Dice Half-life Paradox?

In the popular GCSE/A-level practical where you roll dice to simulate the action of radioactive decay, you usually find that the 'half-life' of a set of 6-sided dice is about 4 throws. But how close is this to the theoretical 'right answer'? Surprisingly, you get two different answers depending on how you approach the problem:

Proof I

Each time you throw N dice and remove the 6s, you will be left with $\frac{5}{6}N$ dice.
After n throws you have $\frac{1}{2}N$ dice remaining. Therefore:

$$\left(\frac{5}{6}\right)^n = 0.5$$

Taking logs of both sides gives:

$$n\ln\left(\frac{5}{6}\right) = \ln(0.5)$$

So:

$$n = \frac{\ln(0.5)}{\ln\left(\frac{5}{6}\right)} = 3.801\,\text{throws}$$

Proof II

Radioactivity theory ($N = N_0 e^{-\lambda t}$) gives:

$$T_{\frac{1}{2}} = \frac{\ln 2}{\lambda}$$

Where $\lambda = \text{probability of decay} = \frac{1}{6}$ for a single dice .

Therefore:

$$n = T_{\frac{1}{2}} = \frac{\ln 2}{\lambda} = 4.159\,\text{throws}$$

The two methods give noticeably different answers to the problem. Both cannot be simultaneously correct. Is this a genuine paradox, or are there some hidden assumptions which might be causing the apparent problem?