Asymptotic Blunders

"$\cdot = O(\cdot)$" 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

$$n^2 = O(f).$$

False Lemma:

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

Of course really:

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

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

false proof:
\[ 0 = O(1), \quad 1 = O(1), \quad 2 = O(1), \ldots \]

So each \( i = O(1) \). So
\[ \sum_{i=1}^{n} i = O(1) + O(1) + \ldots + O(1) \]
\[ = n \cdot O(1) = O(n). \]