iLab 6 of 7: Abstract Class and Polymorphism

Submit your assignment to the Dropbox located on the silver tab at the top of this page.

(See the Syllabus section "Due Dates for Assignments & Exams" for due dates.)

i L A B   O V E R V I E W

Scenario and Summary

We have two separate goals this week:

1. We are going to create an abstract Employee class and two pure virtual functions - calculatePay() and displayEmployee(). The abstract Employee class will prevent a programmer from creating an object based on Employee, however, a pointer can still be created. Objects based on Salaried and Hourly will be allowed. The pure virtual function calculatePay() in Employee will force the child classes to implement calculatePay(). The other pure virtual function displayEmployee() in Employee will force the child classes to implement displayEmployee().
2. We are going to implement Polymorphism and dynamic binding in this iLab.
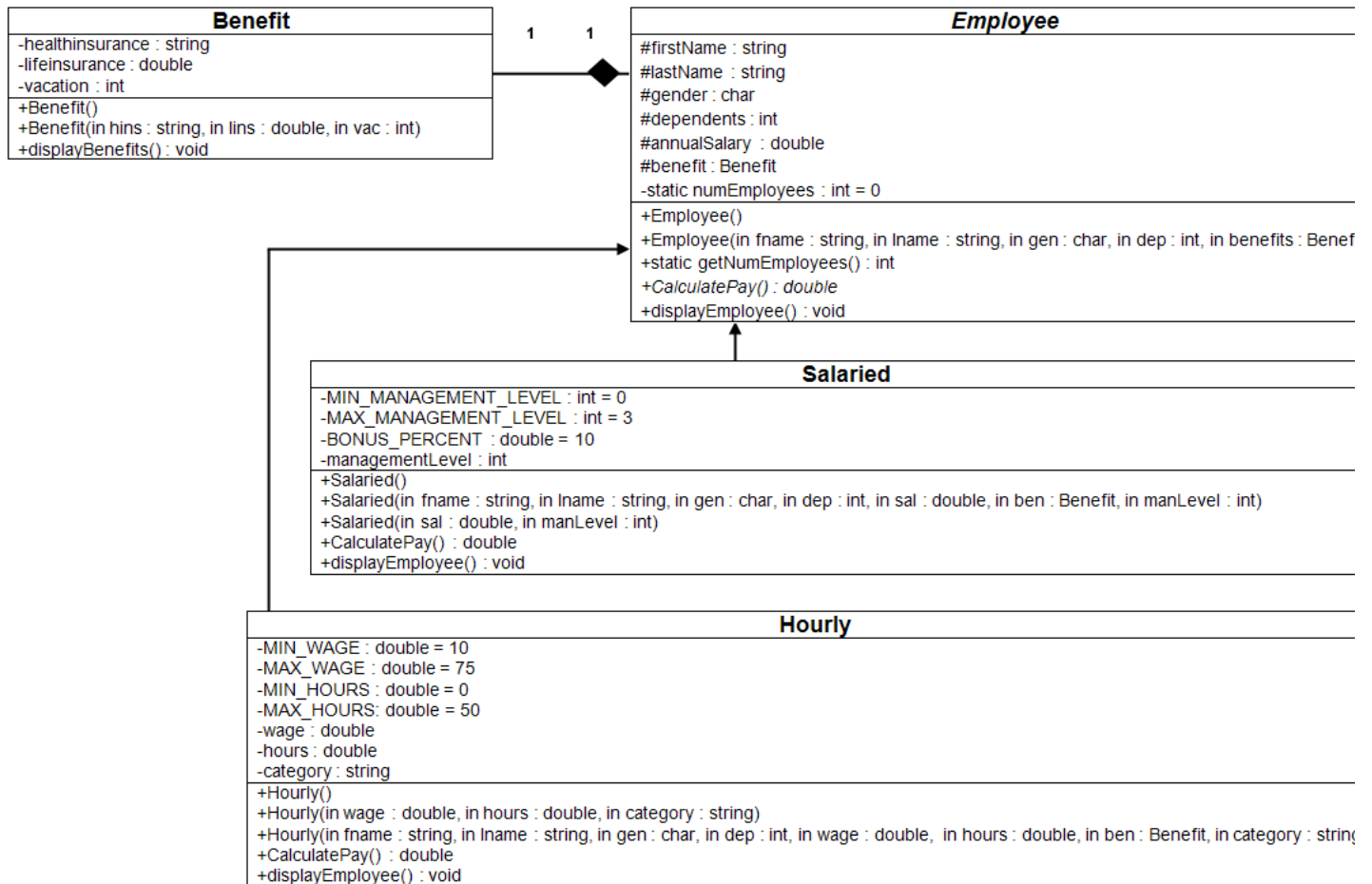
Deliverables

Due this week:

- Capture the Console output window and paste it into a Word document.
- Zip the project folder in the Microsoft Visual Studio.
- Put the zip file and screenshots (word document) in the Dropbox.

i L A B   S T E P S

STEP 1: Understand the UML Diagram

Notice in the updated UML diagram that the Employee class is designated as **abstract** by having the class name *Employee* italicized. Also, the *calculatePay* method is italicized, which means that it is a pure virtual function and needs to be implemented in the derived classes. In addition, make displayEmployee() method a pure virtual function as well.

Benefit

```
-healthinsurance : string
-lifeinsurance : double
-vacation : int
+Benefit()
+Benefit(in hins : string, in lins : double, in vac : int)
+displayBenefits() : void
```

1   1

Employee

```
#firstName : string
#lastName : string
#gender : char
#dependents : int
#annualSalary : double
#benefit : Benefit
-static numEmployees : int = 0
+Employee()
+Employee(in fname : string, in lname : string, in gen : char, in dep : int, in benefits : Benef
+static getNumEmployees() : int
+CalculatePay() : double
+displayEmployee() : void
```

Salaried

```
-MIN_MANAGEMENT_LEVEL : int = 0
-MAX_MANAGEMENT_LEVEL : int = 3
-BONUS_PERCENT : double = 10
-managementLevel : int
+Salaried()
+Salaried(in fname : string, in lname : string, in gen : char, in dep : int, in sal : double, in ben : Benefit, in manLevel : int)
+Salaried(in sal : double, in manLevel : int)
+CalculatePay() : double
+displayEmployee() : void
```

Hourly

```
-MIN_WAGE : double = 10
-MAX_WAGE : double = 75
-MIN_HOURS : double = 0
-MAX_HOURS: double = 50
-wage : double
-hours : double
-category : string
+Hourly()
+Hourly(in wage : double, in hours : double, in category : string)
+Hourly(in fname : string, in lname : string, in gen : char, in dep : int, in wage : double, in hours : double, in ben : Benefit, in category : string
+CalculatePay() : double
+displayEmployee() : void
```

STEP 2: Create the Project

Create a new project and name it CIS247C_WK6_Lab_LASTNAME. Copy all the source files from the Week 5 project into the Week 6 project.

Before you move on to the next step, build and execute the Week 6 project.

STEP 3: Modify the Employee Class

1. Define calculatePay() as a pure virtual function.
2. Define displayEmployee() as a pure virtual function.
3. When class Employee contains two pure virtual functions, it becomes an abstract class.

STEP 4: Create Generalized Input Methods

Reuse method getInput() from the previous iLab to prompt the user to enter Employee information.

STEP 5: Modify the Main Method

Create two employee pointers with:

```
Employee *employeeList1 = new Salaried(10000,3);

Employee *employeeList2 = new Hourly(50, 40, "full time");
```

The first employee pointer refers to a salaried employee and the second employee pointer refers to a hourly employee.

Prompt the user to enter information for these two pointers and display the calculated result.

For salaried employee, the following information needs to be displayed:

Partial Sample Output:

```
Employee Information

Name:           Nana Liu
Gender:         F
Dependents:     2
Annual Salary:  60000.00
Weekly Salary:  1500.00

Benefit Information

Health Insurance:      PPO
Life Insurance:        1.50
Vacation:              21 days
Salaried Employee
Management level:      3
```

For hourly employee, the following information needs to be displayed:

Partial Sample Output:

```
Name:           Jackie Chan
Gender:         M
Dependents:     1
Annual Salary:  100000.00
Weekly Salary:  2000.00

Benefit Information

Health Insurance:      HMO
Life Insurance:        100.00
Vacation:              18 days
Hourly Employee
Category:              full time
Wage:                  50.00
Hours:                 40.00
```

STEP 6: Compile and Test

When done, compile and run your code.

Then, debug any errors until your code is error-free.

Check your output to ensure that you have the desired output, modify your code as necessary, and rebuild.

Below is a complete sample program output for your reference.

```
Welcome to your Object Oriented Program--Employee ClassCIS247C, Week 6 LabName:
Prof.Nana Liu
**************** Employee 1 *************************
Please enter your First Name :Nana
Please enter your Last Name :Liu
Please enter your Gender :Female
Please enter your Dependents :2
Please enter your Annual Salary :60000
Please enter your Health Insurance:PPO
Please enter your Life Insuarance:1.5
Please enter your Vocation Days:21
Employee Information
_____
Name:              Nana Liu
Gender:            F
Dependents:        2
Annual Salary:     60000.00
Weekly Salary:     1500.00

Benefit Information
_____
Health Insurance:      PPO
Life Insurance:        1.50
Vacation:              21 days
Salaried Employee
Management level:      3
**************** Employee 2 *************************
Please enter your First Name :Jackie
Please enter your Last Name :Chan
Please enter your Gender :Male
Please enter your Dependents :1
Please enter your Health Insurance:HMO
Please enter your Life Insuarance:100
Please enter your Vocation Days:18
Employee Information
_____
Name:              Jackie Chan
Gender:            M
Dependents:        1
Annual Salary:     100000.00
Weekly Salary:     2000.00

Benefit Information
_____
Health Insurance:      HMO
Life Insurance:        100.00
Vacation:              18 days
Hourly Employee
Category:              full time
Wage:                  50.00
Hours:                 40.00

--- Number of Employee Object Created ----     Number of employees: 2
The end of the CIS247C Week6 iLab.
Press any key to continue . . . _
```

STEP 7: Submit Deliverables

Submit your lab to the Dropbox located on the silver tab at the top of this page. For instructions on how to use the Dropbox, read these step-by-step instructions or watch this   Dropbox Tutorial.

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