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Unit 6 - Week 2 Quiz

Week 2 Quiz

The due date for submitting this assignment has passed. Due on 2020-02-12, 23:59 IST.
As per our records you have not submitted this assignment.

All questions carry equal weightage. You may submit as many times as you like within the deadline. Your final submission will be graded.

1) Arrays A and B each contain N integers arranged in a random sequence. We want to check if A and B have any entries in common. Which of the following would be the most efficient algorithm, asymptotically? ***2 points***

- For each pair of positions $0 \le i,j < N$, check if A[i] is equal to B[j].
- Sort A using merge sort. For each element B[i], try to insert B[i] in A and see if you encounter a duplicate.
- Sort A using quicksort. For each element B[i], use binary search to check if B[i] appears in A.
- Sort A and B using merge sort. Merge A and B to check for duplicates.

No, the answer is incorrect.
Score: 0

Feedback:
Mergesort of A and B takes time O(n log n). Merging A and B and checking for duplicates (equal elements will appear together) takes O(n). So the last option takes time O(n log n).

Comparing each A[i] and B[j] takes time $O(n^2)$. Inserting each B[i] in sorted A takes time O(n), so overall it takes time $O(n^2)$. Quicksort is $O(n^2)$ in worst case, even though the following n binary searches only take time O(n log n) overall. So all the other options take time $O(n^2)$.

Accepted Answers:
Sort A and B using merge sort. Merge A and B to check for duplicates.

2) Suppose our aim is to sort an array in ascending order. Which of the following statements is true? ***2 points***

- Input in descending order is worst case for both selection sort and insertion sort.
- Input in descending order is worst case for selection sort but not for insertion sort.

- Input in ascending order is worst case for both selection sort and insertion sort.
- Input in ascending order is worst case for insertion sort but not for selection sort.

No, the answer is incorrect.
Score: 0
Feedback:
Input in descending order and ascending order are both worst case for selection sort. Input in descending order is worst case for insertion sort.
Accepted Answers:
Input in descending order is worst case for both selection sort and insertion sort.

3) Suppose we want to sort an array in descending order and we implement quicksort so that we always choose the last element in the array as the pivot element. Assume that the input is a permutation of {1, 2, …, n}. Which of the following would ***definitely*** be a worst case permutation of this input for this implementation of quicksort? ***2 points***

- {1, 2, …, n} with all odd numbers in ascending order followed by all even numbers in random order
- {1, 2, …, n} with all even numbers in descending order followed by all odd numbers in ascending order.
- {1, 2, …, n} in descending order.
- {1, 2, …, n} in some random order.

No, the answer is incorrect.
Score: 0
Feedback:
Choosing the last element as pivot for an already sorted array will split the array into size (n-1) and 1 each time.
Accepted Answers:
{1, 2, …, n} in descending order.

4) Which of the following statements is ***not*** true? ***2 points***

- Quicksort and merge sort are both examples of divide and conquer algorithms.
- If we randomly choose a pivot element each time, quicksort will always terminate in time O(n log n).
- For every fixed strategy to choose a pivot for quicksort, we can construct a worst case input that requires time $O(n^2)$.
- If we could find the median in time O(n), quicksort would have worst case complexity O(n log n).

No, the answer is incorrect.
Score: 0
Feedback:
Even with a random choice of pivot in each iteration, we can only guarantee that the expected time is O(n log n), not the worst-case.
Accepted Answers:
If we randomly choose a pivot element each time, quicksort will always terminate in time O(n log n).

5) We have a list of pairs [("Shweta",71),("Sunita",85),("Tariq",71),("Brinda",85), ("Salma",72), ("Uday",60)], where each pair consists of a student's name and his/her marks in a course. We sort these pairs in ascending order of marks. Which of the folllowing corresponds to a stable sort of this input? ***2 points***

- [("Uday",60),("Tariq",71),("Shweta",71),("Salma",72).("Sunita",85),("Brinda",85)]
- [("Uday",60),("Shweta",71),("Tariq",71),("Salma",72),("Sunita",85),("Brinda",85)]
- [("Uday",60),("Tariq",71),("Shweta",71),("Salma",72),("Brinda",85),("Sunita",85)]
- [("Uday",60),("Shweta",71),("Tariq",71),("Salma",72),("Brinda",85),("Sunita",85)]

No, the answer is incorrect.
Score: 0
Feedback:

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The repeated marks values are 71 and 85. The students with these marks should appear in the same orde in the output as in the input.

Accepted Answers:
[("Uday",60),("Shweta",71),("Tariq",71),("Salma",72),("Sunita",85),("Brinda",85)]