

2) (5 pts) ANL (Algorithm Analysis)

An algorithm to process a query on an array of size n takes $O(\sqrt{n})$ time. For $n = 10^6$, the algorithm runs in 125 milliseconds. How many *seconds* should the algorithm take to run for an input size of $n = 64,000,000$?

Let the algorithm with input array size n have runtime $(n) = c\sqrt{n}$, where c is some constant.

Using the given information, we have:

$$T(10^6) = c\sqrt{10^6} = 125ms$$

$$c(1000) = 125ms$$

$$c = .125ms = \frac{1}{8}ms$$

Now, solve for the desired information:

$$T(64 \times 10^6) = c\sqrt{64 \times 10^6}$$

$$= \frac{1ms}{8} \times \sqrt{64} \times \sqrt{10^6}$$

$$= \frac{8 \times 1000ms}{8} = 1000ms = 1second$$

Grading: 2 pts solving for c , 2 pts for plugging 64,000,000 and canceling to get to 1000 ms, 1 pt to answer 1 second as the question requests.