

CSC 212: Data Structures and Abstractions

Spring 2018

University of Rhode Island

Weekly Problem Set #5

Due Thursday 3/1 before class. Please turn in neat, and organized, answers hand-written on standard-sized paper **without any fringe**. At the top of each sheet you hand in, please write your name, and ID. The only library you're allowed to use in your answers is `iostream`.

1. Mark each of the following as true or false.

Code	Big O	T/F	Big Omega	T/F	Big Theta	T/F
$3n^2 + 10n \log n$	$O(n \log n)$		$\Omega(n \log n)$		$\Theta(n \log n)$	
$3n^2 + 10n \log n$	$O(n^2)$		$\Omega(n)$		$\Theta(\log n)$	
$n \log n + n/2$	$O(2^n)$		$\Omega(n \log n)$		$\Theta(n \log n)$	
$10\sqrt{n} + \log n$	$O(\log n)$		$\Omega(n)$		$\Theta(\log n)$	
$\sqrt{n} + 10 \log n$	$O(\sqrt{n})$		$\Omega(1)$		$\Theta(\sqrt{n})$	

2. Complete the following table.

Code	Big Theta
$\log n + 200n \log n$	
$2^n + n^2$	
$\sqrt{n} + \log n$	
$2n + 3n + 4n + 5n + 6n$	
$\sqrt{n} + 10 \log n$	
$200n * 10n + \log n$	
Selection Sort	
Insertion Sort	
Bubble Sort	

3. Given the array **A** with elements [22, 15, 36, 44, 10, 3, 9, 13, 29, 25], illustrate the performance of the selection-sort algorithm from the lecture slides on **A**. To illustrate the performance, depict the status of the array after line 15 at every iteration.
4. Given the array **A** with elements [22, 15, 36, 44, 10, 3, 9, 13, 29, 25], illustrate the performance of the insertion-sort algorithm on **A**. Again, use the function provided in the lecture notes, and depict the status of the array after line 14 at every iteration. (Line 14 signifies the moment after the if statement terminates)

5. How many inversions are present in each of the following arrays?

A: [1, 5, 4, 3, 3, 7]

B: [5, 4, 3, 2, 1]

C: [1, 2, 4, 3, 5]

D: [5, 1, 3, 2, 4]

E: [6, 9, 1, 4, 10]

6. Write a recursive function that sums all of the elements of a given array, matching this signature:
`int sum(int* arr, int n);`

The following items are considered optional.

1. Rewrite recursive sum function to only sum odd numbers within the array.
2. Write a recursive function that can find the minimum of a given array.
3. Briefly describe the principles behind Bin Sort. (Refer to OpenDSA)
4. What is the Big O, Big Omega, and Big Theta of Radix Sort? (Refer to OpenDSA)