DAAQuiz#2-Chap2-24Sep2022

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DAAQuiz#2-Chap2-24Sep2022

Quiz#1.1-Chap1-10thAug2020
Note: The "_" symbol denotes subscript whereas ^ symbol depicts the superscript.

Assuming that You-tube pushes the choice of the songs liked by a person, with the choices of the songs between you and me as shown, for songs B, C, and D there are _____, _____, _____ mismatches respectively between our choices. 2 points

	Songs				
	A	B	C	D	E
Me	1	2	3	4	5
You	1	3	4	2	5

- 1, 0, 0
- 1, 1, 0
- 1, 1, 1
- 0, 1, 0

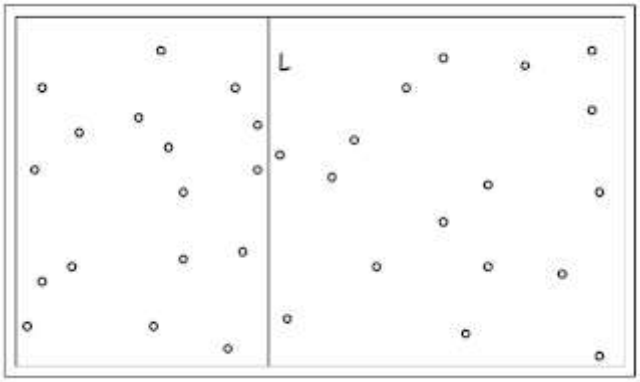
Consider a binary tree that represents sorting of 9 elements. Then it can have at least _____ number of leaves. And the depth of this binary tree must be at least _____. 2 points

- 362880, 18
- 1024, 19
- 362881, 19
- 512, 12

The number of inversions between the two sorted subhalves in the figure is _____. 2 points

- 20
- 31
- 30
- 29

Consider the figure shown here that models an effort to solve the closest pairs of points problem. The partial recurrence relation after the following two steps is _____. (a) Divide: Draw a vertical line L so that roughly $(1/2)n$ points are there on each side. (b) Conquer: Find the closest pair in each side recursively. 2 points



- T(n) = O(1)
- T(n) = T(n/2) + T(n/2)
- T(n) = O(n)
- T(n) = O(n lg n)

Consider the code shown in the figure. The complexity of this code given the combined size of A and B vectors is n, is _____ 2 points

```
Algorithm Merge-and-count(A, B)
Maintain a Current pointer into each list,
                initialized to point to the front elements
Maintain a variable Count for the number of inversions,
                initialized to 0
While both lists are nonempty {
        Let a_i and b_j be the elements pointed to
                by the Current pointer
        Append the smaller of these two to the output list
        If b_j < a_i then
                increment Count by the number of
                        elements remaining in A
                Advance the Current pointer in the list from
                        which the smaller element
                        was selected.
}
```

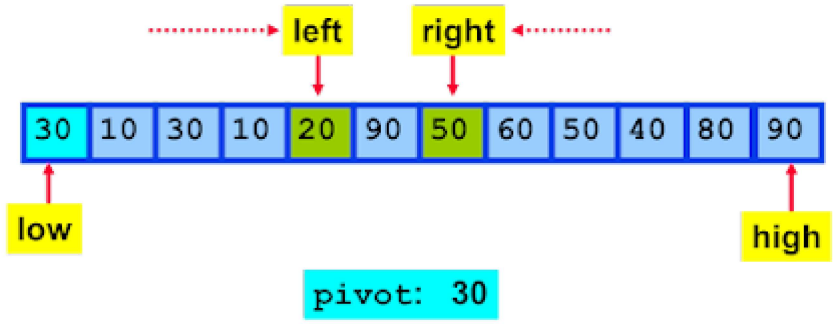
- O(n lg n)
- O(n^2)
- O(n)
- O(lg n)

Given the interger array as in the figure here, applying the Merge-and-Count algorithm discussed in the class, the number of inversions in the left half is _____ whereas that in the right half is _____. 2 points

1	5	4	8	10	2	6	9	12	11	3	7

- 6,8
- 7,6
- 5,8
- 5,9

Given the following instance in the execution of the Hoare PArtition routine (i.e. the naive partition routine discussed in the class) of the Quick sort, in the next iteration, when the loop stops _____. 2 points



- the iteration would terminate now.
- the items pointed to be left and right pointers would be swapped with each other.
- the left and right pointers would simply be incremented.
- none of these

The complexity of the Divide routine is _____that of the Combine routine is _____, whereas that of the Conquer routine is _____in the Mergesort. 2 points

- O(1), 2T(n/2), O(n)
- O(n), 2T(n/2), O(1)
- 2T(n/2), O(1), O(n)
- O(1), 2T(n/2), O(1)

Given n points in the plane, finding a pair with the Euclidean distance between points p1(x1, y1) and p2(x2, y2) is given by _____. 2 points

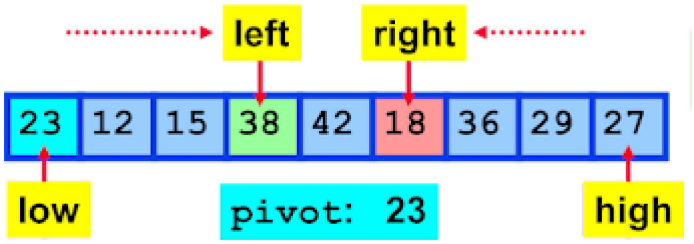
- ((x1-x2)^2 + (y1+y2)^2)^(1/2)
- ((x1+x2)^2 + (y1+y2)^2)^(1/2)
- ((x1-x2)^2 + (y1-y2)^2)^(1/2)
- ((x1+x2)^2 + (y1-y2)^2)^(1/2)

Given the following integer array, the total number of inversions in the array is _____. 2 points

1	5	4	8	10	2	6	9	12	11	3	7

- 20
- 5
- 13
- 22

Given the following instance in the execution of the Hoare PArtition routine (i.e. the naive partition routine discussed in the class) of the Quick sort, in the next iteration, _____. 2 points

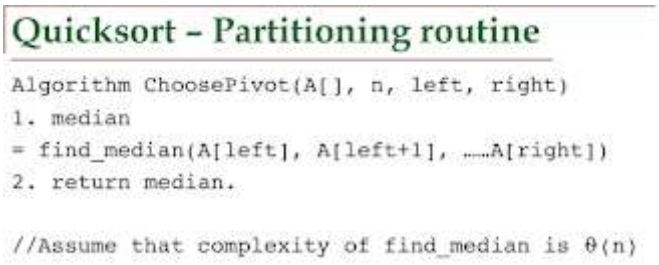


- the iteration would terminate now.
- items pointed to be left and right pointers would be swapped with each other.
- the left and right pointers would simply be incremented.
- none of these

Having designed the Mergesort routine to sort the input integer array in the ascending order, if given an array sorted already in the ascending order as input, the Mergesort complexity would be _____. 2 points

- O(lg n)
- O(n^2)
- O(n)
- O(n lg n)

Consider the Quicksort algorithm in which the Partitioning is done using the algorithm as shown in the figure. Then, the running time of the Quicksort is given by _____. 2 points



- Θ(n)
- Θ(n log n)
- Insufficient information to answer
- Θ(n^2)

Merge sort _____ a sorting algorithm because _____. 2 points

- is in place, it requires an auxiliary array
- is stable, it requires an auxiliary array
- is not in place, it requires an auxiliary array
- is not stable, it requires an auxiliary array

Consider a run of Quicksort in which after the first call of partitioning, the input integer array to be sorted takes the form as shown in the table here. Then the pivot element used in the first run must have been _____. 2 points

2	5	1	7	9	12	11	10

- ◯ 9 or 12
- ◯ 1 or 7
- ◯ 12 or 11
- ◯ 7 or 9

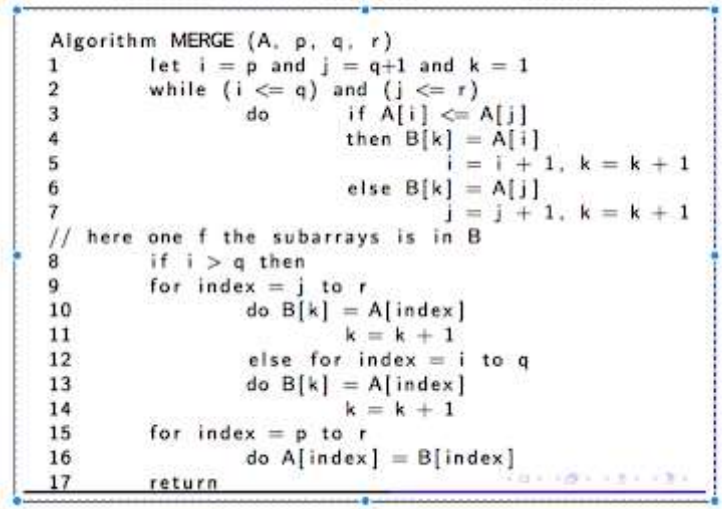
Assuming that You-tube pushes the choice of the songs liked by a person, with the choices of the songs between you and me as shown in the figure here, there are _____ mismatches between our choices. 2 points

	A	B	C	D	E	F	G
Me	1	2	3	4	5	6	7
You	1	6	7	5	2	3	4

Songs

- ◯ 11
- ◯ 9
- ◯ 8
- ◯ 10
- ◯ none of these

The procedure Merge shown here requires _____ comparisons. 2 points



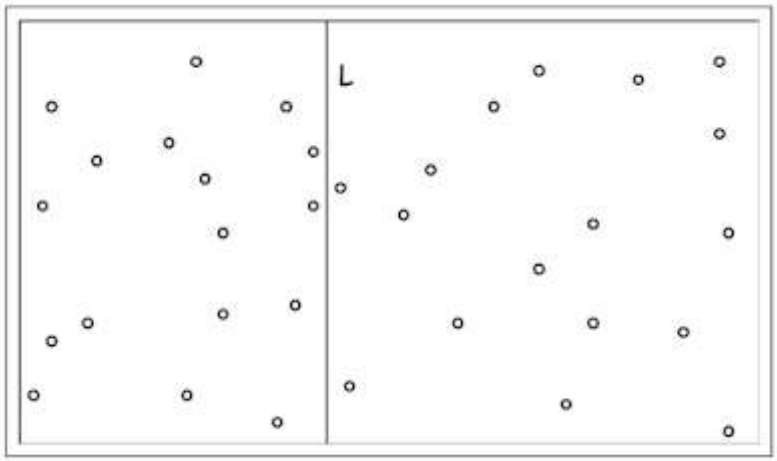
```
Algorithm MERGE (A, p, q, r)
1       let i = p and j = q+1 and k = 1
2       while (i <= q) and (j <= r)
3               do      if A[i] <= A[j]
4                       then B[k] = A[i]
5                               i = i + 1, k = k + 1
6                       else B[k] = A[j]
7                               j = j + 1, k = k + 1
// here one f the subarrays is in B
8       if i > q then
9       for index = j to r
10              do B[k] = A[index]
11                      k = k + 1
12              else for index = i to q
13              do B[k] = A[index]
14                      k = k + 1
15      for index = p to r
16              do A[index] = B[index]
17      return
```

- 3n-1
- 3n+1
- 3n+2
- 3n-1+1

The given array is arr = { 2,6,1 }, then _____are the pivots that are returned as a result of the first and the subsequent partitioning, in Quicksort. 2 points

- 2 and 1
- none of these
- 6 and 1
- 2 and 6

Consider the figure shown here that models an effort to solve the closest pairs of points problem that shows a vertical line L drawn to divide the plane into two sections so that roughly $(1/2)n$ points are there on each side. The time required for this operation is _____. 2 points



- O(1)
- O(n)
- O(n lg n)
- O(lg n)

In Quick-sort the _____ phase is trivial, with actual sorting occurring during the _____ phase, whereas in the Merge-sort _____ phase is trivial, with actual sorting occurring during the _____ phase. 2 points

- Combine, Divide, Divide, Combine
- Divide, Combine, Divide, Combine
- Divide, Combine, Combine, Divide
- Combine, Divide, Combine, Divide

The correct recurrence relation of the Merge-sort procedure without any assumption on how division is done - is _____ 2 points

- neither of these
- T(n) = 0, if n=1; T(n) = floor(n/2) + ceiling(n/2) + n - otherwise
- T(n) = 0, if n = 1, T(n) = 2T(n/2) + n - otherwise

IF f(n)=O(lg n) and g(n)=O(1), then g(n) is _____. 2 points

- slower than f(n)
- faster than f(n)
- grows at the same rate as f(n)
- none of these options

Given the following integer array, the total number of inversions in the array is _____ 2 points

5	8	11	3	10	9	6	27	21	16	18	13

- 19
- 20
- 13
- 16

D&C algorithms have typically _____ running times as compared to brute force and their running time can be determined by _____. 2 points

- greater, recursion
- lesser, recursion
- greater, the standard tech to solve recurrences.
- lesser, the standard tech to solve recurrences.

The number of inversions between the two sorted subhalves in the figure is _____. 2 points

- 13
- 10
- 12
- 14

Consider the following code snippet. If the abstract cost of execution of each statement here is unity, then the overall time complexity of the algorithm is _____. 2 points

```
Algorithm RSum(a[], int n)
1       if (n <= 0)
2               then return(0)
3               else return(RSum(a, n-1) + a[n])
```

- O(√ n)
- O(√ n logn 2)
- O(n)
- O(√ n log n)

The running time of naive PARTITION routine (one discussed in the class) of Quicksort is of the order of _____. 2 points

- Θ(n)
- Θ(lg n)
- Θ(n^2)
- Θ(n lg n)

Given two arrays to be sorted using the Quick-sort as shown in the table here, let n1 and n2 be the number of comparisons Quicksort would require in sorting A and B in ascending order and let the partition routine choose the first element as the pivot then _____ 2 points

A	2	5	11	18	19	121	1111	2120
B	2901	2526	2100	700	690	512	411	10

- ○ n1> n2
- ○ n1 != n2
- ○ n1 = n2
- ○ n1 < n2

Given two integer arrays: one sorted and the other reverse sorted, a brute force algorithm to compute the number of inversions between the two integer arrays requires _____. 2 points

- ○ Θ(n)
- ○ Θ(n^2)
- ○ Θ(2n)
- ○ Θ(lg n)

Given an array of n elements, that is reverse sorted. The complexity of merge sort to sort it is _____. 2 points

- O(lg n)
- O(n lg n)
- O(n^2 lg n)
- O(n^2)

The _____ execute the same query on many different search engines and then try to synthesize the results by looking for similarities. 2 points

- query processing systems
- meta-search engines
- search engines
- collaborative filtering systems

Let f and g be non-decreasing real-valued functions defined on the positive integers, with f(n) and g(n) at least 2 for all $n \geq 1$. Assume that f(n) = O(g(n)), and let c be a positive constant. Then, is f(n) x lg (f(n)^c) = O(g(n) * lg(g(n)))? 2 points

- Sometimes yes, sometimes no, depending on the functions f and g
- Sometimes yes, sometimes no, depending on the constant c
- Yes, for all such f, g, and c
- Never, no matter what f, g, and c are

Assume that the Quicksort is given as input an array A= { 2,2,2,2,2,2,2,2,2,2 } , with n= 10. Then, the running time of Quicksort is of the order of _____. 2 points

- 10
- 20
- 100
- 2

Let s_i be the point in the 2δ-strip with the i^{th} smallest y-coordinate then, if |i − j| ≥ _____; the distance between the distinct points s_i and s_j is at least _____. 2 points

- 7, δ
- 7, δ+1
- 8, δ+1
- 8, δ

_____ always produces the two partitions which are of almost equal size in the divide phase, whereas _____ does not guarantee so. 2 points

- none of these
- Quicksort, Mergesort
- Mergesort, Quicksort
- Insertionsort, MErgesort

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