Quiz Submissions - Fall 2021 Quiz 04 Master

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Exit Preview

Attempt 1

Written: Sep 22, 2021 21:40 - Sep 22, 2021 21:40

Submission View

Your quiz has been submitted successfully.

Question 1 **0 / 1 point**

An array contains 10,000 unique elements in arbitrary order (A[1] is the first element). You are looking for the 175-th smallest element. A randomly chosen pivot x is determined. After pivoting around x, x ends up in the 200-th position in the array.

On which side of the pivot x do we recurse? The recursive call is looking for an element of what rank?

Note: Left side of pivot x goes from position 1 to rank(x)-1. Right side from rank(x)+1 to n.

- The 175th smallest on the right side of the pivot
- The 176th smallest on the right side of the pivot
- ➡ The 175th smallest on the left side of the pivot
- Not enough information
- The 50th smallest on the left side of the pivot

Question 2 **0 / 1 point**

An array contains 10,000 unique elements in arbitrary order (A[1] is the first element). You are looking for the 100-th smallest element. A randomly chosen pivot x is determined. After pivoting around x, x ends up in the 75-th position in the array.

On which side of the pivot x do we recurse? The recursive call is looking for an element of what rank?

Note: Left side of pivot x goes from position 1 to rank(x)-1. Right side from rank(x)+1 to

- Not enough information
- The 75th smallest on the right side of the pivot
- The 25th smallest on the left side of the pivot
- The 24th smallest on the right side of the pivot
- ➡ The 25th smallest on the right side of the pivot

Question 3 **0 / 1 point**

Your classmate, Lydia, remembers CS 251's introduction of bucket sort. She postulates that because bucket sort is a linear time sorting algorithm and the randomized quicksort algorithm is much like dividing the elements into 3 buckets, that randomized quicksort should be a linear time sorting algorithm.

Another classmate, George, says that Lydia's logic is incorrect because she needs to remember that sorting the individual buckets requires another sorting algorithm, which takes at minimum O(nlogn) time. Is George's reasoning as to why Lydia's logic is incorrect true or false?

- ➡ True
- False

Question 4 **0 / 1 point**

Which of the following statements are true for the closest pair density-based divide & conquer algorithm?

- ➡ ✖ A brute-force combine step without considering point density takes O(n^2) time
- ✔ Presorting the points and sorting on-demand when combining results in the same runtime
- ➡ ✖ The density-based divide & conquer approach has an O(nlogn) implementation

✔ The density argument uses the fact that at most two points can be in a

$$\delta/2 \times \delta/2$$

square

Question 5 **0 / 1 point**

What is the optimal base case for the closest pair algorithm? Again, assume that all the points have different x-coordinates.

➡ We divide until each of the two parts has at maximum two points

We divide until each of the two parts has at maximum one point

We keep dividing ad infinitum

We specify a minimum width that is a given proportion of the original grid size.

Question 6 **0 / 1 point**

What is the most efficient time bound to an algorithm designed to find all elements between the 5th and 10th smallest elements in a sorted array A?

$O(\log n)$

$O(n \log n)$

➡ $O(1)$

$O(n)$

Hide Feedback

Use linear time selection

Question 7 **0 / 1 point**

What is the most efficient time bound to an algorithm designed to find all the elements in between

$$i^{th}$$

smallest element and the

$$j^{th}$$

smallest element in an unsorted array A? i and j are constants

- $O(\log n)$
- $O(n \log n)$
- $O(1)$
- ➡ $O(n)$

Hide Feedback

Use linear time selection

Question 8 **0 / 1 point**

Suppose a method F is given that can find the median of a list of n numbers in constant time. Does using this function improve the expected performance O(nlogn) on quicksort?

- True
- ➡ False

Question 9 **0 / 1 point**

Your task is to create a leaderboard of the top n/5 scores in an unsorted array A with n integer scores ranging from 0 to 100. What is the best case scenario runtime for an algorithm to achieve such a task?

- $O(\log n)$
- $O(n \log n)$
- ➡ $O(n)$
- $O(n^2)$

Question 10 **0 / 1 point**

Which of the following relationships are never true?

- ➡ ✖ $\Theta(n^2) + O(n^3 \log n) = \Omega(n^5)$
- ✔ $\Theta(n^4) + O(n^3 \log n) = \Theta(n^4)$
- ✔ $O(n^5) + O(8^{\log n}) = O(n^3)$
- ✔ $\Omega(1) + O(n^3) = \Omega(n)$

Question 11 **0 / 1 point**

Which of the following relationships are never true?

- ➡ ✖ $\Theta(n^2) + O(n^3 \log n) = \Omega(n^5)$

- [ ] $\Omega(n^3) + O(n^3) = \Theta(n)$
- [x] $O(n^5) + O(\log^3 n) = O(n^3)$
- [x] $\Theta(n^4) + O(n^3 \log n) = \Theta(n^4)$

Attempt Score:0 / 11 - 0 %

Done