2) (5 pts) ANL (Algorithm Analysis)

A $O(n^3)$ image processing algorithm took 125 milliseconds to index ***n*** = 400 images. How long would it be expected for this algorithm to take to index ***640*** images, in milliseconds? **Please show all your work, including algebraic simplification, which is part of what is being tested with this question.**

Let T(n) be the run time of the algorithm. Then there is some constant c such that

$T(n) = cn^3$

$T(400) = c(400^3) = 125ms \rightarrow c = \frac{125\ ms}{400^3}$.

$T(640) = c(640^3) = \frac{125\ ms}{400^3} \times 640^3 = (125ms) \times \left(\frac{640}{400}\right)^3 = (125ms) \times \left(\frac{8}{5}\right)^3 = 125ms \times \frac{512}{125} = \mathbf{512ms}$

Grading: 1 pt set up to solve for c
1 pt solve for c (no simplify)
1 pt plug in 640
2 pts to get to final answer