Chapter 4: Recursion — Question 7

J.Z.W

November 29, 2023

Question 7

Isabel has an interesting way of summing up the values in a sequence A of n integers, where n is a power of two. She creates a new sequence B of half the size of A and sets $B[i] = A[2i + 1]$, for $i = 0, 1, ..., (n/2) - 1$. If B has size 1, then she outputs $B[0]$. Otherwise, she replaces A with B, and repeats the process. What is the running time of her algorithm?

Answer:

Given the fact that the algorithms requires the use of the entire input size, the algorithm is at least $O(n)$. Now for the entire input of A it is split into two, $n/2$ and for the two parts of A, they are added, thus $n/2$ addition operations. Thus, the running time is $O(n)$.