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Decay Simulation

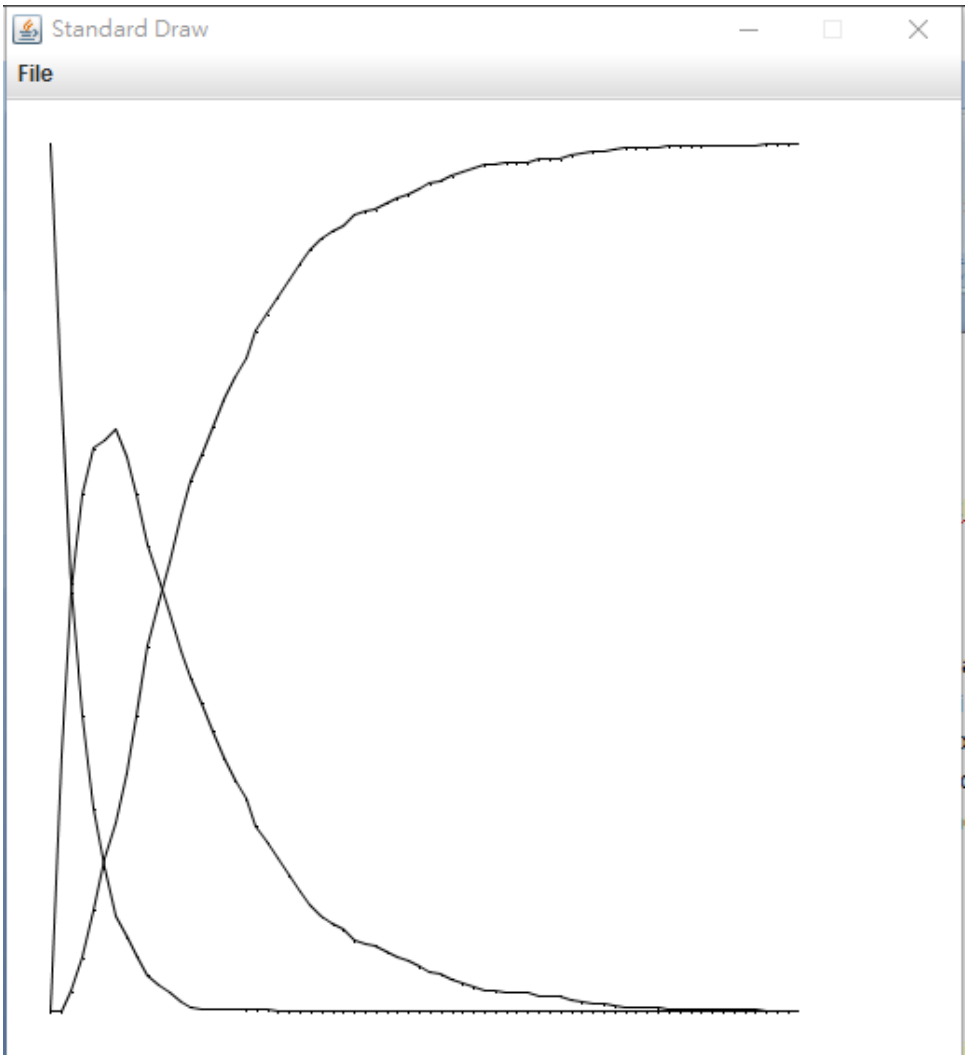
Introduction

Unstable nuclei continually undergo a process of disintegration called radioactive decay. Although it is impossible to tell exactly which nuclei in a sample will disintegrate, it is possible to predict, on average, the percentage of nuclei that will decay during a given time period. This percentage expressed as a decimal, is called the decay constant, λ. Mathematically, the decay process is modeled exponentially:

$$N = N_0 e^{-\lambda \tau}$$

Data

The input the initial number of atoms is 1000. The input P which is the probability of decay for A to B is 0.3. The input P, the probability of decay for B to C is 0.1.



Steps A B C

0 1000 0 0
1 706 294 0
2 494 482 24
3 342 596 62
4 234 649 117
5 165 658 177
6 111 671 218
7 86 639 275
8 64 596 340
9 42 537 421
10 31 499 470
11 22 459 519
12 12 416 572
13 5 384 611
14 3 356 641
15 3 323 674
16 3 292 705
17 3 266 731
18 2 245 753
19 2 214 784
20 2 195 803
21 0 177 823
22 0 157 843
23 0 138 862
24 0 122 878
25 0 110 890
26 0 101 899
27 0 95 905
28 0 82 918
29 0 78 922
30 0 76 924
31 0 69 931
32 0 63 937
33 0 59 941
34 0 52 948
34 0 52 948
35 0 46 954
36 0 43 957
37 0 38 962
38 0 32 968
39 0 28 972
40 0 25 975
41 0 24 976
42 0 23 977
43 0 23 977
44 0 22 978
45 0 18 982
46 0 18 982
47 0 18 982
48 0 14 986
49 0 11 989
50 0 10 990
51 0 9 991
52 0 6 994
53 0 5 995
54 0 5 995
55 0 5 995
56 0 4 996
57 0 3 997
58 0 3 997
59 0 3 997
60 0 3 997
61 0 2 998
62 0 2 998
63 0 2 998
64 0 2 998
65 0 2 998
66 0 1 999
67 0 1 999
68 0 1 999

The number of time steps was 69

Discussion & Conclusion

From the data above, we can see the rate of decay from A to B is higher than the rate of decay from B to C. In the diagram the peak is the point when the decay of B to C is starting to be higher than A to B, which is the 6^{th} step. When the decay get to the 21^{st} step A is decay to approaching 0.

After the simulation, I found out that this program can help us to calculate the life of radioactive from two different elements.