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Tutorial 1: Complexity1. Reorder the following efficiencies from the smallest to the largest:  
a. 2n  
b. n!  
c. n  
5  
d. 15,000  
e. nlog2(n)

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| --- |
| c. n5  a. 2n  b. n!  e. nlog2(n)  d. 15,000 |

2. Reorder the following efficiencies from the smallest to the largest:  
a. nlog2(n)  
b. n + n2 + n3  
c. 105  
d. n0.5

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| --- |
| b. n + n2 + n3  a. nlog2(n)  d. n0.5  c. 105 |

3. Determine the big-O notation for the following:  
a. 5n5/2 + 11n2/5  
b. 9log2(n) + 6n  
c. 3n4 + 8nlog2(n)  
d. 5n2 + n3/2 + 3n5/3

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| --- |
| a. 5n5/2 + 11n2/5 : O(n5/2)  b. 9log2(n) + 6n : O(n)  c. 3n4 + 8nlog2(n) : O(n4)  d. 5n2 + n3/2 + 3n5/3 : O(n2) |

4. Calculate the run-time efficiency of the following program segment:  
1 i = 1  
2 loop (i <= n)  
1 print (i)  
2 i = i + 1  
3 end loop

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| --- |
| 1 i = 1 //0(1)  2 loop (i <= n) //0(n)  1 print (i) //0(n)  2 i = i + 1 //0(n)  3 end loop  O(1+n+n+n) = 0(n) |

5. Calculate the run-time efficiency of the following program segment:  
1 i = 1  
2 loop (i <= n)  
1 j = 1  
2 loop (j <= n)  
1 k = 1  
2 loop (k <= n)  
1 print(i,j,k)  
2 k = k + 1  
3 end loop  
4 j = j + 1  
3 end loop  
4 i = i + 1  
3 end loop  
6. If the algorithm doIt has an efficiency factor of 7n, calculate the run time efficiency  
of the following program segment.  
1 i = 1  
2 loop (i <= n)  
1 doIt(...)  
2 i = i + 1  
3 end loop

7. If the efficiency of the algorithm doIt can be expressed as O(n) = n2, calculate the  
efficiency of the following program segment.  
1 i = 1  
2 loop (i <= n)  
1 j = 1  
2 loop (j < n)  
1 doIt(...)  
2 j = j + 1  
3 end loop  
4 i = i + 1  
3 end loop

8. If the efficiency of the algorithm doIt can be expressed as O(n) = n2, calculate the  
efficiency of the following program segment.  
1 i = 1  
2 loop (i < n)  
1 doIt(...)  
2 i = i \* 2  
3 end loop

9. Given that the efficiency of an algorithm is 5n2, if a step in this algorithm takes 1  
nanosecond (10-9), how long does it take the algorithm to process an input of size  
10000?

10. Given that the efficiency of an algorithm is 3n3, if a step in this algorithm takes 1  
nanosecond (10-9), how long does it take the algorithm to process an input of size  
10000?

11. Given that the efficiency of an algorithm is 3nlog2(n), if a step in this algorithm  
takes 1 nanosecond (10-9), how long does it take the algorithm to process an input of  
size 8000?