

# Chapter 15

## Inheritance, Polymorphism, Virtual Functions

Spring 2015

# Key Terminology

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

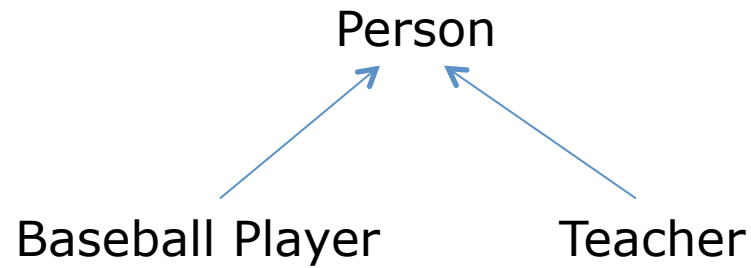
# Inheritance

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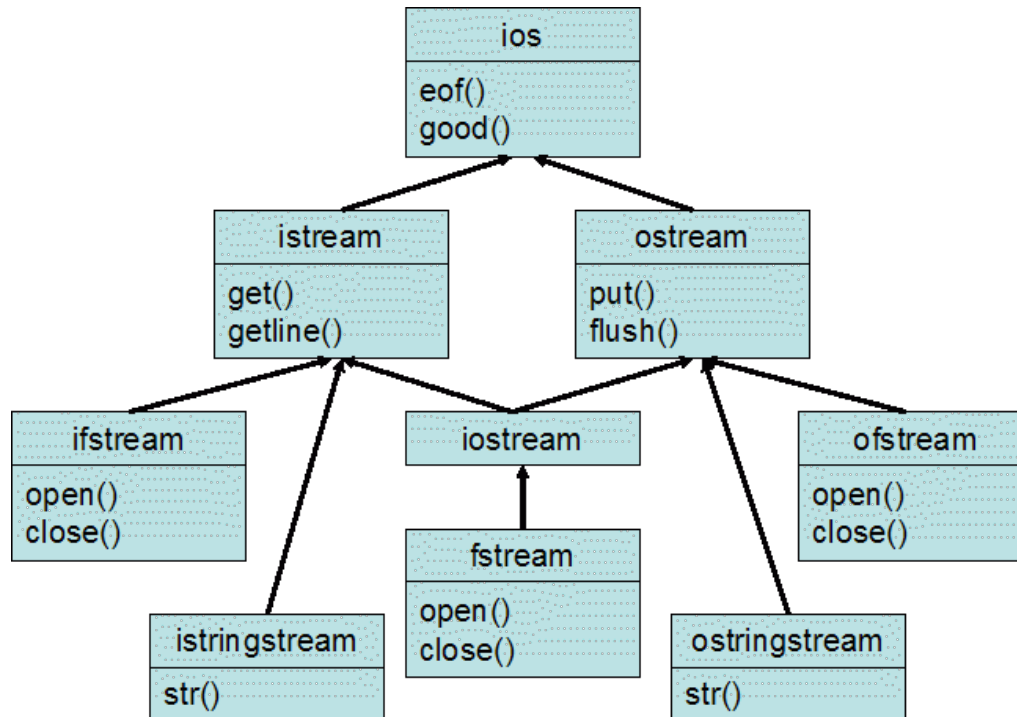
- Allows a new class to be based on an existing class (reusability)
- The new class inherits
  - all member variables
  - all member functions (excluding the constructors and destructor)
- The new class then adds new functionality

# Simple Inheritance

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# More Complex Inheritance



(c) C++ How to program by Deitel

# Inheritance and the is-a relationship

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- A car is-a vehicle
- A rectangle is-a shape
- An athlete is-a person
- A football player is-a athlete

# OOP Terminology

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- Inheritance is used to create an is-a relationship
- Inheritance involves a base class (also called a superclass or parent class) and a derived class (also called a subclass or a child class)
- base class is the existing class
- derived class is the new class with inherited members and additional behaviors

# Simple Inheritance Example

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

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



# HourlyEmployee

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- 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?

# Public Inheritance

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- Every derived class object is also an object of the superclass.
- As an example, if the superclass is "Vehicle" then a subclass might be "Cars" and "Trucks." Cars inherit the members and behaviors of a Vehicle and add other behaviors and members
- Members of a subclass cannot directly access the private members of a superclass

# Let's Play

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1. Grab the solution Inheritance from CS250 Public and let's go through the initial setup
2. Write additional set and get methods for HourlyEmployee
3. Create a subclass (derived class) called SalariedEmployee for an employee that works on a yearly salary model. Write the interface and implementation for SalariedEmployee.

# Let's Play

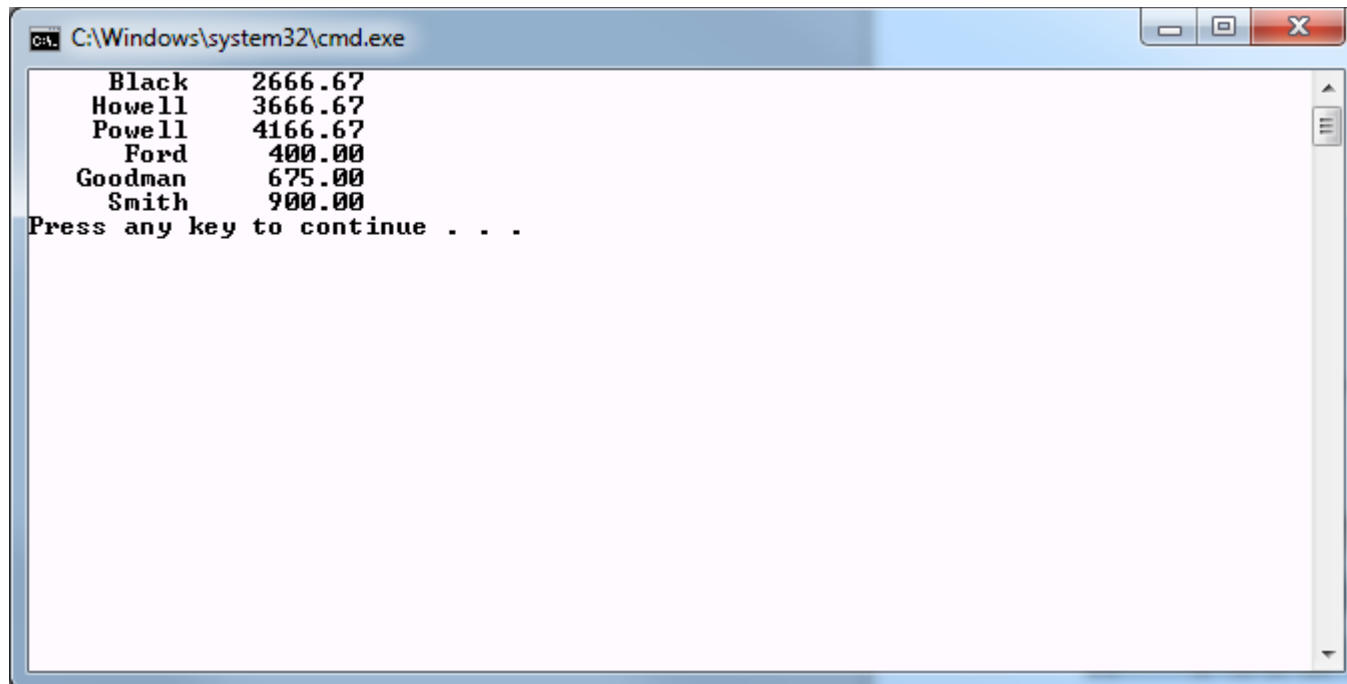
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4. Create the following data file employees.txt:  
S Black 32000.0  
H Ford 10.0 40.0  
H Goodman 15.0 45.0  
S Howell 44000.0  
S Powell 50000.0  
H Smith 22.5 40
5. Create an array of HourlyEmployees and SalariedEmployees. Read the data from the data file into the appropriate array and print out each person's monthly gross income.

# Let's Play

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## 6. Results



A screenshot of a Windows command prompt window. The title bar shows the path `C:\Windows\system32\cmd.exe`. The window contains the following text:

Black	2666.67
Howell	3666.67
Powell	4166.67
Ford	400.00
Goodman	675.00
Smith	900.00

Press any key to continue . . .