Analysis of Algorithms
CS 312 - HBD1
Department of Physics and Computer Science
Medgar Evers College
Exam 1 Make-Up

Instructions:

- **The make-up exam requires completing a few tasks by Wednesday, 10/29, before class.**
- **Type your solutions in the Exam01 directory of your GitHub repository.**
- **Use the pseudocode guidelines for Question 1.**
- **Case Study: A box plot (or box-and-whisker plot) is a graphical tool used to display the distribution, spread, and central tendency of a dataset. It is based on five key statistical values, known as the five-number summary:**
  - **Minimum - smallest value of the dataset**
  - **First Quartile (Q1) - the median of the lower half of the dataset**
  - **Median - the middle value of the dataset**
  - **Third Quartile (Q3) - the median of the upper half of the dataset**
  - **Maximum - largest value of the dataset**

  The box extends from Q1 to Q3, and its length (Q3 - Q1), called the interquartile range (IQR), represents the spread of the middle 50% of the data.
  Your objective is to define and test an algorithm that finds the interquartile range of a dataset.
- **Cheating of any kind is prohibited and will not be tolerated.**
- **Violating and/or failing to follow any of the rules will result in an automatic zero (0) for the exam.**

TO ACKNOWLEDGE THAT YOU HAVE READ AND UNDERSTOOD THE INSTRUCTIONS ABOVE, PRINT YOUR NAME AND THE DATE ON YOUR SUBMISSIONS

Grading

Section	Maximum Points	Points Earned
1	2	
2	2	
3	2	
4	1	
5	1	
Total	8	

1. **Define an algorithm (in pseudocode) named `InterquartileRange()` that takes an unsorted number array as input and returns the interquartile range of the array.**

2. **Construct a runtime table and determine the runtime function for the `InterquartileRange()` algorithm defined in Question 1. Before constructing the table, clearly specify the input size. The runtime analysis should be performed for the worst-case scenario, assuming that the cost of each operation is 1.**

3. **Simulate the execution of the `InterquartileRange()` algorithm for each of the input examples provided. Each simulation should be a detailed record list of any changes made to the input data and any significant data structures utilized by the algorithm, ending with the resulting output.**

   - `[3,2,8,5,1,7,4,6]`
   - `[6,3,2,9,4,5,7,1,8]`

4. **State and prove the Θ-notation asymptotic bound for the `InterquartileRange()` algorithm described in Question 1. The bound must be expressed as a parent function (a monomial with no coefficient or 1). You must show work to receive credit.**

5. **Create a C++ program that defines a function implementing the `InterquartileRange()` algorithm you described in Question 1, and calls and displays it with datasets from Question 3 as arguments. The function header should include any additional parameters necessary for its correct execution.**