Quiz Submission

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Question 1

```
SuperSort(A)
sorts array A recursively
    // base cases
    if (length(A) == 1) return;
    if (length(A) == 2)
        swap the two elements if they're out of order;
        return;
     else  // recursive calls
        SuperSort the first two thirds of A;
        SuperSort the second two thirds of A;
        SuperSort the first two thirds of A again;
```

Answer:

so if length a = 1, we will return, if it's 2, we will swap elements(base), and then we will do 3 recursive calls on the first 2/3 of a, then 2nd, then 3rd. therefore, Our recursive solution would be T(n)=3T(2n/3)+O(n).

Question 2

Part B: Give a recurrence relation upper bound, tight up to constant factors, for the performance of your algorithm given in Part A. Don't forget the base case(s).

Answer:

T(n)=T(k/2)+O(1)

Question 3

Part C: Solve your recurrence relation given in Part B by providing an asymptotic solution tight up to constant factors, but do NOT use the master theorem or the master-master theorem/nuclear bomb. Show your work.

Answer:

the solution would just be adding the constant factors,

Question 4

Suppose you are given positive integers where for nonnegative integer . You would like to determine using only the elementary operations of addition, subtraction, multiplication, and division.

A brute force algorithm is described below.

The brute force algorithm requires time to find the correct value of . To help with this task, your friend designed a function called which takes input of the form and computes in time. In Part A, you will use to design a divide and conquer algorithm to find the correct value of with smaller asymptotic runtime than the above brute force algorithm. Hint: , so such that if is even or if is odd.

Part A: Design a divide and conquer algorithm that has an asymptotically faster performance than the given brute force algorithm.

Answer:

base : if a =1, then k=0. our design is, If let's say that we have a variable n and n = sqrta so the means that n = $b^k/2. wewanttodecideifkisevenorodd, ifit'seventhennwouldbe(b^k/2)sothatmakesn^2thenk = 2(k/2)thenifit'soddthena = bmultipliedbyb*(b^k/2)^2andthatwouldmakek = 2(k/2)+1. thentheruntimewouldbeO(l$