

CS 2401 Assignment #7

Due Date: Tuesday, April 04, 2017 11:59PM (See the syllabus for late policy).

Objective: The goal of this assignment is to practice sorting algorithms.

Assignment: In this assignment you will be implementing versions of two sorting algorithms. You will use them to sort an array of objects representing cubes. Your first step is to implement a class called `Cube` that has three double variables to store the length, width, and height of the cube. Then, write a method that calculates the volume of the `Cube` as a member of the class. All other requirements are listed below.

- Next, you should write a method in a class named `Runner1` that will generate a random list of `Cubes` for testing. The method should take in a number representing the size of the list, and return an array of that many `Cubes`. Each `Cube` should have a randomly generated length, width, and height between 0 and 100.
- Implement another method in `Runner1` to print out your array of cubes. You should print a line for each cube listing the length, width, and height and then the volume.
- As another preliminary step, implement a method `CopyArray` in `Runner1` that creates a new array of cubes with identical values of a given one.
- Now, write two methods inside `Runner1`, one named `BubbleSort` and the other named `SelectionSort`. Use parameters as you think appropriate. `BubbleSort` must implement the bubble sort algorithm we discussed in the class and `SelectionSort` must implement the selection sort algorithm we discussed in class. Note that both `BubbleSort` and `SelectionSort` must sort the cubes in the input array in ascending order of the volumes of the cubes.
- Demonstrate that your code works by generating a random list of 20 cubes (in an array), printing out the list before you sort it, and then printing out the list again after it is sorted using `BubbleSort`. For an identical list of 20 cubes (copied right after the generation of the array that was given to `BubbleSort` as an input), show the list before and after the use of the `SelectionSort` method.
- Write a class named `Runner2` that will test the speed of your `BubbleSort` and `SelectionSort` methods by recording the time needed to sort an array of different number of cubes (For example, 2000, 3000, 4000, 5000, 6000, and 7000 cubes). Using this data, draw two lines on the same line-plot using MS Excel, one line for Bubble Sort and one for Selection Sort, where x-axis is the number of cubes in the array and y-axis is the runtime. Copy the plot and paste it in MS Word and submit the MS Word file with your source codes.

Deliverables: `Cube.java`, `Runner1.java`, `Runner2.java`, and `MyPlot.docx`. You must use Blackboard to submit. Talk to your TA for further instructions.