# 2020B F=ma Exam: Problem 25

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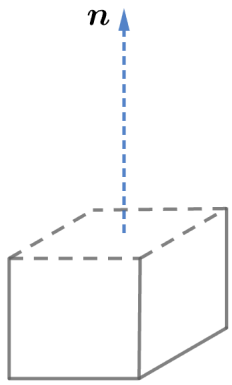


Let $X_i$ be the random variable representing the number of decays in hour $i$. After $N$ hours of observation, we estimate $n$ as

$$\overline{X} = \frac{X_1 + X_2 + ... + X_N}{N}$$

Since $X_i$ are independent and identically distributed variables,

$$\operatorname{Var} \overline{X} = \frac{\operatorname{Var} X}{N}$$

$$\Delta \overline{X} = \frac{\Delta X}{\sqrt{N}}$$

By assumption, $\Delta X = \sqrt{n}$ and we want $\Delta \overline{X} = 0.01n$ so

$$0.01n = \sqrt{\frac{n}{N}}$$

$$0.0001n^2 = \frac{n}{N}$$

$$N = \frac{10^4}{n}$$

and the answer is $\boxed{\text{D}}$.