**Goin’ Fission**

Results:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start | 1st | 2nd | 3rd | 4th | 5th | 6th |
| 100 | 45 | 26 | 16 | 8 | 3 | 2 |

1. With a perfect 50/50 split, the numbers would be 100 -> 50 -> 25 -> 12.5 -> 6.25 -> 3.125 -> 1.5625. As I am writing this (25 June), the class averages are 100 -> 47 -> 18 -> 5 -> 1 -> 1 -> 1. This means that currently my results are closer to the expected value. As more people submit their results, I expect the class average to converge towards the expected value and become a more accurate estimate than my results. This is due to the law of large numbers (Wikipedia: “the average of the results obtained from a large number of trials should be close to the expected value and tends to become closer to the expected value as more trials are performed.”).

2. Three half-lives would have elapsed. In the sampled rock, the ratios for the daughter and parent isotopes would be 7/8 and 1/8 of the original amount. After one half-life the expected fraction is 1/2. After two it is 1/4, and after three the parent isotope is expected to be the observed value of 1/8.

3. Referring to the graph and extrapolating between the values for one and two half-lives, I would expect around 30% of the original isotope remains. The expected percentage can also be found using the formula 100 / 2n where n is the number of half-lives. Plugging 1.5 into this formula results in an expected value of 35.355% remaining.

4. With MATH! And SCIENCE! We shouldn’t have to stare at a sample of radioactive uranium for millions of years in order to estimate the half-life. If we isolate a pure sample (the bigger the better, law of large numbers and what not), we would be able to count the rate that the various types of decays are occurring over a span of minutes to hours. Once we have the rate, we plug that number into the half-life formula in order to get a number in years. We should also repeat this many times with different samples due to the probabilistic nature of decay.