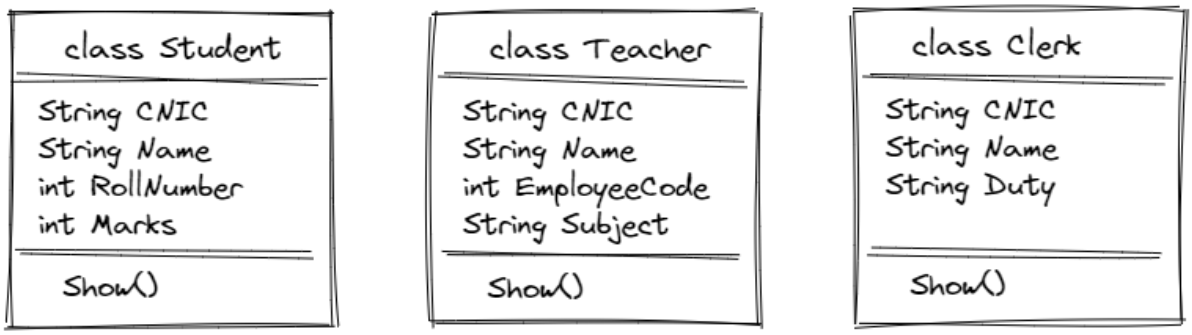
12 - Inheritance

Suppose we are designing Student Admission System where Student applies for admission. Clerk confirms the admission and Teach teaches a subject. Class Diagram looks like this

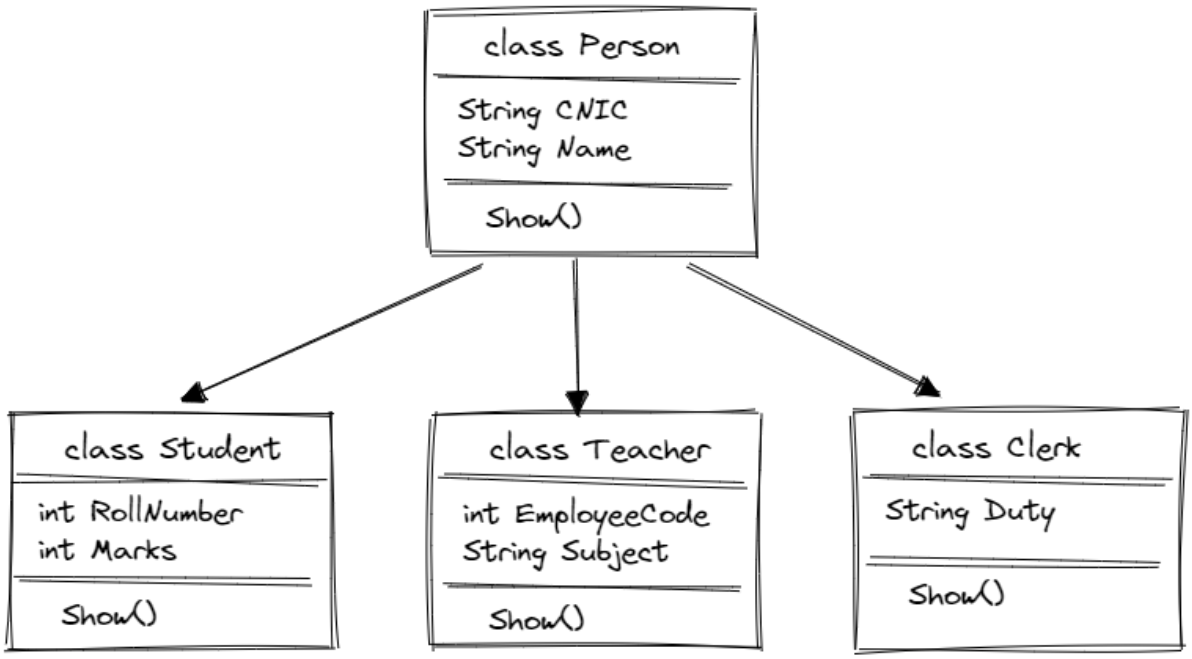



```
using System;

namespace _20220612_Inheritance.Without
{
    public class Studuent
    {
        public String CNIC { get; set; }
        public String Name { get; set; }
        public int RollNumber { get; set; }
        public int Marks { get; set; }

        public void Show()
        {
            Console.WriteLine("CNIC: \t" + CNIC);
            Console.WriteLine("Name: \t\t" + Name);
            Console.WriteLine("Roll Number: \t\t" + RollNumber);
            Console.WriteLine("Marks: \t\t" + Marks);
        }
    }

    public class Teacher
    {
        public String CNIC { get; set; }
        public String Name { get; set; }
```

```
        public int EmployeeCode { get; set; }
        public String Subject { get; set; }

        public void Show()
        {
            Console.WriteLine("CNIC: \t" + CNIC);
            Console.WriteLine("Name: \t\t" + Name);
            Console.WriteLine("Employee Code: \t\t" + EmployeeCode);
            Console.WriteLine("Subject: \t\t" + Subject);
        }

    }

    public class Clerk
    {
        public String CNIC { get; set; }
        public String Name { get; set; }
        public String Duty { get; set; }

        public void Show()
        {
            Console.WriteLine("CNIC: \t" + CNIC);
            Console.WriteLine("Name: \t\t" + Name);
            Console.WriteLine("Duty: \t\t" + Duty);
        }
    }
}
```

Parent-Child Relationship

We need to organize the code so that our code should be maintainable and easy to understand. We re-design our classes in class hierarchy. In classes hierarchy we will have parent-child relationship.



Person is Parent Class and Student, Teacher and Clerk are child classes.

- Variable declared in Parent class comes in Child classes objects
- Function declared in Parent class comes in Child classes objects
- You can create Parent class object and Save in Parent class type variable

```
Person p1 = new Person();
```

⇒ p1.Show() will call show function in Parent class

- You can create Child class object and Save in Child class type variable

```
Student s1 = new Student();
```

⇒ s1.Show() will call show function in Child class

Polymorphism

- You can create Child class object and Save in Parent class type variable. We call it polymorphism

Steps:

- set Parent class show function as *virtual*

- change Child class show function as *override*

```
Person s1 = new Student();
```

⇒ s1.Show() will call show function in Child class

Usage:

When we pass an object to a function, we pass it Parent class object Person

Accessors

We can set accessibility of our variables and functions.

Private: A variable or function declared as private only accessible inside the class. If we set accessibly of function to private it will not be called from other classes.

Public: Variable or function declared public accessible in all other classes

Protected: We can have hierarchy of classes. When we have hierarchy of classes, variable declared as protected is only accessible inside the class or inside child class in parent-child relationship.

Internal: Variable or function declared public accessible in all other classes only inside the same assembly

Built-in Classes Hierarchy

When we use already built-in classes in our code, we create its object and call a function on it. Those classes are organized using Inheritance.

References:

1. https://online.visual-paradigm.com/diagrams/solutions/free-class-diagram-tool/
2. http://dia-installer.de/

Assignments

1. Make a class diagram of Banking System

   There are mainly two types of Accounts. Personal account and Business account. When an Account is opened. It is not active. You can deposit to or withdraw from an account. When you don’t do any transaction in a 6 month, account becomes Dormant. You can close your account any time.

Personal Account can be

2. Current Account - No Profit No Loss
3. Salaries Account, A special Current Account for Salaried persons
4. Saving Account - Profit / Loss account
5. Fix Deposit Account - Profit / Loss for a specific period of time e.g. 2 years / 5 years

2. Make a class diagram of Hospital System.

   Doctors as the persons who treat patients. Patient is also a person. Doctor can be Permanent or Visiting doctor. Permanent doctors stays 9-5 on daily basis and Visiting doctors comes for 2-3 hours a day. House Job are trainee doctors who don’t have much experience. Specialist doctor have specialization in any field and has high fees. Surgeon are doctor who do patient operation.

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