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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 $O(N \log_2 N)$ 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 $10/200,000 N \log_2 N$ 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 = 3.125×10^{-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 is 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 $M \leq 3519999$

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. $M \geq 3520000$, We will get 8088 is faster.

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5. (5 pts) Assume that function f is in the complexity class $O(N (\log_2 N))$, and that for $N = 1,000$ t...

5. (5 pts) Assume that function f is in the complexity class $O(N (\log_2 N))$, and that for $N = 1,000$ the program runs in 10 seconds.
(1) Write a formula, $T(N)$ that computes the approximate time that it takes to run f for any input of size N . Show your work/calculations by hand, approximating logarithms, then finish/simplify all the arithmetic.

(2) Compute how long it will take to run when $N = 1,000,000$ (which is also written 10^6). Show your work/calculations by hand, approximating logarithms, then finish/simplify all the arithmetic.

See answer

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

7c. (5 pts) Write the complexity class of each algorithm, assuming the required data structure storage. (1) _____ Remove the value at the middle of a linked list (assuming (2) _____ Use binary search to determine whether a value is in a vector (3) _____ Remove the 10 smallest values in a list by repeatedly (4) _____ Remove the N/2 smallest values in a list by repeatedly (5) _____ Remove the N/2 smallest values in a list by sorting it.

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 fast $O(N \log_2 N)$ 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...

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



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