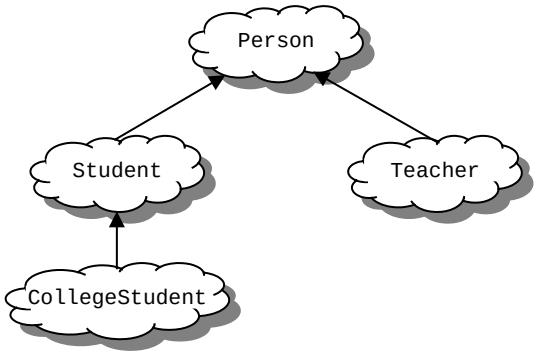
LAB EXERCISE

BackToSchool

Background:

The HighSchool application described in the lesson has two classes: the `Person` superclass and the `Student` subclass. Using inheritance, in this lab you will create two new classes, `Teacher` and `CollegeStudent`. A `Teacher` will be like `Person` but will have additional properties such as *salary* (the amount the teacher earns) and *subject* (e.g. "Computer Science", "Chemistry", "English", "Other"). The `CollegeStudent` class will extend the `Student` class by adding a *year* (current level in college) and *major* (e.g. "Electrical Engineering", "Communications", "Undeclared").

The inheritance hierarchy would appear as follows:



Here is the `Person` base class from the lesson to be used as a starting point for the `Teacher` class:

```
class Person{
  private String myName ;   // name of the person
  private int myAge;        // person's age
  private String myGender;  // "M" for male, "F" for female

  // constructor
  public Person(String name, int age, String gender){
    myName = name;
    myAge = age;
    myGender = gender;
  }

  public String getName() {
    return myName;
  }


   public int getAge(){
    return myAge;
  }

  public String getGender(){
    return myGender;
  }

  public void setName(String name){
    myName = name;
  }
```

```
  public void setAge(int age) {
    myAge = age;
  }

  public void setGender(String gender){
    myGender = gender;
  }

  public String toString(){
     return myName + ", age: " + myAge + ", gender: " +
                                 myGender;
  }
}
```

The `Student` class is derived from the `Person` class and used as a starting point for the `CollegeStudent` class:

```
class Student extends Person{
   private String myIdNum;    // Student Id Number
   private double myGPA;      // grade point average

   // constructor
   public Student(String name, int age, String gender,String idNum, double gpa){
      // use the super class' constructor
      super(name, age, gender);

      // initialize what's new to Student
      myIdNum = idNum;
      myGPA = gpa;
   }

   public String getIdNum(){
      return myIdNum;
   }

   public double getGPA(){
      return myGPA;
    }


public void setIdNum(String idNum){
   myIdNum = idNum;
}

public void setGPA(double gpa){
   myGPA = gpa;
}

// overrides the toString method in the parent class
public String toString(){
   return super.toString() + ", student id: " + myIdNum + ", gpa: " + myGPA;
}
}
```

Assignment:

1. Given two programs shown above: *Person.java* for the `Person` class, *Student.java* for the `Student` class. These files should be used throughout this assignment.

2. Write a `Teacher` class that extends the parent class `Person`.

   a. Add instance variables to the class for *subject* (e.g. “Computer Science”, "Chemistry", "English", "Other”) and *salary* (the teacher’s annual salary). *Subject* should be of type `String` and *salary* of type **`double`**. Choose appropriate names for the instance variables.

b. Write a constructor for the `Teacher` class. The constructor will use five parameters to initialize `myName, myAge`, `myGender`, *subject*, and *salary*. Use the **`super`** reference to use the constructor in the `Person` superclass to initialize the inherited values.

c. Write "setter" and "getter" methods for all of the class variables. For the `Teacher` class they would be: `getSubject`, `getSalary`, `setSubject`, and `setSalary`.

d. Write the `toString()` method for the `Teacher` class. Use a **`super`** reference to do the things already done by the superclass.

3. Write a `CollegeStudent` subclass that extends the `Student` class.

a. Add instance variables to the class for *major* (e.g. "Electrical Engineering", "Communications", "Undeclared") and *year* (e.g. FROSH = 1, SOPH = 2, …). *Major* should be of type `String` and *year* of type **`int`**. Choose appropriate names for the instance variables.

b. Write a constructor for the `CollegeStudent` class. The constructor will use seven parameters to initialize `myName, myAge`, `myGender`, `myIdNum`, `myGPA`, *year*, and *major*. Use the **`super`** reference to use the constructor in the `Student` superclass to initialize the inherited values.

c. Write "setter" and "getter" methods for all of the class variables. For the `CollegeStudent` class they would be: `getYear`, `getMajor`, `setYear`, and `setMajor`.

d. Write the `toString()` method for the `CollegeStudent` class. Use a **`super`** reference to do the things already done by the superclass.

4. Write a testing class with a `main()` that constructs all of the classes (`Person`, `Student`, `Teacher`, and `CollegeStudent`) and calls their `toString()` method. Sample usage would be:

```
Person bob = new Person("Coach Bob", 27, "M");
System.out.println(bob);

Student lynne = new Student("Lynne Brooke", 16, "F", "HS95129", 3.5);
System.out.println(lynne);

 Teacher mrJava = new Teacher("Duke Java", 34, "M", "Computer Science", 50000);
 System.out.println(mrJava);

CollegeStudent ima = new CollegeStudent("Ima Frosh", 18, "F", "UCB123",
                                        4.0, 1, "English");
System.out.println(ima);
```

A sample run of the program would give:

```
Coach Bob, age: 27, gender: M
Lynne Brooke, age: 16, gender: F, student id: HS95129, gpa: 3.5
Duke Java, age: 34, gender: M, subject: Computer Science, salary: 50000.0
Ima Frosh, age: 18, gender: F, student id: UCB123, gpa: 4.0, year: 1, major: English
```

5. Show me the source code and run output. There should be one source file for each class: *Teacher.java* for the `Teacher` class, *CollegeStudent.java* for the `CollegeStudent` class, and *BackToSchool.java* for the `BackToSchoolTester` class. Make sure you have at least 10 persons included in your tester. Make sure you include Persons, Students, Teachers, and CollegeStudents Make sure you tester is NOT the same as any other student in our class.