

Chapter 10

Inheritance, Polymorphism, Virtual Functions

Spring 2019

Vocabulary

- Inheritance
- Superclass
- Subclass
- Base class
- Derived class
- is-a relationship
- Composition
- has-a relationship

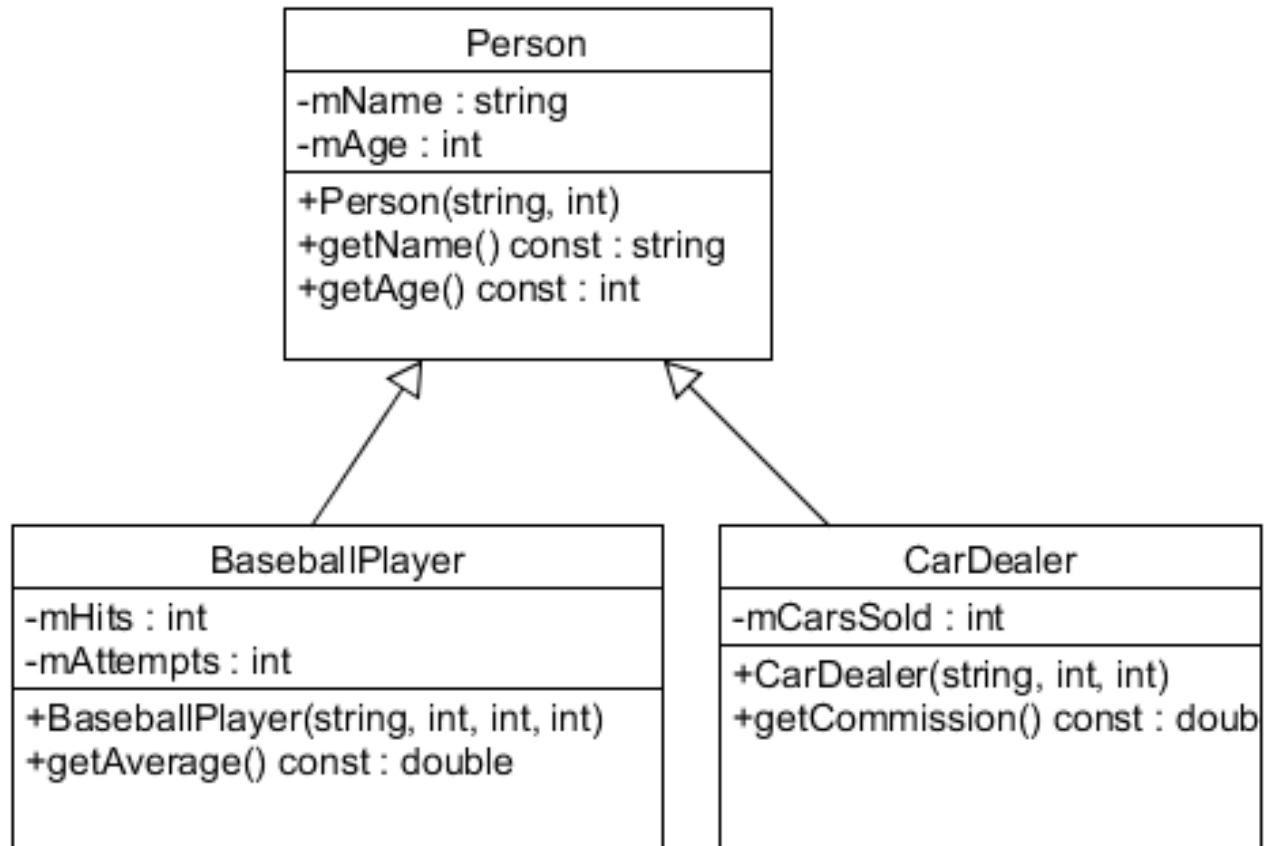
We will define as
we go along today.

Inheritance

- Allows a new class to be based on an existing class
 - Reusability
- The new class inherits:

- The new class then adds new functionality
 - **Specialize**

Simple Inheritance



is-a vs has-a

- Inheritance
 - A car is-a vehicle
 - An athlete is-a person
 - A football player is-a athlete
- Composition
 - A DNASet has-a DNA
 - A Course has-a Student

OOP Vocabulary

- Inheritance is used to create an is-a relationship

Simple Inheritance Example

```
class Employee
{
    public:
        Employee (string name = "",
                  string ssn = "");
        string getName () const;
        string getSSN () const;
        void print (ostream &rcOut) const;

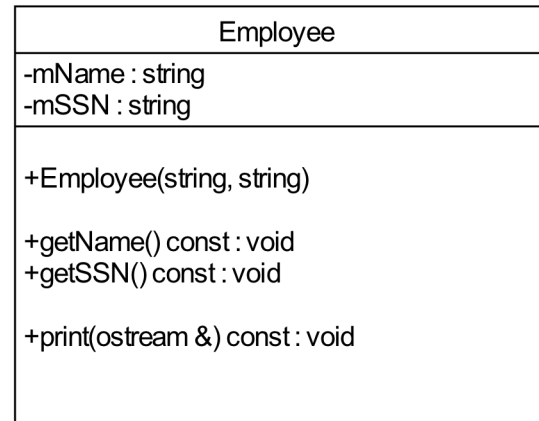
    private:
        string mName;
        string mSSN;
};
```

Employee
-mName : string -mSSN : string
+Employee(string, string) +getName() const : void +getSSN() const : void +print(ostream &) const : void

HourlyEmployee

- An hourly employee is an employee that
 - earns an hourly wage rate
 - works a certain number of hours
- What additional member variables and behavior is necessary for an hourly employee? Let's draw the UML diagram.

UML



HourlyEmployee.h

```
#include "Employee.h"
```

```
class HourlyEmployee
```


HourlyEmployee.cpp

```
#include "HourlyEmployee.h"
```


Practice

- Grab the solution Inheritance from CS250 Public
- Rename the folder to Inheritance_PUNETID
- This contains Employee, HourlyEmployee, and a small driver.

Homework for Wednesday:

- Edit the UML diagram in Inheritance to add
 - a subclass (derived class) called `SalariedEmployee` for an employee that works on a yearly salary model.
 - Write the interface (.h) and implementation (cpp) for `SalariedEmployee`.
- Make sure this is done before next class

Practice – Coding Lab

- Look at the **employees.txt** file in Inheritance
- Add a member function to each class:
`bool read(istream &rcIn);`

Practice

- Create two arrays
 - ten HourlyEmployees
 - ten SalariedEmployees.
- Read the data from the data file into the appropriate array in a single loop without printing any information.
- H means hourly, S means Salaried
- Print out each employee
 - Hourly first
 - Salaried second.

Practice

- Results

Hourly

Name: Ford SSN: 234567890 Wage: 10 HoursWorked: 40 Pay: 400

Name: Goodman SSN: 345678901 Wage: 15 HoursWorked: 45 Pay: 675

Name: Smith SSN: 678901234 Wage: 22.5 HoursWorked: 40 Pay: 900

Salary

Name: Black SSN: 123456789 Salary: 32000

Name: Howell SSN: 456789012 Salary: 44000

Name: Powell SSN: 567890123 Salary: 50000