### Introduction

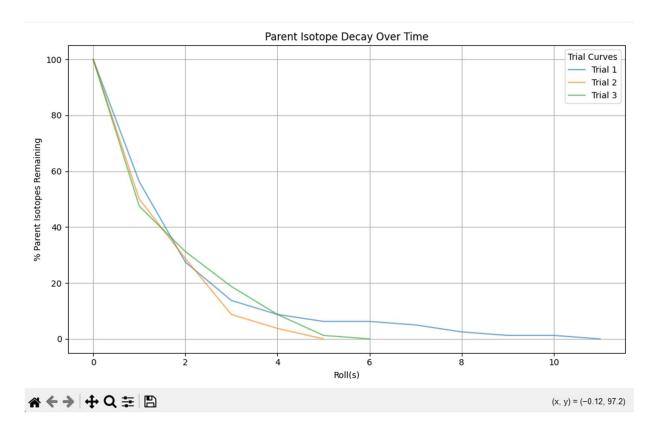
In this document, I'll walk you through what the program does if you run it. This example will show you the output if you choose the Odd/Even decay experiment and run 3 trials. You can, of course, choose more or fewer trials depending on what you want.

# **Odd/Even Example (3 Trials)**

After selecting the Odd/Even option and choosing 3 trials, the program will output something like this in the terminal:

	WELCOME TO THE DICE DECAY SIMULATION									
This	This simulation models radioactive decay using virtual dice.									
				parent isotopes' o						
			sage of time.		,					
Chaoc	o an evneni	mont to mun	(3 to exit):							
CHOOS	e an expert	ment to run	(3 to exit).							
		/ Even (Dau								
2: 1	-5 (Parent)	/ 6 (Daught	er)							
Enter	choice (1	on 2). 1								
Lincer	CHOICE (I	01 2). 1								
How m	any trials	do you want	to run? 3							
		(5 .)	- 6							
	rial 1 (Odd s) Dice Lef		Even (Daught Daughters	er)) === % Parents Left	% Daughters Left	Prob (decay)				
0	80	80	0	100.00	0.00	0.0000				
1	80	45	35	56.25	43.75	0.4375				
2	45	22	23	27.50	72.50	0.5111				
3	22	11	11 4	13.75	86.25	0.5000				
5	11 7	7 5	2	8.75 6.25	91.25 93.75	0.3636 0.2857				
6	5	5	9	6.25	93.75	0.0000				
7	5	4	1	5.00	95.00	0.2000				
8	ц	2	2	2.50	97.50	0.5000				
9	2	ī	ī	1.25	98.75	0.5000				
10	1	1	0	1.25	98.75	0.0000				
11	1	0	1	0.00	100.00	1.0000				
T		(D+) /	From (Dorocht							
	rial 2 (Odd s) Dice Lef		Even (Daught Daughters	er)) === % Parents Left	% Daughters Left	Prob (decay)				
0	80	80	0	100.00	0.00	0.0000				
1	89	40	40	50.00	50.00	0.5000				
2	40	23	17	28.75	71.25	0.4250				
3	23	7	16	8.75	91.25	0.6957				
4	7	3	4	3.75	96.25	0.5714				
5	3	0	3	0.00	100.00	1.0000				
=== T.	rial 3 (Odd	(Parent) /	Even (Daught	er)) ===						
	s) Dice Lef		Daughters	% Parents Left	% Daughters Left	Prob (decay)				
Θ	80	80	0	100.00	0.00	0.0000				
					F3 F0	0 5350				
1 2	80 38	38 25	42 13	47.50 31.25	52.50 68.75	0.5250 0.3421				
3	38 25	25 15	10	31.25 18.75	81.25	0.4000				
4	15	7	8	8.75	91.25	0.5333				
5	7	i	6	1.25	98.75	0.8571				
6	1	0	1	0.00	100.00	1.0000				

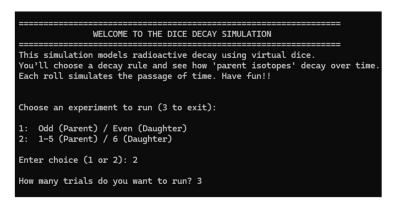
Once the simulation finishes, a graph window will pop up showing the decay curves for each trial:



### 1-5 / 6 Example (Different Decay Rule)

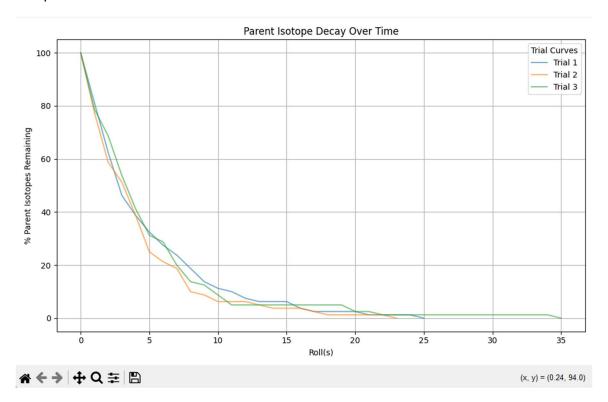
This example shows what happens if you choose the 1-5 (Parent) / 6 (Daughter) decay logic:

Upon launching the program, the terminal will display (I'm only showing the terminal output for trials 1-2, to show you the idea of what it'll look like):



=== Tri	al 1 (1-5 (F	Parent) / (	6 (Daughter)	) ===		
	Dice Left	Parents	Daughters	% Parents Left	% Daughters Left	Prob (decay)
0	80	80	Θ	100.00	0.00	0.0000
1	 80	 65	15	81.25	18.75	0.1875
2	65	50	15	62.50	37.50	0.2308
3	50	37	13	46.25	53.75	0.2600
4	37	31	6	38.75	61.25	0.1622
5	31	26	5	32.50	67.50	0.1613
6	26	22	4	27.50	72.50	0.1538
7	22	19	3	23.75	76.25	0.1364
8	19	15	й	18.75	81.25	0.2105
9	15	11	ī.	13.75	86.25	0.2667
10	11	9	2	11.25	88.75	0.1818
11	9	8	1	10.00	90.00	0.1111
12	8	6	2	7.50	92.50	0.2500
13	6	5	ī	6.25	93.75	0.1667
14	5	5	Đ	6.25	93.75	0.0000
15	5	5	9	6.25	93.75	0.0000
16	5	3	2	3.75	96.25	0.4000
17	3	2	1	2.50	97.50	0.3333
18	2	2	9	2.50	97.50	0.0000
19	2	2	Ö	2.50	97.50	0.0000
20	2	2	9	2.50	97.50	0.0000
21	2	ī	i	1.25	98.75	0.5000
22	1	ī	9	1.25	98.75	0.0000
23	1	ī	0	1.25	98.75	0.0000
24	ī	ī	Ö	1.25	98.75	0.0000
25	1	9	1	0.00	100.00	1.0000
			6 (Daughter)			
Roll(s)	Dice Left	Parents	Daughters	% Parents Left	% Daughters Left	Prob (decay)
					% Daughters Left 0.00	Prob (decay) 0.0000
Roll(s) 0	Dice Left	Parents	Daughters	% Parents Left 100.00 	0.00	0.0000
Roll(s) 0 1	Dice Left 80	Parents 80	Daughters 0	% Parents Left		
Roll(s) 0  1 2	Dice Left 80 80 80 62	Parents 80 	Daughters 0 18 15	% Parents Left 100.00  77.50 58.75	0.00 	0.0000  0.2250 0.2419
Roll(s) 0 1	Dice Left 80 80	Parents 80 62 47	Daughters 0 18	% Parents Left 100.00 77.50	0.00  22.50	0.0000  0.2250
Roll(s) 0  1 2 3	Dice Left 80 80 62 47	Parents 80 62 47 41	Daughters 0 18 15 6	% Parents Left 100.00 	0.00 	0.0000  0.2250 0.2419 0.1277
Roll(s) 0  1 2 3 4	80 62 47	Parents 80 62 47 41 31	Daughters 0 18 15 6 10	% Parents Left 100.00 	0.00 22.50 41.25 48.75 61.25	0.0000  0.2250 0.2419 0.1277 0.2439
Roll(s) 0  1 2 3 4 5	0 Dice Left 80 80 62 47 41 31	Parents 80 62 47 41 31 20	Daughters 0 18 15 6 10	% Parents Left 100.00 	0.00 22.50 41.25 48.75 61.25 75.00	0.0000 0.2250 0.2419 0.1277 0.2439 0.3548
Roll(s) 0  1 2 3 4 5 6	Dice Left 80 80 62 47 41 31	Parents 80 62 47 41 31 20	Daughters 0 18 15 6 10 11	% Parents Left 100.00 77.50 58.75 51.25 38.75 25.00 21.25	0.00 22.50 41.25 48.75 61.25 75.00 78.75	0.0000 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500
Roll(s) 0  1 2 3 4 5 6 7	80 80 62 47 41 31 20	Parents 80 62 47 41 31 20 17	Daughters 0 18 15 6 10 11 3 2	% Parents Left 100.00 	0.00 22.50 41.25 48.75 61.25 75.80 78.75 81.25	0.0000 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176
Roll(s) 0  1 2 3 4 5 6 7 8	Dice Left 80 80 62 47 41 31 20 17	Parents 80 62 47 41 31 20 17 15	Daughters 0 18 15 6 10 11 3 2	% Parents Left 100.00 77.50 58.75 51.25 38.75 25.00 21.25 18.75 10.00	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00	0.0000 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667
Roll(s) 0  1 2 3 4 5 6 7 8	Dice Left 80 62 47 41 31 20 17 15	Parents 80 62 47 41 31 20 17 15 8 7	Daughters 0 18 15 6 10 11 3 2 7	% Parents Left 100.00 777.59 58.75 51.25 38.75 25.00 21.25 18.75 10.00 8.75	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25	0.2050 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250
Roll(s) 0  1 2 3 4 5 6 7 8 9	Dice Left 80 62 47 41 31 20 17 15 8	Parents 80 62 47 41 31 20 17 15 8 7	Daughters 0 18 15 6 10 11 3 2 7 1	% Parents Left 100.00 77.50 58.75 51.25 38.75 51.25 18.75 10.00 8.75 6.25	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75	0.2050 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250
Roll(s) 0  1 2 3 4 5 6 7 8 9 10	80 62 47 41 31 20 175 88 7 7 5	Parents 80 62 47 41 31 20 17 15 8 7 5	Daughters 0  18 15 6 10 11 3 2 7 1	% Parents Left 100.00 77.50 58.75 51.25 38.75 25.60 21.25 18.75 10.00 8.75 6.25	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75	0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857
Roll(s) 0  1 2 3 4 5 6 7 8 9 10 11 12	Dice Left 80 80 62 47 41 31 20 17 15 8 7 5	Parents 80 62 47 41 20 17 15 8 7 5	Daughters 0  18 15 6 10 11 3 2 7 1 2 0	% Parents Left 100.00 77.50 58.75 51.25 38.75 25.00 21.25 18.75 10.00 8.75 6.25 6.25 6.25	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75	0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000
Roll(s) 0 1 2 3 4 5 6 7 8 9 10 11 12 13	80 62 47 41 31 20 17 15 8 7 5 5 5 5 5	Parents 80 62 47 41 31 20 15 8 7 5 5	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0	% Parents Left 100.00 77.50 58.75 51.25 38.75 51.25 18.75 10.00 8.75 6.25 6.25 6.25 6.25 5.00	9.00	0.0000  0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.0000 0.2000
Roll(s) 0  1 2 3 4 5 6 7 8 9 10 11 12 13	80 62 47 41 20 17 15 8 7 5 5 5 5 4	Parents 80 62 47 41 31 20 17 15 8 7 5 5 5	Daughters 0  18 15 6 10 3 2 7 1 2 0 0 1	% Parents Left 100.00 777.50 58.75 51.25 38.75 25.00 21.25 18.75 10.00 8.75 6.25 6.25 6.25 5.00	0.00 22.50 41.25 48.75 61.25 78.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 93.75 95.00 96.25	0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.0000 0.2500
Roll(s) 0  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	0 Dice Left 80 80 62 47 41 31 20 17 15 8 7 5 5 5	Parents 80 62 41 31 20 17 15 8 7 5 5 5 4 3 3	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1	% Parents Left 100.00 77.50 58.75 51.25 38.75 51.25 18.75 10.00 21.25 18.75 10.00 8.75 6.25 6.25 6.25 6.25 5.00 3.75	0.00  22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 93.75 95.00 96.25	0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.2000 0.2000
Roll(s) 0  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Dice Left 80 80 80 62 47 41 20 17 55 5 4 3 3	Parents 80 62 47 41 31 20 17 15 8 7 5 5 5 4 3 3 3	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1 1 0	% Parents Left 100.00 77.50 58.75 51.25 38.75 51.25 18.75 10.00 8.75 6.25 6.25 6.25 6.25 5.00 3.75 3.75	9.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 93.75 93.75 95.00 96.25 96.25	0.0000  0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.0000 0.2500 0.2500 0.0000 0.0000
Roll(s) 0 	Dice Left 80 80 62 47 41 20 17 15 8 7 5 5 4 3 3 3	Parents 80 62 47 41 31 20 17 15 8 7 5 5 5 5 4 3 3 3 3	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1	% Parents Left 100.00  77.50 58.75 51.25 38.75 52.00 21.25 18.75 10.00 8.75 6.25 6.25 6.25 5.00 3.75 3.75 3.75	0.00  22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 95.00 96.25 96.25 96.25 97.50	0.2050 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.2000 0.2500 0.0000 0.0000 0.3333
Roll(s) 0  1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Dice Left 80  80  80  62  41  31  20  17  15  8  7  5  4  3  3  3	Parents 80 62 47 41 31 20 17 15 8 7 5 5 5 5 5 4 3 3 3 3 2	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1 1 1	% Parents Left 100.00  77.50 58.75 51.25 38.75 51.25 18.75 10.00 21.25 18.75 10.00 8.75 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.2	9. 00 9 22. 50 41. 25 48. 75 61. 25 75. 00 78. 75 81. 25 90. 00 91. 25 93. 75 93. 75 93. 75 95. 00 96. 25 96. 25 96. 25 96. 25 97. 50 98. 75	9.0000  0.2250 9.2419 9.1277 9.2439 9.3548 9.1500 9.1176 9.4667 9.1250 9.2857 9.0000 9.0000 9.2500 9.2500 9.0000 9.3333 9.5000
Roll(s) 0 	Dice Left 80  80  62 47 41 20 17 15 8 7 5 5 4 3 3 3 2 1	Parents 80 62 417 411 31 20 17 15 8 7 5 5 5 5 4 3 3 2 1 1 1	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1 1 1 0	% Parents Left 100.00  77.50 58.75 51.25 38.75 25.80 21.25 18.75 10.80 8.75 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.2	0.00  22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 93.75 95.00 96.25 96.25 96.25 97.50 98.75	0.0000  0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.4250 0.2857 0.0000 0.0000 0.2500 0.0000 0.3333 0.5000 0.0000
Roll(s) 0 	Dice Left 80  80  80  62 47 41 31 20 17 15 8 7 5 5 4 3 3 3 2 1	Parents 80 62 47 411 31 20 17 15 8 7 5 5 5 5 4 3 3 3 2 1	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1 1 1 0 0	% Parents Left 100.00  77.50 58.75 51.25 38.75 51.25 18.75 10.00 21.25 18.75 10.00 3.75 6.25 6.25 6.25 6.25 5.00 3.75 3.75 3.75 3.75 2.50 1.25	0.00 22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 95.00 96.25 96.25 96.25 97.50 98.75	0.2050 0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4667 0.1250 0.2857 0.0000 0.2500 0.0000 0.0000 0.3333 0.5000 0.0000 0.0000
Roll(s) 0 	Dice Left 80  80  62 47 41 20 17 15 8 7 5 5 4 3 3 3 2 1	Parents 80 62 417 411 31 20 17 15 8 7 5 5 5 5 4 3 3 2 1 1 1	Daughters 0  18 15 6 10 11 3 2 7 1 2 0 0 1 1 1 0 0 0	% Parents Left 100.00  77.50 58.75 51.25 38.75 51.25 18.75 10.00 21.25 18.75 6.25 6.25 6.25 6.25 6.25 6.25 6.25 6.2	0.00  22.50 41.25 48.75 61.25 75.00 78.75 81.25 90.00 91.25 93.75 93.75 93.75 93.75 95.00 96.25 96.25 97.50 98.75 98.75 98.75	0.0000  0.2250 0.2419 0.1277 0.2439 0.3548 0.1500 0.1176 0.4250 0.2857 0.0000 0.2000 0.2500 0.2500 0.0000 0.3333 0.5000 0.0000 0.0000 0.0000 0.0000

And then the program will generate a graph showing the decay curves for this logic setup:



### **Pushing the Limits (Large Number of Trials)**

Now, for fun, let's push the limits a little. Here, I chose option 2 (1-5 / 6) but ran 9,999 trials.

Note: The number of trials you can run depends on the processing power of your computer. It may take a few minutes (or longer) to process large numbers like this.

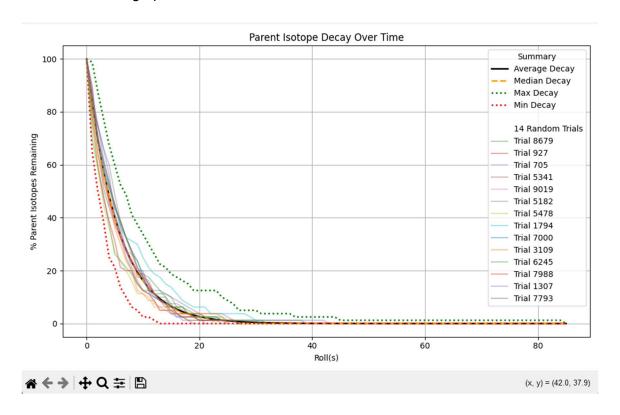
The terminal will output a lot of data, every single trial and the information associated to it, but for this example, I'm only showing the output for trial number 9,999 (because I'm sure you don't want to scroll through all of them!).

=== Trial 9999 (1-5 (Parent) / 6 (Daughter)) ===							
Roll(s)	Dice Left	Parents	Daughters	% Parents Left	% Daughters Left	Prob (decay)	
0	80	80	0	100.00	0.00	0.0000	
1	80	67	13	83.75	16.25	0.1625	
2	67	58	9	72.50	27.50	0.1343	
3	58	52	6	65.00	35.00	0.1034	
4	52	41	11	51.25	48.75	0.2115	
5	41	35	6	43.75	56.25	0.1463	
6	35	29	6	36.25	63.75	0.1714	
7	29	23	6	28.75	71.25	0.2069	
8	23	16	7	20.00	80.00	0.3043	
9	16	13	3	16.25	83.75	0.1875	
10	13	8	5	10.00	90.00	0.3846	
11	8	5	3	6.25	93.75	0.3750	
12	5	5	Θ	6.25	93.75	0.0000	
13	5	2	3	2.50	97.50	0.6000	
14	2	2	Θ	2.50	97.50	0.0000	
15	2	2	Θ	2.50	97.50	0.0000	
16	2	2	Θ	2.50	97.50	0.0000	
17	2	1	1	1.25	98.75	0.5000	
18	1	1	Θ	1.25	98.75	0.0000	
19	1	1	Θ	1.25	98.75	0.0000	
20	1	Θ	1	0.00	100.00	1.0000	

Then the program will plot a graph displaying:

- -The Average decay curve
- The Median decay curve
- The Maximum and Minimum decay curves
- Plus 14 random trials to illustrate the decay paths

Here's what that graph would look like:



# **Final Thoughts**

Hopefully, this walkthrough gives you a good idea of what this program can do!

Whether you're running a few trials or thousands, the simulator is built to adapt and display the results cleanly.

If you run into any bugs, have suggestions, or just want to say hi, feel free to open an issue thread on GitHub!

Have fun and good luck with your experiments!