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Cs350

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Title: Mid



Suppose we have two algorithms to solve the same problem. One runs in time T1(n) = 400n, whereas the other runs in time T2(n) = n\*n. What are the complexities (Big-O) of these two algorithms? For what values of n might we consider using the algorithm with the higher complexity?

Ans:

T1(n) = 400n has O(n) Notation

*Tn*=400*n*

*Tn*−400*n*=0

(*T*−400)*n*=0

*T*−400(*T*−400)*n*​=*T*−4000​  
*n*=0

T2(n) = n\*n has O(n^2) Notation



Inflix: x \* y / ( ( x - y / 2 ) \* 4 - ( z + x ) )

Postflix: x y \* x y 2 /- 4 \* z x + -/

2 3 \* 2 3 2 /- 4 \* 1 2 + - /

The first character scanned is "**2**", which is an operand, so push it to the stack

2 **3** \* 2 3 2 /- 4 \* 1 2+ -/

The next character scanned is "**3**", which is an operand, so push it to the stack.

2 3 **\*** 2 3 2 /- 4 \* 1 2+ -/

The next character scanned is "**\***", which is an operator, so pop its two operands from the stack. Pop **3** from the stack for the right operand and then pop **2** from the stack to make the left operand.

Next, push the result of **2 \* 3** (**6**) to the stack.

2 3 \* **2** 3 2 /- 4 \* 1 2+ -/

The next character scanned is "**2**", which is an operand, so push it to the stack.

2 3 \* 2 **3** 2 /- 4 \* 1 2+ -/

The next character scanned is "**3**", which is an operand, so push it to the stack.

2 3 \* 2 3 **2** /- 4 \* 1 2+ -/

The next character scanned is "**2**", which is an operand, so push it to the stack.

2 3 \* 2 3 2 **/-** 4 \* 1 2+ -/

The next character scanned is "**/-**", which is an operator, so pop its two operands from the stack. Pop **2** from the stack for the right operand and then pop **3** from the stack to make the left operand.

Next, push the result of **3 /- 2** (**6**) to the stack.

2 3 \* 2 3 2 /- **4** \* 1 2+ -/

The next character scanned is "**4**", which is an operand, so push it to the stack.

2 3 \* 2 3 2 /- 4 **\*** 1 2+ -/

The next character scanned is "**\***", which is an operator, so pop its two operands from the stack. Pop **4** from the stack for the right operand and then pop **6** from the stack to make the left operand.

Next, push the result of **6 \* 4** (**24**) to the stack.

2 3 \* 2 3 2 /- 4 \* **1** 2+ -/

The next character scanned is "**1**", which is an operand, so push it to the stack.

2 3 \* 2 3 2 /- 4 \* 1 **2+** -/

The next character scanned is "**2+**", which is an operator, so pop its two operands from the stack. Pop **1** from the stack for the right operand and then pop **24** from the stack to make the left operand.

Next, push the result of **24 2+ 1** (**24**) to the stack.

2 3 \* 2 3 2 /- 4 \* 1 2+ **-/**

The next character scanned is "**-/**", which is an operator, so pop its two operands from the stack. Pop **24** from the stack for the right operand and then pop **2** from the stack to make the left operand.

Next, push the result of **2 -/ 24** (**24**) to the stack.

Since we are done scanning characters, the remaining element in the stack (**24**) becomes the result of the postfix evaluation.

Postfix notation: 2 3 \* 2 3 2 /- 4 \* 1 2+ -/  
Result: 24

| **Input String** | **Output Stack** | **Operator Stack** |
| --- | --- | --- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 |  |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 |  |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 | \* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 | \* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 | \* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 | \* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | / |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | / |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | /( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | /( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | /(( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* | /(( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 | /(( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 | /(( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 | /((- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 | /((- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 | /((- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 | /((- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 | /((-/ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 | /((-/ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 | /((-/ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 | /((-/ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- | /( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- | /( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- | /(\* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- | /(\* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 | /(\* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 | /(\* |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* | /(- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* | /(- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* | /(-( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* | /(-( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 | /(-( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 | /(-( |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 | /(-(+ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 | /(-(+ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 | /(-(+ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 | /(-(+ |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 + | /(- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 + | /(- |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 + - | / |
| 2 \* 3 / ( ( 2 - 3 / 2 ) \* 4 - ( 1 + 2 ) ) | 2 3 \* 2 3 2 /- 4 \* 1 2 + -/ |  |