

King Fahd University of Petroleum and Minerals
College of Computer Science and Engineering
Information and Computer Science Department
Spring Semester (062)
ICS 102 - Introduction to Computing I
Homework # 02

Solve the following Problems

Q1. Define a class called **Counter** whose objects count things. An object of this class records a count that is a nonnegative integer. Include methods to set the counter to 0, to increase the count by 1, and to decrease the count by 1. Be sure that no method allows the value of the counter to become negative. Include an accessor method that returns the current count value and a method that outputs the count to the screen. There should be no input method or other mutator methods. The only method that can set the counter is the one that sets it to zero. Also, include a **toString** method and an **equals** method. Write a program (or programs) to test all the methods in your class definition.

Q2. Write a **Temperature** class that has two instance variables: a temperature value (a floating-point number) and a character for the scale, either **C** for Celsius or **F** for Fahrenheit. The class should have four constructor methods: one for each instance variable (assume zero degrees if no value is specified and Celsius if no scale is specified), one with two parameters for the two instance variables, and a no-argument constructor (set to zero degrees Celsius). Include the following: (1) two accessor methods to return the temperature—one to return the degrees Celsius, the other to return the degrees Fahrenheit—use the following formulas to write the two methods, and round to the nearest tenth of a degree:

$$\text{degreesC} = 5(\text{degreesF} - 32) / 9$$
$$\text{degreesF} = (9(\text{degreesC}) / 5) + 32$$

(2) three mutator methods: one to set the value, one to set the scale (**F** or **C**), and one to set both; (3) three comparison methods: an **equals** method to test whether two temperatures are equal, one method to test whether one temperature is greater than another, and one method to test whether one temperature is less than another (note that a Celsius temperature can be equal to a Fahrenheit temperature as indicated by the above formulas); and (4) a suitable **toString** method. Then write a driver program (or programs) that tests all the methods. Be sure to use each of the constructors, to include at least one true and one false case for each of the comparison methods, and to test at least the following temperature equalities: 0.0 degrees C = 32.0 degrees F, -40.0 degrees C = -40.0 degrees F, and 100.0 degrees C = 212.0 degrees F.

Q3. Define a class whose objects are records on animal species. The class should have instance variables for the species name, population, and growth rate. The growth rate is a percentage that can be positive or negative and can exceed 100 percent. Include a suitable collection of constructors, mutator methods, and accessor methods. Include a **toString** method and an **equals** method. Include a **boolean** valued method named **endangered** that returns **true** when the growth rate is negative and returns **false** otherwise. Write a test program (or programs) that tests each method in your class definition.

Notes:

- Due date is Wednesday April 25, 2007 by 11:00 PM
- *Late work is not accepted.*
- *Copying will result in a grade of F in the course.*