Mathematics for Computer Science
MIT 6.042J/18.062J

Asymptotic Blunders

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!

Big Oh Mistakes

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

Big Oh Mistakes

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

Of course really:
$$\sum_{i=1}^{n} i = \Theta(n^2)$$

1

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

$$\sum_{i=1}^{n} i = O(1) + O(1) + \cdots + O(1)$$

$$= n \cdot O(1) = O(n).$$

6.042J / 18.062J Mathematics for Computer Science
Spring 2015