

CSCI 4041, Spring 2019, Quiz 2 (30 minutes, 20 points)

Name:

x500:

Discussion Start Time (**circle one**): 3:35 4:40 **5:45** 6:50 7:55 other:

1. (2 points each) True/False - Circle one. Note that when asking about the properties of an algorithm, we specifically mean the version of that algorithm discussed in lecture.

True False Heap-Extract-Max has a $\Theta(\lg n)$ worst-case runtime

True False For extremely large arrays initially in random order, Heapsort will run faster than Insertion Sort.

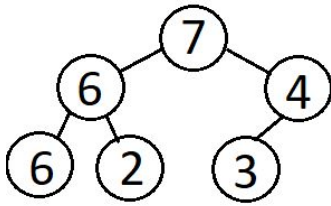
True False Quicksort is in place.

True False If the median element in the subarray is chosen as the pivot for every Partition during Quicksort, the asymptotic runtime will be $\Theta(n^2)$.

True False All comparison sorts have a $\Theta(n \lg n)$ worst case runtime.

2. (3 points) Give the array that results when Partition(A,3,7) is called on A = [19, 21, 18, 22, 9, 22, 15, 18] (assume array indexing starting at 1). Showing your work may be useful for awarding partial credit, but is not required.

3. (3 points) Give the max heap that results (in tree form, not array form) after Heap-Insert-Key is called on the max heap below, with key 9. Showing your work may be useful for awarding partial credit, but is not required.



4. (4 points) Suppose that we modified Merge-Sort as shown below, without changing what the subroutine Merge does. Give a tight bound for the worst-case asymptotic runtime, and briefly explain your answer.

```
Merge_Sort(A,p,r)
  if p < r
    Merge_Sort(A, p, r-1)
    Merge_Sort(A, p+1, r)
    Merge(A, p, p, r)
```