COMP9020 - Assignment 1

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Question 1

(a) Show that: $\sum_{i=1}^{n} i^2 = O(n^3)$

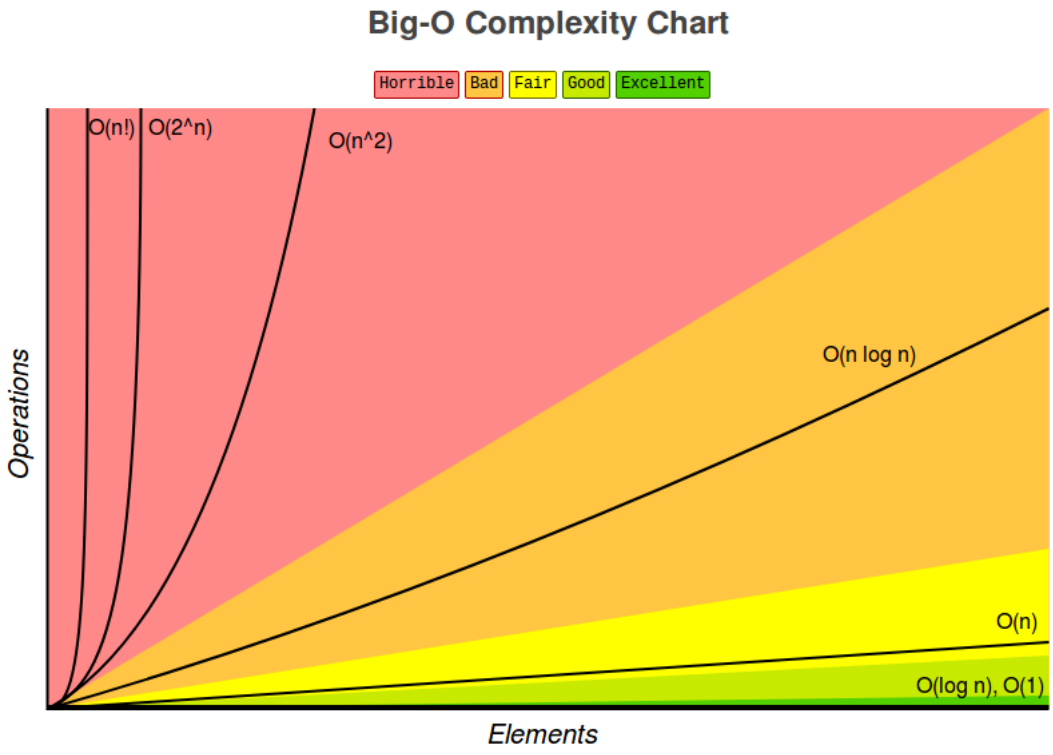
correct. $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$, which is $O(n^3)$

Related Nodes:

- Arithmetic progression: SUM $= n\frac{(a_1+a_n)}{2}$
- Geometric progression: SUM $= a_1\frac{1-r^n}{1-r}$
- Square number: SUM $= \frac{n(n+1)(2n+1)}{6}$
- Cubic number: SUM $= (\frac{n(n+1)}{2})^2$

(b)

let $p(n) = n^c$, then $\log p(n) = \log n^c = c \log n$



- O(1): constant
- O(logn): logarithmic
- O(n): linear
- O(nlogn): loglinear
- $O(n^c)$: *polynomial*
- $O(c^n)$: *exponential*

(c) Show that $\sum_{i=1}^{n} \log i = O(n \log n)$

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

(d) Show that $\sum_{i=1}^{n} \frac{i}{2^i} = O(1)$