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 # 04

Solve the following Problems

Q1. The standard deviation of a list of numbers is a measure of how much the numbers deviate from the average. If the standard deviation is small, the numbers are clustered close to the average. If the standard deviation is large, the numbers are scattered far from the average. The standard deviation of a list of numbers n1, n2, n3, and so forth is defined as the square root of the average of the following numbers:
$(n_1 - a)^2$, $(n_2 - a)^2$, $(n_3 - a)^2$, and so forth.
The number a is the average of the numbers n1, n 2, n3, and so forth.
Define a static method that takes a partially filled array of numbers as its argument and returns the standard deviation of the numbers in the partially filled array. Because a partially filled array requires two arguments, the method should actually have two formal parameters, an array parameter and a formal parameter of type int that gives the number of array positions used. The numbers in the array should be of type double. Write a suitable test program for your method.

Q2. Enhance the definition of the class PartiallyFilledArray (Display 6.5) in the following way: When the user attempts to add one additional element and there is no room in the array instance variable a, the user is allowed to add the element. The object creates a second array that is twice the size of the array a, copies values from the array a to the user's new array, makes this array (or more precisely its reference) the new value of a, and then adds the element to this new larger array a. Hence, this new class should have no limit (other than the physical size of the computer) to how many numbers it can hold. The instance variable maxNumberOfElements remains and the method getMaxCapacity is unchanged, but these now refer to the currently allocated memory and not to an absolute upper bound. Write a suitable test program.

Q3. Write a program that will allow two users to play tic-tac-toe. The program should ask for moves alternately from player X and player O. The program displays the game positions as follows:

```
1  2  3
4  5  6
7  8  9
```

The players enter their moves by entering the position number they wish to mark. After each move, the program displays the changed board. A sample board configuration is

```
X  X  O
4  5  6
O  8  9
```

Notes:

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