Tutorial: Data structures I (Arrays and Linked lists)

1. Use the debugger to step through the program that finds the maximum element of an array (that was covered in the lecture). Make sure you understand how it works. Modify the program so that it also prints out the location of the element in the array that contains the maximum.

2. Use the debugger to step through the program that computes the mean value for a number of doubles (that was covered in the lecture). Make sure you understand how it works. Then modify it so that it also computes the standard deviation given by the formula

$$sd = \frac{\sqrt{n\sum_{i=1}^{n} a_i^2 - \left(\sum_{i=1}^{n} a_i\right)^2}}{n(n-1)}$$

   where n is the number of elements and a_i are the values of each element in the array.

3. Write a Java program that will read in two integer matrices A and B of size nxn (assume n will not be larger than 5). Use Java methods appropriately in your program. Then print out the computation for
   a. A+B
   b. A-B
   c. AxA (or A^2)
   d. B^2
   e. B^6
   f. A^{10}

4. Write a Java class that will create a simple linked list of the names and ages of people studying in a tutorial class (call it `disneyClass`). Here is the data:
   `(Cinderella,21),(Sleepy,28),(Sneezy,27),(Dopey,25),(Bashful,22),`
   `(Happy,26),(Doc,35),(Grumpy,29),(Snow White,18 ),(Pinocchio,26),`
   `(Ariel,22),(Mickey,31) (Minnie,28),(Donald,33),(Winnie,45),`
   `(Peter Pan,19),(Tinkerbell,25) .`
   Using the ADT given in *SLinkedList.zip* as a starting point, modify it to allow for a `String name` and an `int age` (so make sure you understand how it works!) then do the following:
   a. write a method called `frequency` that will count how many times a given age appears in the list. For example, `disneyClass.frequncy(22)` will return 2 for the list above.
   b. write a method that will process the list to find the youngest person(s) and print out the name(s) of the individual(s). For example, `disneyClass.youngest()` will return Snow White (18) for the list above.
   c. write a method that will return a count of the people that are less than a given age. For example `disneyClass.lessthan(24)` would return 5 for the list above.
   d. Now add the following to the tutorial class `(Pocahontas, 23), (Tigger,40), (Dumbo,21)` and `(Daffy,40).`
      As a result, the class is now too big so write a method called `split` that will split the class into two groups and create two new lists in the process (called `disneyAClass` and `disneyBClass`).