Question: PYTHON 3: Analysis of Algorithms/ Complexity classes PLEASE ...

PYTHON 3: Analysis of Algorithms/ Complexity classes

PLEASE ANSWER ALL PARTS SINCE THEY ARE RELATED TO EACH OTHER

In 1972, Intel's 8008 processor could execute 200,000 (200 thousand) instructions per second; at present, an Intel Core 2 processor can execute 3,200,000,000 (3.2 billion) instructions per second (16,000 times faster). Let's assume that we program the 8008 to run a fast O(N Log2 N) sorting algorithm, and program the Core 2 to run a slow O(N^2) sorting algorithm. Assume the time to sort N values on the 8008 is exactly 10/200,000 N Log2 N seconds; assume the time to sort N values on the Core 2 is 2/3,200,000,000 N^2 seconds. Here the constant for fast sorting on the 8008 is 5 times as big as the constant for slow sorting on the Core 2 (both constants are divided by the speed of the machines the algorithm runs on).

PLEASE ANSWER THE FOLLOWING QUESTIONS:
a1) About how long does it take the 8008 to sort 1,000 values?
a2) About how long does it take the Core 2 to sort 1,000 values?
b1) About how long does it take the 8008 to sort 1,000,000 values? b2) About how long does it take the Core 2 to sort 1,000,000 values?
c1) For what problem sizes N is it faster to use the Core 2 for sorting?
c2) For what problem sizes N is it faster to use the 8008 for sorting?

In problems c1 and c2 only, compute your answer to the closest integer value (you can ignore decimal places). Use a calculator, spreadsheet, or a program to compute (possibly to guess and refine) your answer.

Expert Answer

Jaqen_Hghar answered this
1,676 answers

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a1). As mentioned in question, the time taken to sort N values in 8008 is 100/200,000 N Log_2 N seconds

So for N = 1000, putting in above equation gives, total time = 4.98 Seconds

a2). As mentioned in question, the time taken to sort N values in Core 2 is 10/3,200,000,000 N^2 seconds

So for N = 1000, putting in above equation gives, total time = 3.125 x 10^{-3} Seconds

b1). As mentioned in question, the time taken to sort N values in 8008 is 100/200,000 N Log_2 N seconds

So for N = 1000000, putting in above equation gives, total time = 9965.78 Seconds

b2). As mentioned in question, the time taken to sort N values in Core 2 is 10/3,200,000,000 N^2 seconds

So for N = 1000000, putting in above equation gives, total time = 3125 Seconds

c1). Let for N=M, Core 2 us faster for sorting,

it means 100/200,000 M Log_2 M > 10/3,200,000,000 M^2

=> M / Log_2 M < 160000

For M <= 3519999

we get, M / Log_2 M < 160000, because we are considering $\lceil \log_2 M \rceil$ while calculating log. We will get Core 2 is faster.

c2). Clearly for M > 3519999 i.e. M>= 3520000 , We will get 8088 is faster.

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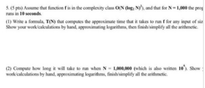
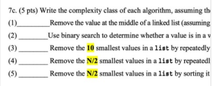
5. (5 pts) Assume that function f is in the complexity class O(N (log2 N), and that for N = 1,000 t...



See answer

7c. (5 pts) Write the complexity class of each algorithm, assuming the required data structure stor...



See answer

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Q: 1. In 1972, Intel's 8008 processor could execute 200,000 (200 thousand) instructions per second; at present, an Intel Core 2 processor can execute 3,200,000,000 (3.2 billion) instructions per second. Let's assume that we program the 8008 to run a fastO(N Log2 N) sorting algorithm, and program the Core 2 to run a slowO(N2)sorting algorithm. Assume the time to sort N values on the...

A: See answer 100% (1 rating)

Q: Fill in the last line of the three empty rows, which shows the size of a problem can be solved in the same amount of time for each complexity class on a new machine that runs nine as fast as the old one. Solve by hand when you can, use Excel or a calculator when you must: I used a calculator only for O(N Log_2 N) and solved it to 3 significant digits. Solving a problem in the same...

A: See answer 100% (5 ratings)

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