Equation for One Die “Decay” Activity

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Consider a series of repetitions to find the number of throws (*t*) required to get a "1" on a single 6-sided die.

For a given set of repetitions, the maximum value of *t* is *t* = *t*max.
Values for *t* then range from *t* = 1 to *t* = *t*max.

The number of occurrences in a data set for each *t* value is *N*t.
For a large number of repetitions (*N*R), the weighted average number of throws to get a '1" is

$$\frac{\sum\_{t=1}^{t\_{max}}tN\_{t}}{\sum\_{t=1}^{t\_{max}}N\_{t}}=\frac{6N\_{R}}{N\_{R}}=6$$

This can be derived by doing the sums in the numerator and denominator with the appropriate probabilities for each *t* value.

It can also be seen by the following argument:

For a fair die and a very large number of throws, we expect that 1/6 of all throws produce a “1” or $\frac{Total number of throws}{Total number of "1" s}=\frac{6}{1}=\frac{\sum\_{t=1}^{t\_{max}}tN\_{t}}{\sum\_{t=1}^{t\_{max}}N\_{t}}$ .