COMP 110-003
Introduction to Programming
In-Class Exercise: Selection Sort

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THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Review: Arrays

- `int[] scores = new int[5];`
- This is like declaring 5 strangely named variables of type int:
  - scores[0]
  - scores[1]
  - scores[2]
  - scores[3]
  - scores[4]
- Especially, you can use **score[i]** to locate a single one

Review: Index

- Variables such as scores[0] and scores[1] that have an integer expression in square brackets are known as:
  - ***indexed variables***, ***subscripted variables***, ***array elements***, or simply ***elements***
- An ***index*** or ***subscript*** is an integer expression inside the square brackets that indicates an array element
  - ArrayName[index]

Review: Array and Index

var name	score[0]	score[1]	score[2]	score[3]	score[4]
data	62	51	88	70	74
m address	25131	25132	25133	25134	25135

- Index numbers start with **0**. They do NOT start with 1 or any other number.
- he array name represents a memory address, and the i^{th} element can be accessed by the address plus i

Review: Creating an Array

- Array is a special class and we create its objects
  - Syntax for creating an array:
    - **Base_Type[] Array_Name = new Base_Type[Length];**
  - Example:
    - **int[] pressure = new int[100];**
  - Alternatively:
    - **int[] pressure;**
    - **pressure = new int[100];**

Review: Length of An Existing Array

- An array is a special kind of object
  - It has one public instance variable: *length*
  - *length* is equal to the length of the array

```
Pet[] pets = new Pet[20];
pets.length has the value 20
```

  - You cannot change the value of *length* because it is **final**

Review: Don't be OUT OF BOUNDS!

- Indices MUST be in bounds
  - double[] entries = new double[**5**]; // from [0] to [4]
  - entries[**5**] = 3.7; // ERROR! Index out of bounds
- Your code will compile if you are using an index that is out of bounds, but it will give you a run-time error!

Today's Topic: Sorting

- Given an array of numbers, sort it into ascending/descending order
- Before sorting:

4	7	3	9	6	2	8

- After sorting:

2	3	4	6	7	8	9

There are so many ways……

- Sorting is an extremely important question in computer science:
  - Google “sorting animation”
  - http://www.sorting-algorithms.com/
- We consider a very simple idea in this class
  - Find the minimum value in array, and put it in the front
  - Find the minimum value in the remaining array (without the first value), and put it in the front of the remaining array (without the first value)
  - Repeat until we meet the end of the array

Selection Sort Pseudocode

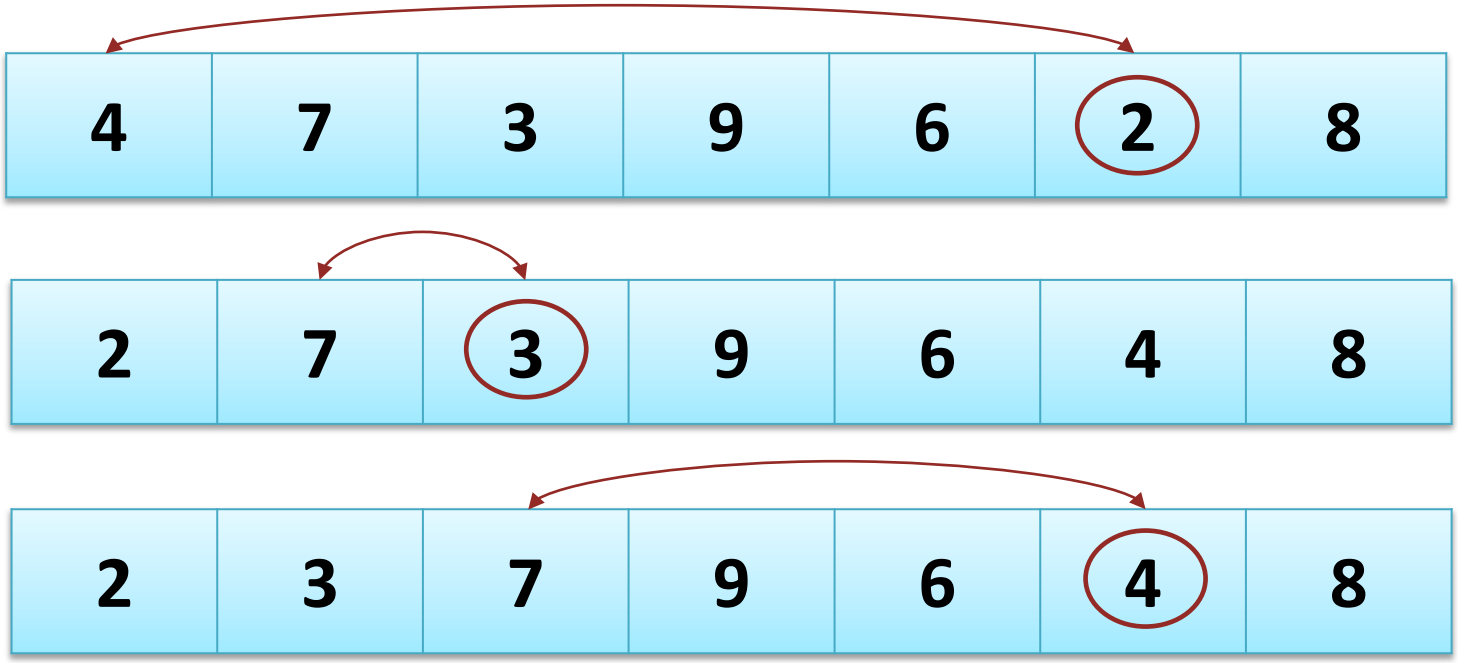
```
for (index = 0; index < length; index++){

    Find index of smallest value of array
        between index and end of array;

    Swap values of current index and the
        index with the smallest value;

}
```

Selection Sort



Swap

```
private static void swap(int i, int j, int[] a) {
    int temp = a[i];
    a[i] = a[j];
    a[j] = temp;
}
```

- This method will swap the value of a[i] and a[j]
- Remember that a is a memory address
  - None of a, i and j are changed in this code
  - Only a[i] and a[j] are changed – they are not local!

Requirement

- Complete the given template and make it run
  - The template is given as an assignment Sakai
- Test your program by test cases on next page
- The deadline is 12:00PM. You must upload your file before that time
  - The website will be close at that time
  - You can upload it many times. Don't do it in the last min!
- If you think you are done, you can raise you hand and let me know

Test Case 1

```
Enter the size of the array:
1
Enter the numbers in the array:
5
The current elements in the array are:
5.
The elements in the sorted array are:
5.
```

Test Case 2

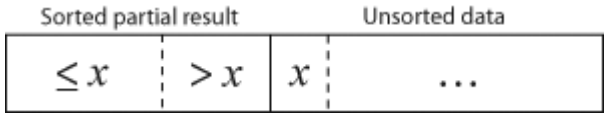
```
Enter the size of the array:
3
Enter the numbers in the array:
3
2
1
The current elements in the array are:
3, 2, 1.
The elements in the sorted array are:
1, 2, 3.
```

Test Case 3

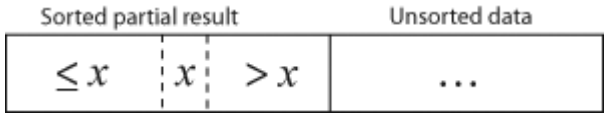
```
Enter the size of the array:
6
Enter the numbers in the array:
4
3
1
5
4
3
The current elements in the array are:
4, 3, 1, 5, 4, 3.
The elements in the sorted array are:
1, 3, 3, 4, 4, 5.
```

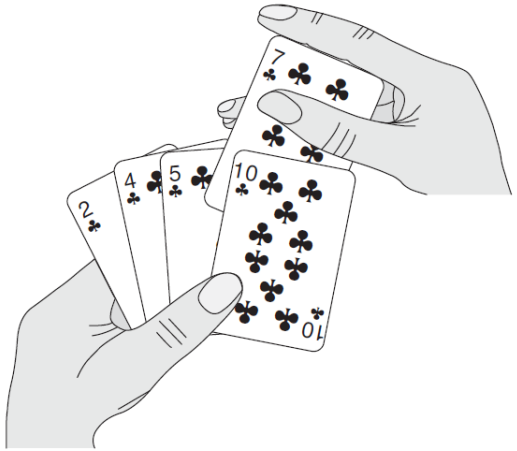
Insertion Sort

- If you are done and feel bored
  - Try insertion sort, print the array in each loop
  - Before each loop:



  - After each loop:





  - Read: http://en.wikipedia.org/wiki/Insertion_sort
  - Raise hand if you are done or have problems