

6	9	13	7
12	10	5	
3	1	4	14
15	8	11	2

Mathematics for Computer Science  
MIT 6.042J/18.062J

# Asymptotic Blunders



Albert R Meyer,

April 10, 2013

Ohblunder.1

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## Big Oh Mistakes

" $\cdot = O(\cdot)$ " defines a relation  
Don't write  $O(g) = f$ .  
Otherwise:  $x = O(x)$ , so  $O(x) = x$ .  
But  $2x = O(x)$ , so  
 $2x = O(x) = x$ ,  
therefore  $2x = x$ .  
Nonsense!



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Ohblunder.2

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## Big Oh Mistakes

Lower bound blunder:  
"f is at least  $O(n^2)$ "  
should say  
 $n^2 = O(f)$



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Ohblunder.3

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## Big Oh Mistakes

False Lemma:  $\sum_{i=1}^n i = O(n)$

Of course really:

$$\sum_{i=1}^n i = \Theta(n^2)$$



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Ohblunder.4

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## Big Oh Mistakes

False Lemma:  $\sum_{i=1}^n i = O(n)$

false proof:

$0 = O(1), 1 = O(1), 2 = O(1), \dots$

So each  $i = O(1)$ . So

$$\begin{aligned}\sum_{i=1}^n i &= O(1) + O(1) + \dots + O(1) \\ &= n \cdot O(1) = O(n).\end{aligned}$$



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