f.Flush();
            f.Close();
        }
        public static Subject isSubjectExists(string type)
        {
            foreach (Subject s in subjectList)
            {
                if (s.type == type)
                {
                    return s;
                }
            }
            return null;
        }
    }
}
```

5.

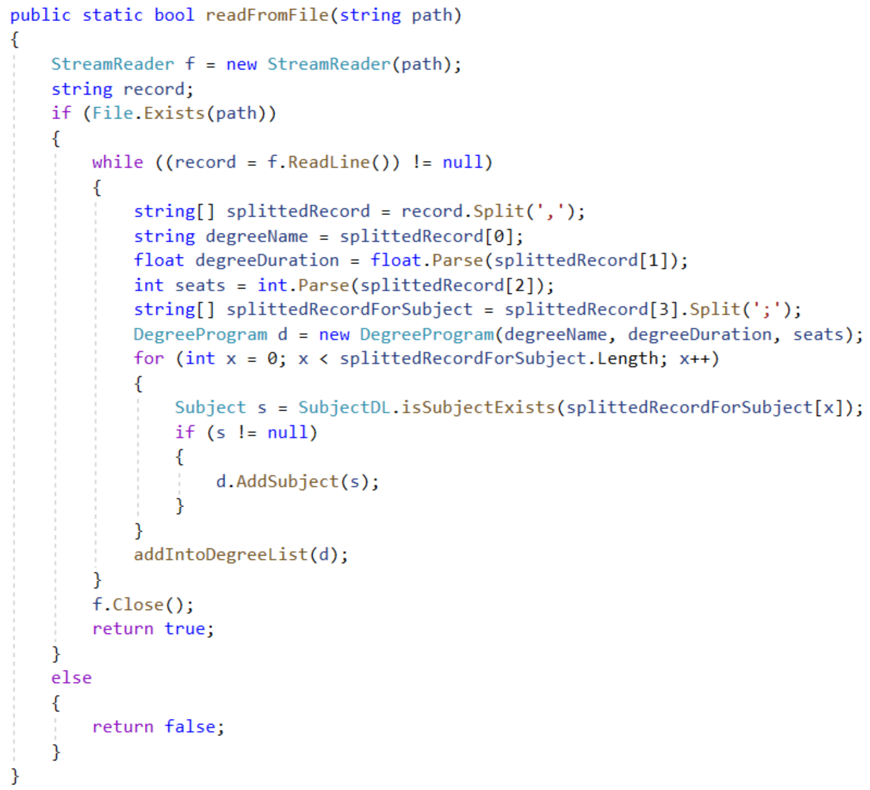


```
class DegreeProgramDL
{
    public static List<DegreeProgram> programList = new List<DegreeProgram>();
    public static void addIntoDegreeList(DegreeProgram d)
    {
        programList.Add(d);
    }

    public static DegreeProgram isDegreeExists(string degreeName)
    {
        foreach (DegreeProgram d in programList)
        {
            if (d.degreeName == degreeName)
            {
                return d;
            }
        }
        return null;
    }
```

- **DegreeProgramDL** Class
- Member functions for **DegreeProgramDL** Class

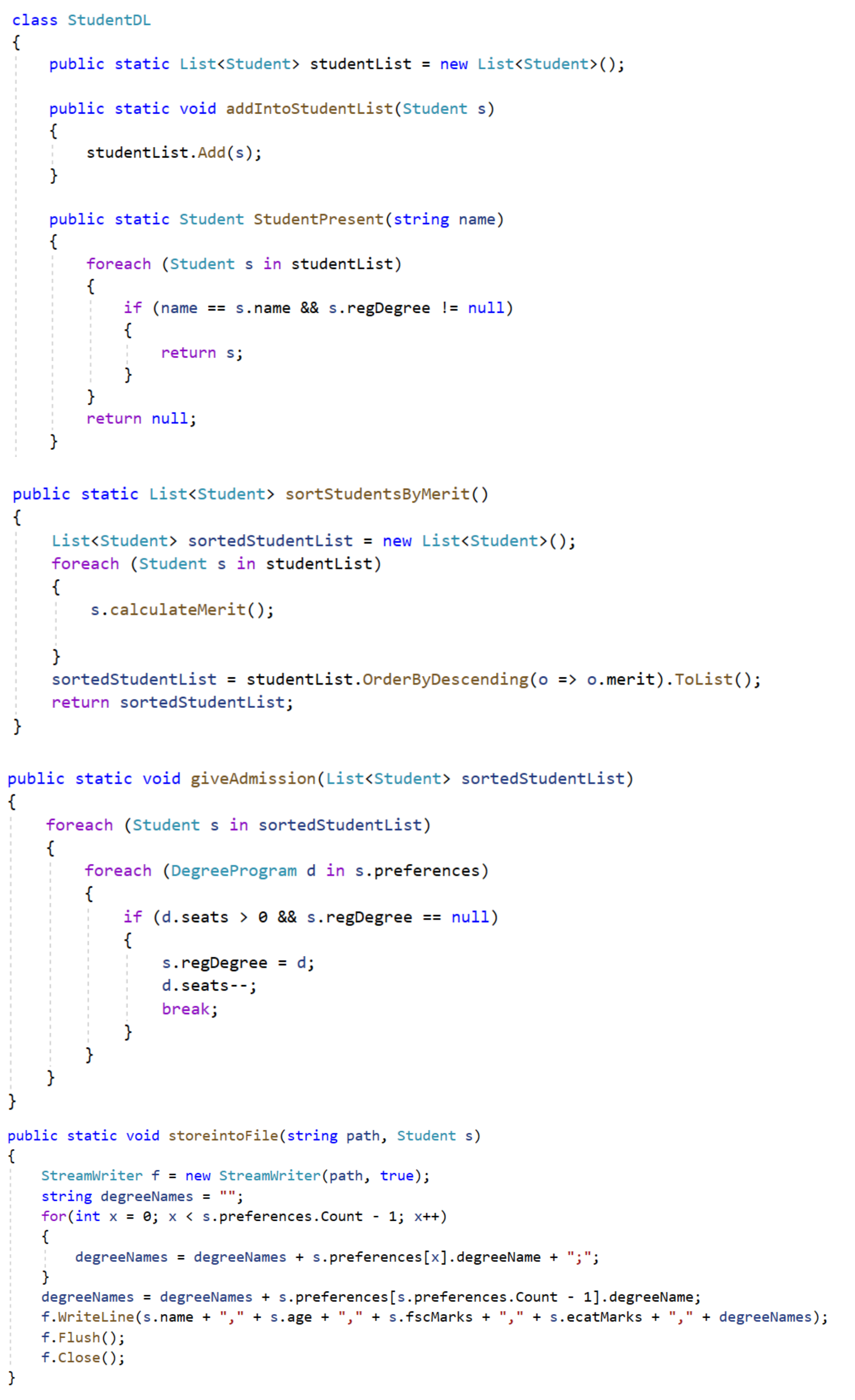


```
public static void storeintoFile(string path, DegreeProgram d)
{
    StreamWriter f = new StreamWriter(path, true);
    string SubjectNames = "";
    for(int x = 0; x < d.subjects.Count - 1; x++)
    {
        SubjectNames = SubjectNames + d.subjects[x].type + ";";
    }
    SubjectNames = SubjectNames + d.subjects[d.subjects.Count - 1].type;
    f.WriteLine(d.degreeName + "," + d.degreeDuration + "," + d.seats + "," + SubjectNames);
    f.Flush();
    f.Close();
}
```



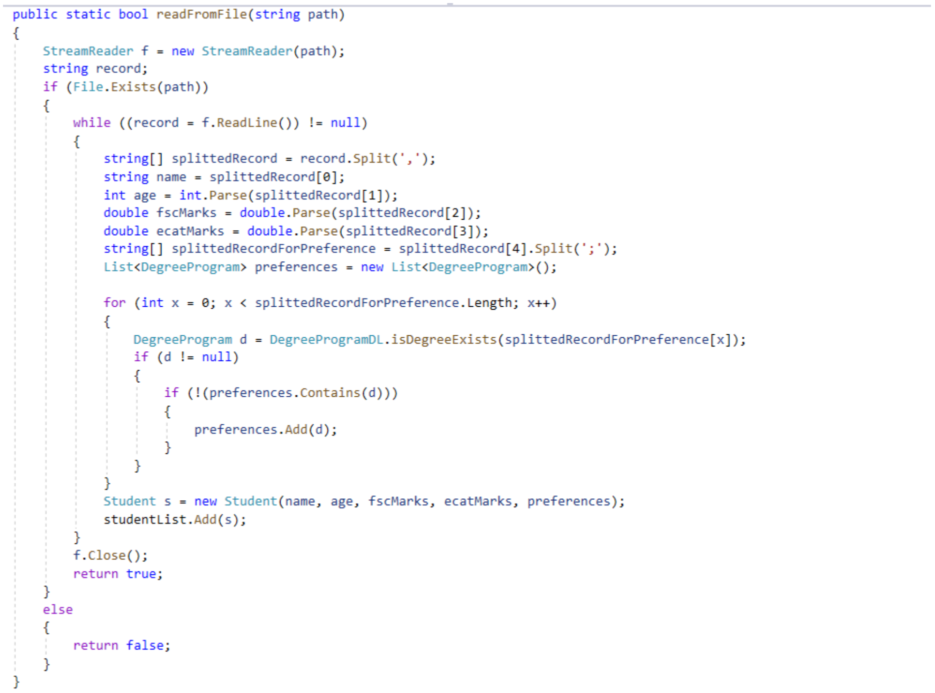
```
public static bool readFromFile(string path)
{
    StreamReader f = new StreamReader(path);
    string record;
    if (File.Exists(path))
    {
        while ((record = f.ReadLine()) != null)
        {
            string[] splittedRecord = record.Split(',');
            string degreeName = splittedRecord[0];
            float degreeDuration = float.Parse(splittedRecord[1]);
            int seats = int.Parse(splittedRecord[2]);
            string[] splittedRecordForSubject = splittedRecord[3].Split(';');
            DegreeProgram d = new DegreeProgram(degreeName, degreeDuration, seats);
            for (int x = 0; x < splittedRecordForSubject.Length; x++)
            {
                Subject s = SubjectDL.isSubjectExists(splittedRecordForSubject[x]);
                if (s != null)
                {
                    d.AddSubject(s);
                }
            }
            addIntoDegreeList(d);
        }
        f.Close();
        return true;
    }
    else
    {
        return false;
    }
}
```

6.



```
class StudentDL
{
    public static List<Student> studentList = new List<Student>();

    public static void addIntoStudentList(Student s)
    {
        studentList.Add(s);
    }

    public static Student StudentPresent(string name)
    {
        foreach (Student s in studentList)
        {
            if (name == s.name && s.regDegree != null)
            {
                return s;
            }
        }
        return null;
    }

public static List<Student> sortStudentsByMerit()
{
    List<Student> sortedStudentList = new List<Student>();
    foreach (Student s in studentList)
    {
        s.calculateMerit();

    }
    sortedStudentList = studentList.OrderByDescending(o => o.merit).ToList();
    return sortedStudentList;
}

public static void giveAdmission(List<Student> sortedStudentList)
{
    foreach (Student s in sortedStudentList)
    {
        foreach (DegreeProgram d in s.preferences)
        {
            if (d.seats > 0 && s.regDegree == null)
            {
                s.regDegree = d;
                d.seats--;
                break;
            }
        }
    }
}

public static void storeintoFile(string path, Student s)
{
    StreamWriter f = new StreamWriter(path, true);
    string degreeNames = "";
    for(int x = 0; x < s.preferences.Count - 1; x++)
    {
        degreeNames = degreeNames + s.preferences[x].degreeName + ";";
    }
    degreeNames = degreeNames + s.preferences[s.preferences.Count - 1].degreeName;
    f.WriteLine(s.name + "," + s.age + "," + s.fscMarks + "," + s.ecatMarks + "," + degreeNames);
    f.Flush();
    f.Close();
}
```

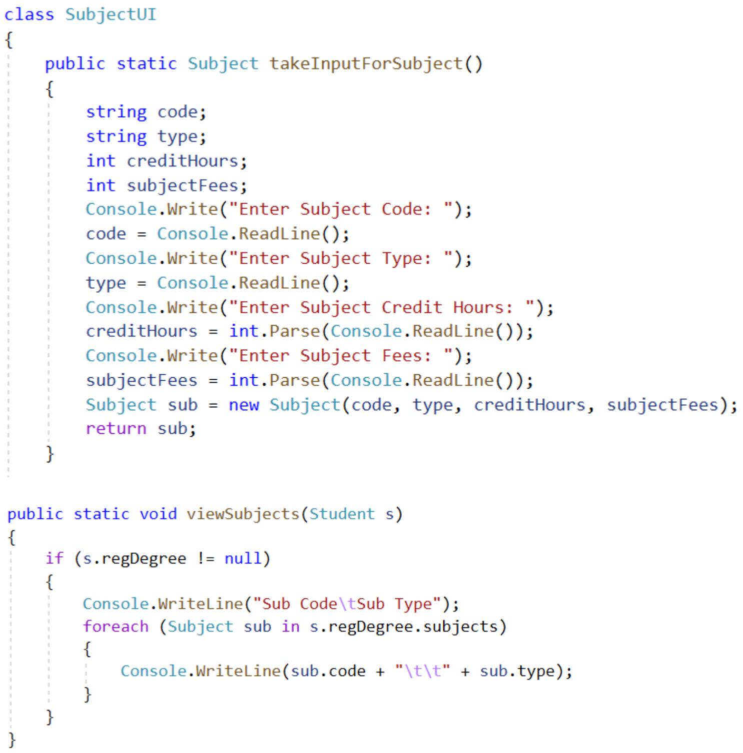
- **StudentDL** Class
- Member functions for **StudentDL** Class



```
public static bool readFromFile(string path)
{
    StreamReader f = new StreamReader(path);
    string record;
    if (File.Exists(path))
    {
        while ((record = f.ReadLine()) != null)
        {
            string[] splittedRecord = record.Split(',');
            string name = splittedRecord[0];
            int age = int.Parse(splittedRecord[1]);
            double fscMarks = double.Parse(splittedRecord[2]);
            double ecatMarks = double.Parse(splittedRecord[3]);
            string[] splittedRecordForPreference = splittedRecord[4].Split(';');
            List<DegreeProgram> preferences = new List<DegreeProgram>();

            for (int x = 0; x < splittedRecordForPreference.Length; x++)
            {
                DegreeProgram d = DegreeProgramDL.isDegreeExists(splittedRecordForPreference[x]);
                if (d != null)
                {
                    if (!(preferences.Contains(d)))
                    {
                        preferences.Add(d);
                    }
                }
            }
            Student s = new Student(name, age, fscMarks, ecatMarks, preferences);
            studentList.Add(s);
        }
        f.Close();
        return true;
    }
    else
    {
        return false;
    }
}
```

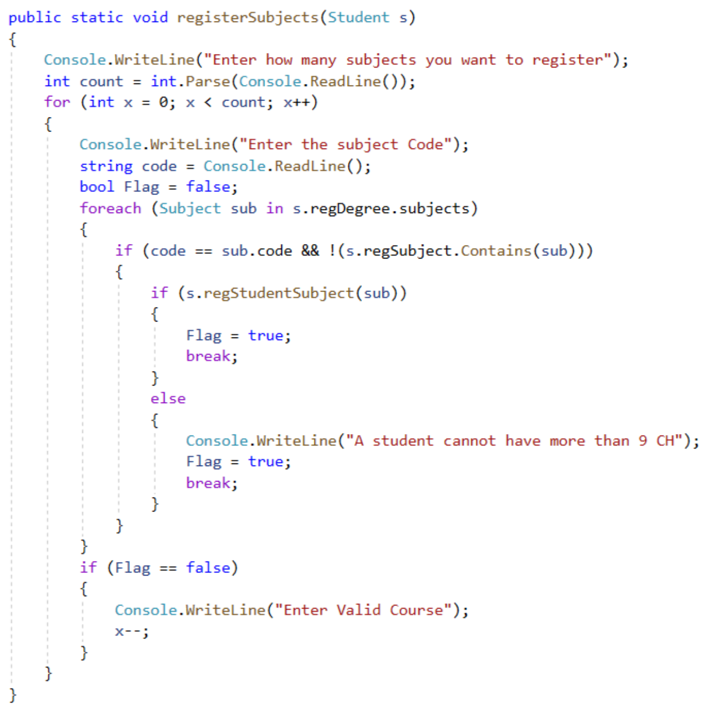
Let us now implement the **User Interface Layer** (UI folder Classes) for this project.

7



```
class SubjectUI
{
    public static Subject takeInputForSubject()
    {
        string code;
        string type;
        int creditHours;
        int subjectFees;
        Console.Write("Enter Subject Code: ");
        code = Console.ReadLine();
        Console.Write("Enter Subject Type: ");
        type = Console.ReadLine();
        Console.Write("Enter Subject Credit Hours: ");
        creditHours = int.Parse(Console.ReadLine());
        Console.Write("Enter Subject Fees: ");
        subjectFees = int.Parse(Console.ReadLine());
        Subject sub = new Subject(code, type, creditHours, subjectFees);
        return sub;
    }

public static void viewSubjects(Student s)
{
    if (s.regDegree != null)
    {
        Console.WriteLine("Sub Code\tSub Type");
        foreach (Subject sub in s.regDegree.subjects)
        {
            Console.WriteLine(sub.code + "\t\t" + sub.type);
        }
    }
}
```

- **SubjectUI** Class
- Member functions for **SubjectUI** Class



```
public static void registerSubjects(Student s)
{
    Console.WriteLine("Enter how many subjects you want to register");
    int count = int.Parse(Console.ReadLine());
    for (int x = 0; x < count; x++)
    {
        Console.WriteLine("Enter the subject Code");
        string code = Console.ReadLine();
        bool Flag = false;
        foreach (Subject sub in s.regDegree.subjects)
        {
            if (code == sub.code && !(s.regSubject.Contains(sub)))
            {
                if (s.regStudentSubject(sub))
                {
                    Flag = true;
                    break;
                }
                else
                {
                    Console.WriteLine("A student cannot have more than 9 CH");
                    Flag = true;
                    break;
                }
            }
        }
        if (Flag == false)
        {
            Console.WriteLine("Enter Valid Course");
            x--;
        }
    }
}
```

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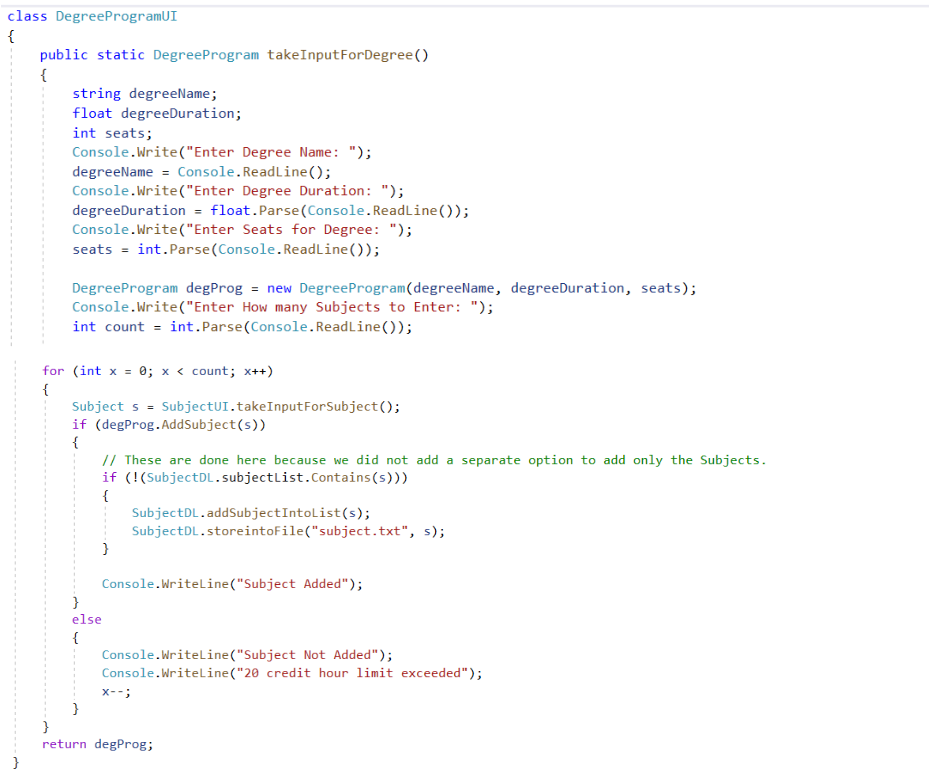


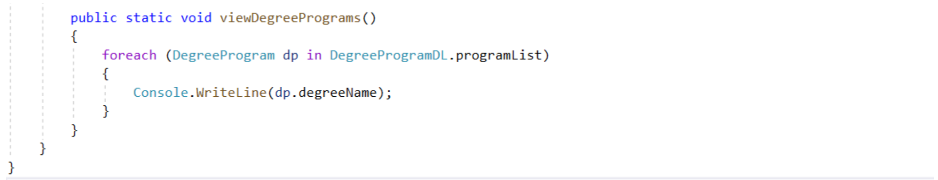
```
class DegreeProgramUI
{
    public static DegreeProgram takeInputForDegree()
    {
        string degreeName;
        float degreeDuration;
        int seats;
        Console.Write("Enter Degree Name: ");
        degreeName = Console.ReadLine();
        Console.Write("Enter Degree Duration: ");
        degreeDuration = float.Parse(Console.ReadLine());
        Console.Write("Enter Seats for Degree: ");
        seats = int.Parse(Console.ReadLine());

        DegreeProgram degProg = new DegreeProgram(degreeName, degreeDuration, seats);
        Console.Write("Enter How many Subjects to Enter: ");
        int count = int.Parse(Console.ReadLine());

        for (int x = 0; x < count; x++)
        {
            Subject s = SubjectUI.takeInputForSubject();
            if (degProg.AddSubject(s))
            {
                // These are done here because we did not add a separate option to add only the Subjects.
                if (!(SubjectDL.subjectList.Contains(s)))
                {
                    SubjectDL.addSubjectIntoList(s);
                    SubjectDL.storeintoFile("subject.txt", s);
                }

                Console.WriteLine("Subject Added");
            }
            else
            {
                Console.WriteLine("Subject Not Added");
                Console.WriteLine("20 credit hour limit exceeded");
                x--;
            }
        }
        return degProg;
    }
```

- **DegreeProgramUI** Class
- Member functions for **DegreeProgramUI** Class



```
        public static void viewDegreePrograms()
        {
            foreach (DegreeProgram dp in DegreeProgramDL.programList)
            {
                Console.WriteLine(dp.degreeName);
            }
        }
    }
}
```

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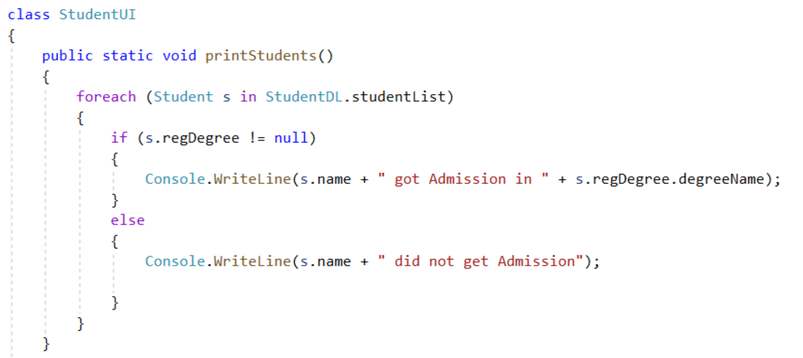
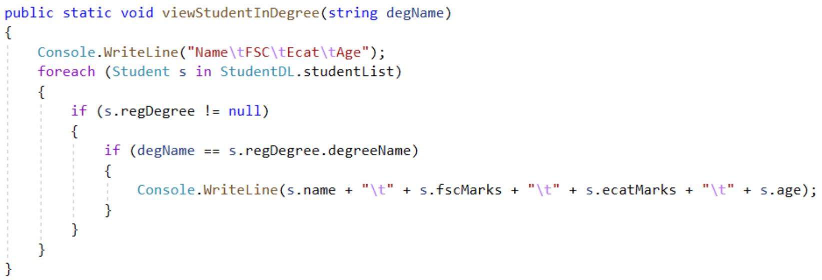
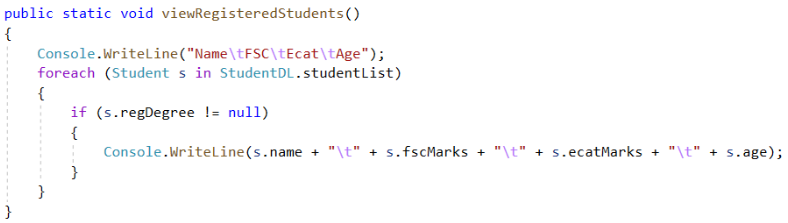


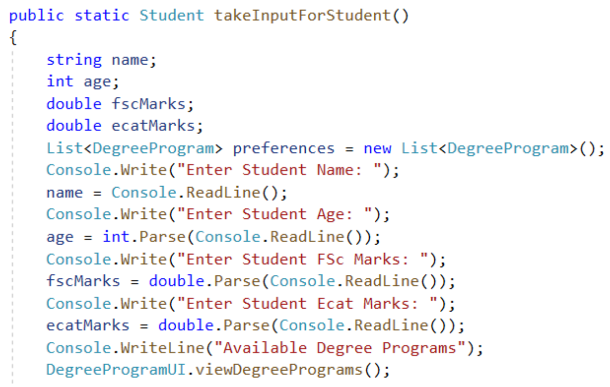
```
class StudentUI
{
    public static void printStudents()
    {
        foreach (Student s in StudentDL.studentList)
        {
            if (s.regDegree != null)
            {
                Console.WriteLine(s.name + " got Admission in " + s.regDegree.degreeName);
            }
            else
            {
                Console.WriteLine(s.name + " did not get Admission");

            }
        }
    }
```



```
public static void viewStudentInDegree(string degName)
{
    Console.WriteLine("Name\tFSC\tEcat\tAge");
    foreach (Student s in StudentDL.studentList)
    {
        if (s.regDegree != null)
        {
            if (degName == s.regDegree.degreeName)
            {
                Console.WriteLine(s.name + "\t" + s.fscMarks + "\t" + s.ecatMarks + "\t" + s.age);
            }
        }
    }
}
```

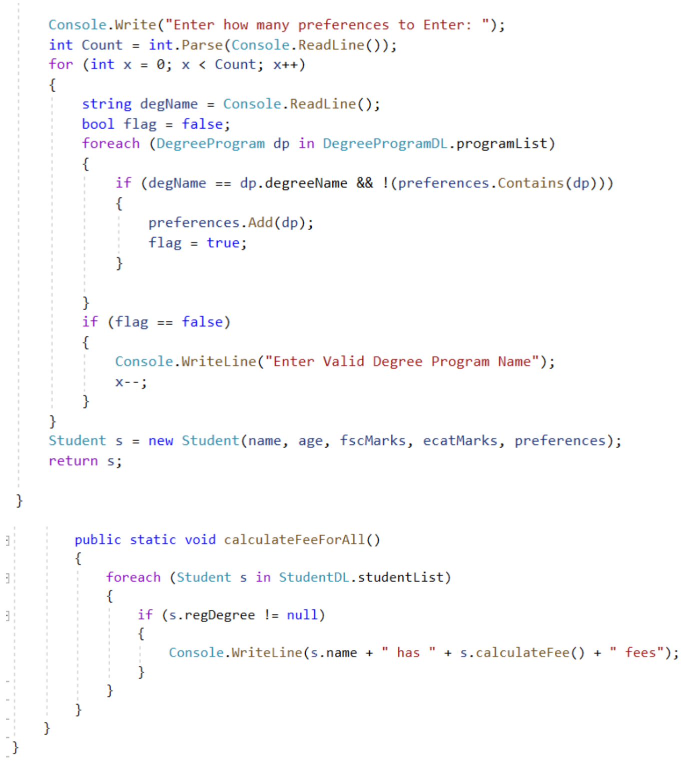


```
public static void viewRegisteredStudents()
{
    Console.WriteLine("Name\tFSC\tEcat\tAge");
    foreach (Student s in StudentDL.studentList)
    {
        if (s.regDegree != null)
        {
            Console.WriteLine(s.name + "\t" + s.fscMarks + "\t" + s.ecatMarks + "\t" + s.age);
        }
    }
}
```



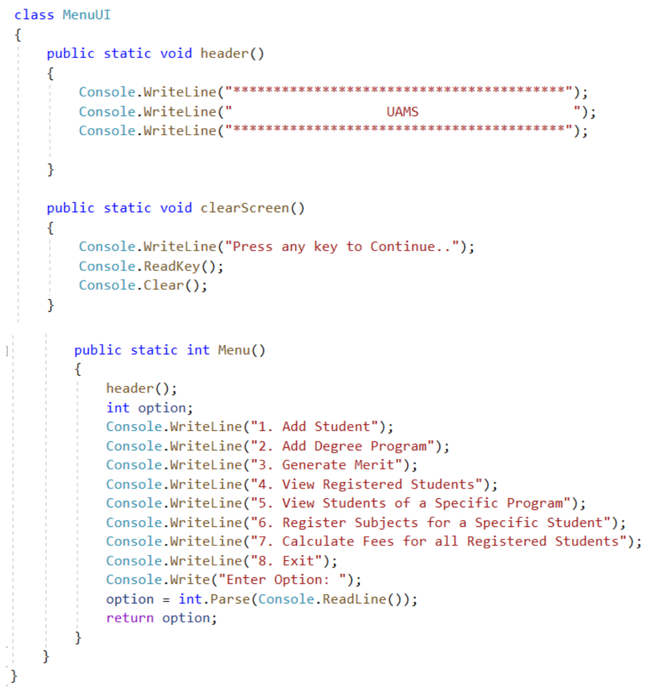
```
public static Student takeInputForStudent()
{
    string name;
    int age;
    double fscMarks;
    double ecatMarks;
    List<DegreeProgram> preferences = new List<DegreeProgram>();
    Console.Write("Enter Student Name: ");
    name = Console.ReadLine();
    Console.Write("Enter Student Age: ");
    age = int.Parse(Console.ReadLine());
    Console.Write("Enter Student FSc Marks: ");
    fscMarks = double.Parse(Console.ReadLine());
    Console.Write("Enter Student Ecat Marks: ");
    ecatMarks = double.Parse(Console.ReadLine());
    Console.WriteLine("Available Degree Programs");
    DegreeProgramUI.viewDegreePrograms();
```

- **StudentUI** Class
- Member functions for **StudentUI** Class



```
    Console.Write("Enter how many preferences to Enter: ");
    int Count = int.Parse(Console.ReadLine());
    for (int x = 0; x < Count; x++)
    {
        string degName = Console.ReadLine();
        bool flag = false;
        foreach (DegreeProgram dp in DegreeProgramDL.programList)
        {
            if (degName == dp.degreeName && !(preferences.Contains(dp)))
            {
                preferences.Add(dp);
                flag = true;
            }

        }
        if (flag == false)
        {
            Console.WriteLine("Enter Valid Degree Program Name");
            x--;
        }
    }
    Student s = new Student(name, age, fscMarks, ecatMarks, preferences);
    return s;

}

    public static void calculateFeeForAll()
    {
        foreach (Student s in StudentDL.studentList)
        {
            if (s.regDegree != null)
            {
                Console.WriteLine(s.name + " has " + s.calculateFee() + " fees");
            }
        }
    }
}
```

10

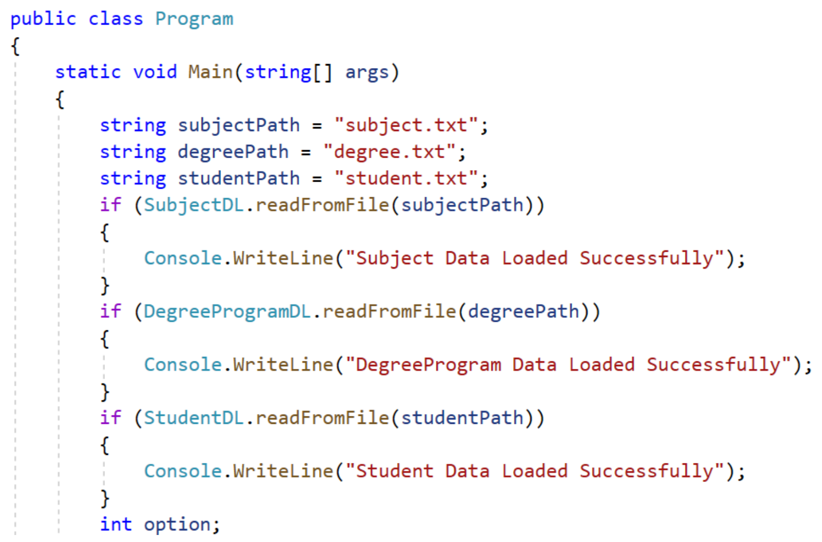


```
class MenuUI
{
    public static void header()
    {
        Console.WriteLine("*****************************************");
        Console.WriteLine("                      UAMS                   ");
        Console.WriteLine("*****************************************");

    }

    public static void clearScreen()
    {
        Console.WriteLine("Press any key to Continue..");
        Console.ReadKey();
        Console.Clear();
    }

        public static int Menu()
        {
            header();
            int option;
            Console.WriteLine("1. Add Student");
            Console.WriteLine("2. Add Degree Program");
            Console.WriteLine("3. Generate Merit");
            Console.WriteLine("4. View Registered Students");
            Console.WriteLine("5. View Students of a Specific Program");
            Console.WriteLine("6. Register Subjects for a Specific Student");
            Console.WriteLine("7. Calculate Fees for all Registered Students");
            Console.WriteLine("8. Exit");
            Console.Write("Enter Option: ");
            option = int.Parse(Console.ReadLine());
            return option;
        }
    }
}
```

- **MenuUI** Class
- Member functions for **MenuUI** Class

Let us now implement the **Main Driver Program** (program.cs file) for this project.

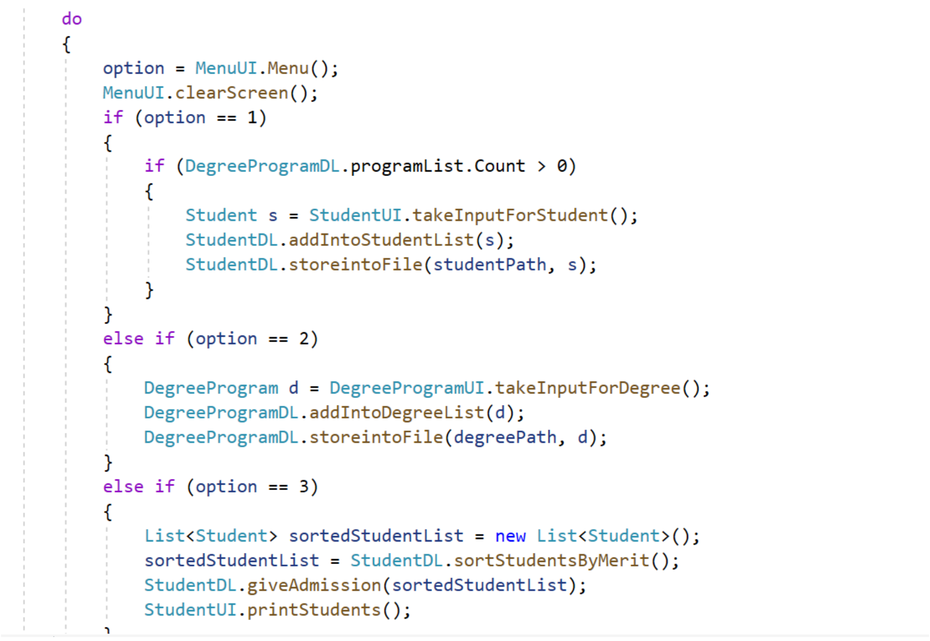
11



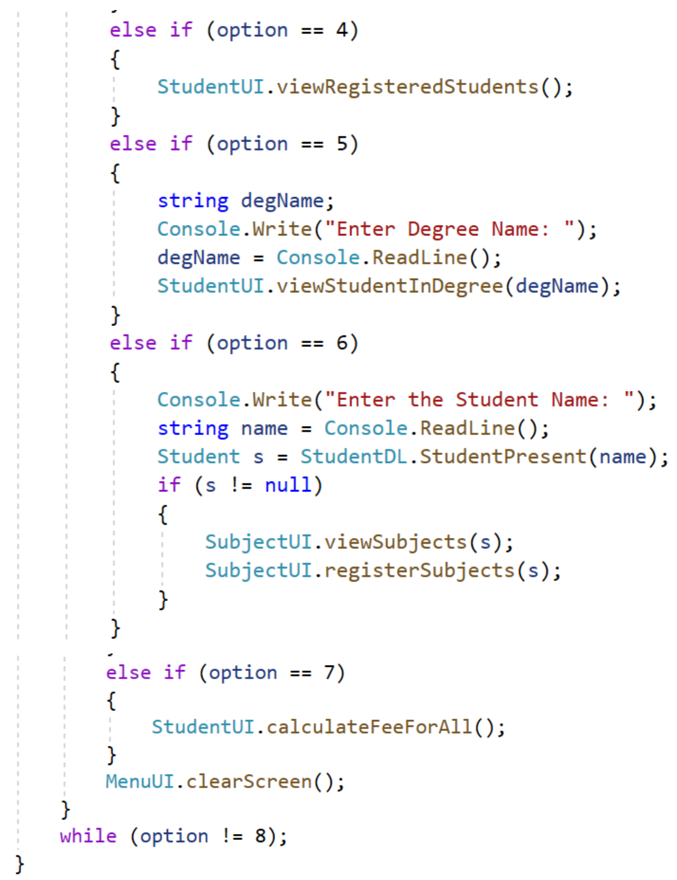
```
public class Program
{
    static void Main(string[] args)
    {
        string subjectPath = "subject.txt";
        string degreePath = "degree.txt";
        string studentPath = "student.txt";
        if (SubjectDL.readFromFile(subjectPath))
        {
            Console.WriteLine("Subject Data Loaded Successfully");
        }
        if (DegreeProgramDL.readFromFile(degreePath))
        {
            Console.WriteLine("DegreeProgram Data Loaded Successfully");
        }
        if (StudentDL.readFromFile(studentPath))
        {
            Console.WriteLine("Student Data Loaded Successfully");
        }
        int option;
```

- **Main Driver Program**

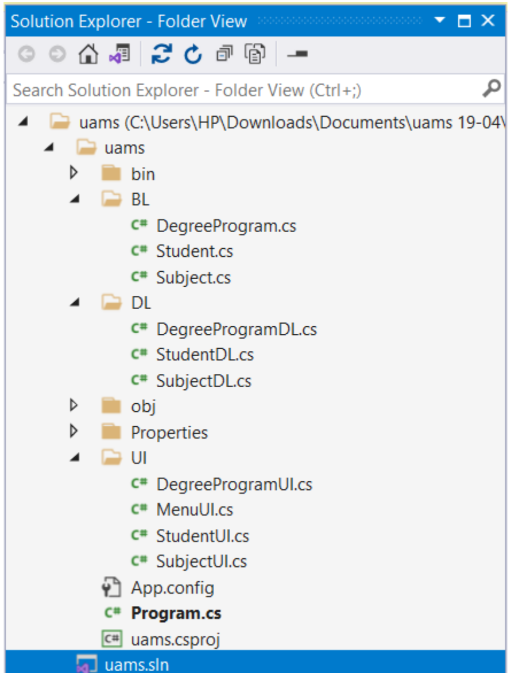
11(a)



```
        do
        {
            option = MenuUI.Menu();
            MenuUI.clearScreen();
            if (option == 1)
            {
                if (DegreeProgramDL.programList.Count > 0)
                {
                    Student s = StudentUI.takeInputForStudent();
                    StudentDL.addIntoStudentList(s);
                    StudentDL.storeintoFile(studentPath, s);
                }
            }
            else if (option == 2)
            {
                DegreeProgram d = DegreeProgramUI.takeInputForDegree();
                DegreeProgramDL.addIntoDegreeList(d);
                DegreeProgramDL.storeintoFile(degreePath, d);
            }
            else if (option == 3)
            {
                List<Student> sortedStudentList = new List<Student>();
                sortedStudentList = StudentDL.sortStudentsByMerit();
                StudentDL.giveAdmission(sortedStudentList);
                StudentUI.printStudents();
            }
```



```
            else if (option == 4)
            {
                StudentUI.viewRegisteredStudents();
            }
            else if (option == 5)
            {
                string degName;
                Console.Write("Enter Degree Name: ");
                degName = Console.ReadLine();
                StudentUI.viewStudentInDegree(degName);
            }
            else if (option == 6)
            {
                Console.Write("Enter the Student Name: ");
                string name = Console.ReadLine();
                Student s = StudentDL.StudentPresent(name);
                if (s != null)
                {
                    SubjectUI.viewSubjects(s);
                    SubjectUI.registerSubjects(s);
                }
            }
            else if (option == 7)
            {
                StudentUI.calculateFeeForAll();
            }
            MenuUI.clearScreen();
        }
        while (option != 8);
    }
```



Solution Explorer - Folder View
Search Solution Explorer - Folder View (Ctrl+;)

```
uams (C:\Users\HP\Downloads\Documents\uams 19-04\
  uams
    bin
    BL
      DegreeProgram.cs
      Student.cs
      Subject.cs
    DL
      DegreeProgramDL.cs
      StudentDL.cs
      SubjectDL.cs
    obj
    Properties
    UI
      DegreeProgramUI.cs
      MenuUI.cs
      StudentUI.cs
      SubjectUI.cs
    App.config
    Program.cs
    uams.csproj
  uams.sln
```

- Final Layer wise Directory Structure

Congratulations !!!!! You have made it through and implemented the complete project through the 3 Tier Model. Great Work Students.

Self Assessment Task: Draw the updated Domain Model and Class Diagram for this project now that contains all the classes from the 3-tier model.

Self Assessment # 1:

Create a Class **MenuItem,** which has three instances

1. **name:** name of the item
2. **type:** whether *food* or a *drink*
3. **price:** price of the item

Write a class called **CoffeeShop**, which has three instance variables:

1. **name** : a string (basically, of the shop)
2. **menu** : an list of items (of object type), with each item containing the item (name of the item), type (whether *food* or a *drink*) and price.
3. **orders** : an empty list of string type.

And a parameterized constructor which takes the name of the CoffeeShop as a parameter.

and eight methods:

1. **addMenuItem:** adds the menu item in the list of menu
2. **addOrder:** adds the name of the item to the end of the orders list if it exists on the menu. Otherwise, return "This item is currently unavailable!"
3. **fulfillOrder:** if the orders list is not empty, return "The {item} is ready!" and make the list empty. If the order list is empty, return "All orders have been fulfilled!"
4. **listOrders:** returns the list of orders taken, otherwise null.
5. **dueAmount:** returns the total amount due for the orders taken.
6. **cheapestItem:** returns the name of the cheapest item on the menu.
7. **drinksOnly:** returns only the *item* names of *type* drink from the menu.
8. **foodOnly:** returns only the *item* names of *type* food from the menu.

IMPORTANT: Orders are fulfilled in a FIFO (first-in, first-out) order.

Following menu needs to be added for the Tesha's Coffee Shop

Name	**Type**	**Price**

"orange juice"	Drink	60
"lemonade"	Drink	50
"cranberry juice"	Drink	100
"pineapple juice"	Drink	100
"lemon iced tea"	Drink	120
"vanilla chai latte"	Drink	150
"hot chocolate"	Drink	140
"iced coffee"	Drink	140
"tuna sandwich"	Food	300
"ham and cheese sandwich"	Food	300
"egg sandwich"	Food	200
"steak"	Food	900
"hamburger"	Food	600
"cinnamon roll"	Food	150

Driver Program: (Following options should be shown to the user)

Welcome to the Tesha’s Coffee Shop

1. Add a Menu item
2. View the Cheapest Item in the menu
3. View the Drink’s Menu
4. View the Food’s Menu
5. Add Order
6. Fulfill the Order
7. View the Orders’s List
8. Total Payable Amount
9. Exit

Test Cases:

// After creating an object of CoffeeShop and initializing its attributes

tcs.addOrder("hot cocoa") ➞ "This item is currently unavailable!"

// Tesha's coffee shop does not sell hot cocoa
tcs.addOrder("iced tea") ➞ "This item is currently unavailable!"
// specifying the variant of "iced tea" will help the process

tcs.addOrder("cinnamon roll") ➞ "Order added!"
tcs.addOrder("iced coffee") ➞ "Order added!"
tcs.listOrders ➞ ["cinnamon roll", "iced coffee"]
// the list of all the items in the current order

tcs.dueAmount() ➞ 290

tcs.fulfillOrder() ➞ "The cinnamon roll is ready!"
tcs.fulfillOrder() ➞ "The iced coffee is ready!"
tcs.fulfillOrder() ➞ "All orders have been fulfilled!"
// all orders have been presumably served

tcs.listOrders() ➞ []
// an empty list is returned if all orders have been exhausted

tcs.dueAmount() ➞ 0.0
// no new orders taken, expect a zero payable

tcs.cheapestItem() ➞ "lemonade"
tcs.drinksOnly() ➞ ["orange juice", "lemonade", "cranberry juice", "pineapple juice", "lemon iced tea", "vanilla chai latte", "hot chocolate", "iced coffee"]
tcs.foodOnly() ➞ ["tuna sandwich", "ham and cheese sandwich", "bacon and egg", "steak", "hamburger", "cinnamon roll"]

Note: You must load data from the file also.

Problem # 2:

In this problem, you have to create a class called **Point,** which models a 2D point with x and y coordinates.
It contains:

- Two instance variables x (int) and y (int).
- A default (or "no-argument" or "no-arg") constructor that constructs a point at the default location of (0, 0).
- A parameterized constructor that constructs a point with the given x and y coordinates.
- Getter and setter for the instance variables x and y.
- A method setXY() to set both x and y.

Next, create a class named **Boundary**.

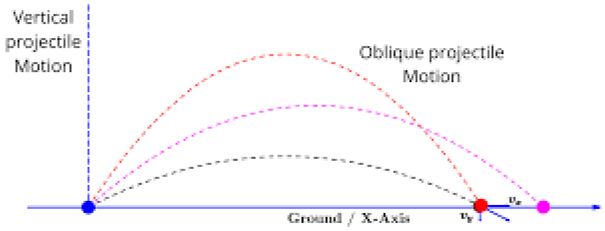
It contains:

- Four attributes of Point type
    - TopLeft
    - TopRight
    - BottomLeft
    - BottomRight
- A default (or "no-argument" or "no-arg") constructor that constructs a boundary with default location of TopLeft(0, 0), TopRight(0,90), BottomLeft(90,0) and BottomRight(90,90).
- A parameterized constructor that constructs a boundary with the given TopLeft, TopRight, BottomLeft and BottomRight points.

Next, create a class named **GameObject.**

It contains 4 attributes:

- One attribute **Shape** (2D Array char type).
- A **StartingPoint** (Point type).
- A **Premises** (Boundary type).
- A **Direction** (String type).

LeftToRight	Starts from the starting point and keeps on moving towards the right and stops at the extreme right boundary point
RightToLeft	Starts from the starting point and keeps on moving towards the left and stops at the extreme left boundary point
Patrol	Starts from the starting point and keeps on moving towards the left and stops at the extreme left boundary point and reverses the direction.
Projectile	Starts from the starting point and move 5 points towards the top right and then 2 steps towards the right and then 4 steps towards bottom right.  Vertical projectile Motion Oblique projectile Motion Ground / X-Axis
Diagonal	Starts from the starting point and moves towards the bottom right

	and stops at the extreme right boundary point.

- A default constructor that initializes
  - Shape (1x3 line “---”)
  - StartingPoint (constructs a point at the default location of (0, 0))
  - Premises (constructs a boundary with default location of TopLeft(0, 0), TopRight(0,90), BottomLeft(90,0) and BottomRight(90,90))
  - Direction (“LeftToRight”)

- A parameterized constructor that takes
  - Shape, StartingPoint
  - Whereas **Premises** (constructs a boundary with default location of TopLeft(0, 0), TopRight(0,90), BottomLeft(90,0) and BottomRight(90,90)) and **Direction** with default direction (“LeftToRight”)

- A parameterized constructor that takes
  - Shape
  - StartingPoint
  - Premises
  - Direction

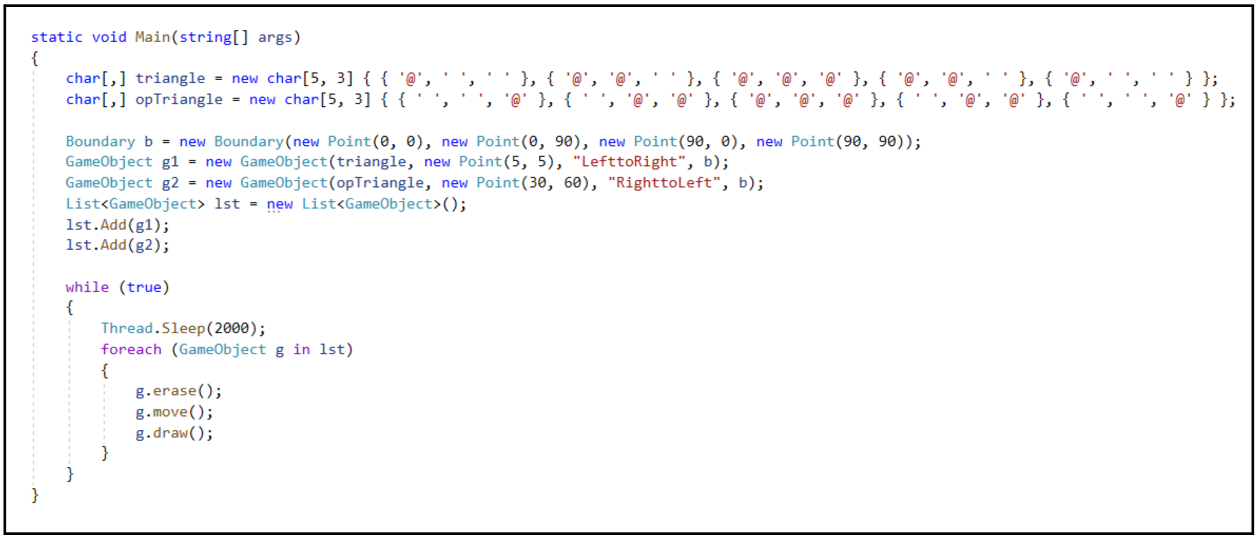
- It will also contain the following methods
  - **Move:** if the direction is “LeftToRight”, the shape will move one step according to its direction. For example, if the direction is from left to right it will move the game object one step toward right.
  - **Erase:** When called, this method will erase the shape on the console.
  - **Draw:** When called, this method will draw the shape on the console.

- Following are some examples of the shapes you can draw (Use your creativity to come up with different shapes)

```
 ¤¤¤¤
¤¤¤¤¤¤  ¤
¤¤¤¤¤¤ ¤¤¤
¤    ¤
```

```
  ☼☼
 ☼☼☼☼
☼☼☼☼☼☼
 ☼☼☼☼
  ☼☼
 ☼☼☼☼
```

Demo Driver Program:



```
static void Main(string[] args)
{
    char[,] triangle = new char[5, 3] { { '@', ' ', ' ' }, { '@', '@', ' ' }, { '@', '@', '@' }, { '@', '@', ' ' }, { '@', ' ', ' ' } };
    char[,] opTriangle = new char[5, 3] { { ' ', ' ', '@' }, { ' ', '@', '@' }, { '@', '@', '@' }, { ' ', '@', '@' }, { ' ', ' ', '@' } };

    Boundary b = new Boundary(new Point(0, 0), new Point(0, 90), new Point(90, 0), new Point(90, 90));
    GameObject g1 = new GameObject(triangle, new Point(5, 5), "LefttoRight", b);
    GameObject g2 = new GameObject(opTriangle, new Point(30, 60), "RighttoLeft", b);
    List<GameObject> lst = new List<GameObject>();
    lst.Add(g1);
    lst.Add(g2);

    while (true)
    {
        Thread.Sleep(2000);
        foreach (GameObject g in lst)
        {
            g.erase();
            g.move();
            g.draw();
        }
    }
}
```

Good Luck and Best Wishes ‼

Happy Coding ahead :)