

Question: PYTHON 3: Analysis of Algorithms/ Complexity classes Fill in th...

PYTHON 3: Analysis of Algorithms/ Complexity classes

Fill in the last line of the three empty rows, which shows the size of a problem (M) that can be solved in the same amount of time on a new machine that runs ten as fast as the old machine. Solve by hand when you can; use Excel or a calculator when you must: I used external tools only for $O(N \log_2 N)$ and $O(N^2)$ solving those to 3 significant figures. Solving a problem in the same amount of time on the new/faster machine is equivalent to solving a problem that takes ten times the amount of time on the old machine. See the $O(N)$ for an example. Check that your answers aren't crazy. Hint: write a formula equating problem sizes N and M using the speedup and complexity class. For linear complexity: $10 \cdot c \cdot N = c \cdot M$; then solve for M.

N = Problem Size on Old Machine	Complexity Class	Time to Solve on Old Machine (secs)	M Solvable in the same Time on a New Machine 10x as Fast
10^3	$O(\log_2 N)$.001	
10^3	$O(N)$.001	$10 \times 10^3 = 10^4$
10^3	$O(N \log_2 N)$.001	
10^3	$O(N^2)$.001	

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Expert Answer



anonymous answered this
1,350 answers

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We can solve all of these by hand except log calculation/equation needs calculator/external tools.

1.

We have $N = 10^3$

Time complexity= $O(\log_2 N)$

Time taken= 0.001 secs

We have Time = $k(\log_2 N)$

=> $0.001 = k(\log_2 N)$

=> $0.001 = k(\log_2 1000)$

=> $k = (0.001)/(3\log_2 10)$

Since new machine works ten times faster, it does work in 0.001 sec as that of the old machine in 0.01 secs.

So, again Time= $k(\log_2 M)$

=> $0.01 = ((0.001)(\log_2 M))/(3(\log_2 10))$

=> $30\log_2 10 = \log_2 M$

=> $\log_2 10^{30} = \log_2 M$

=> $M = 10^{30}$

2.

We have $N = 10^3$

Time complexity= $O(N \log_2 N)$

Time taken= 0.001 secs

We have Time = $k(N \cdot \log_2 N)$

=> $0.001 = k(N \cdot \log_2 N)$

=> $0.001 = k(1000 \cdot \log_2 1000)$

=> $k = (0.001)/(3000 \log_2 10)$

Since new machine works ten times faster, it does work in 0.001 sec as that of the old machine in 0.01 secs.

So, again Time= $k(M \cdot \log_2 M)$

=> $0.01 = ((0.001)(M \cdot \log_2 M))/(3000(\log_2 10))$

=> $30000 \log_2 10 = M \log_2 M$

By approximation solving for M (using external tools)

M=7717.13= 7717

3.

We have $N = 10^3$

Time complexity= $O(N^2)$

Time taken= 0.001 secs

We have Time = $k(N \cdot N)$

=> $0.001 = k(N \cdot N)$

=> $0.001 = k(1000 \cdot 1000)$

=> $k = (0.001)/(10^6)$

Since new machine works ten times faster, it does work in 0.001 sec as that of the old machine in 0.01 secs.

So, again Time= $k(M \cdot M)$

=> $0.01 = ((0.001)(M \cdot M))/(10^6)$

=> $10^7 = M^2$

By approximation solving for M (using calculator)

M=3162.278= 3162

So, the new table looks like:

N=Problem Size in Old Machine	Complexity Class	Time to solve in Old Machine(in secs)	M solvable in the same time on new Machine(10x faster)
10^3	$O(\log_2 N)$	0.001	10^{30}
10^3	$O(N)$	0.001	10^4
10^3	$O(N \log_2 N)$	0.001	7717
10^3	$O(N^2)$	0.001	3162

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Q: Can someone pls help me with number 6 asap ?

A: [See answer](#)

Up next for you in Computer Science

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
(1) _____ Remove the value at the middle of a linked list (assuming
(2) _____ Use binary search to determine whether a value is in a v
(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](#)

4. (6 pts) The following functions each determine if any two values in a list sum to asum. As is shown in the...

4. (6 pts) The following functions each determine if any two values in a list sum to asum. As is shown in the
Note: For each function, write the complexity class in the box to the right. (Do not write the full
code, just the complexity class.)
def is_sum(a, b, lst):
 for i in range(len(lst)-1):
 for j in range(i+1, len(lst)):
 if lst[i] + lst[j] == a + b:
 return True
 return False
(a) _____ (b) _____
(c) _____ (d) _____

[See answer](#)

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Questions viewed by other students

Q: Can someone pls help me with number 6 asap ?

A: [See answer](#)

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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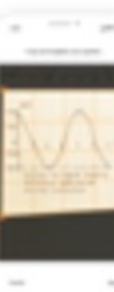
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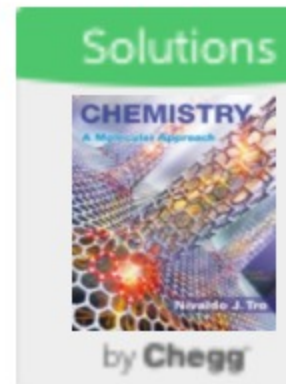
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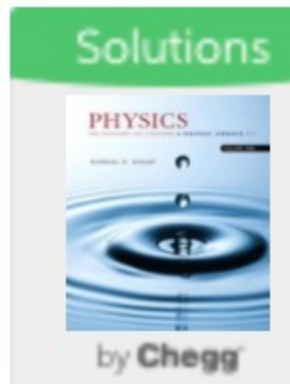
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