Description:

In this project I have written a Python program that estimates the area of a triangle by randomly placing points within a square of user input length. The triangle is of equal height and width to the square and with a hypotenusal line dividing the square in half by connecting adjacent corners. It is clear to any reader that the real area of the triangle would just be half that of the square which can easily be determined given the side length. However, the purpose of this program is simply estimation based on recursive plotting, so the effectiveness still stands.

Experimental Data:

Side Length:	Actual:	Trial 1:	Trial 2:	Trial 3:	Avg. % Error:			Key:
1	0.5	0.4882	0.4968	0.4944	-4.12			+1 % ERROR
2	2	2.0148	1.994	2.0268	1.78			+0.1% ERROR
3	4.5	4.4406	4.4307	4.473	-3.46			-1 % ERROR
4	8	8.0928	7.9008	8.1024	1.2			-0.1% ERROR
5	12.5	12.6225	12.485	12.4875	0.76			
6	18	17.8128	17.7768	17.8056	-3.36			
7	24.5	24.1276	24.1913	24.549	-2.58			
8	32	32.0448	32.0256	31.9872	0.18			
9	40.5	40.3704	40.6863	40.7187	0.68			
10	50	50.07	48.76	49.09	-4.16			
11	60.5	62.1214	60.5484	61.1897	3.9			
12	72	72.3456	70.2864	72.6048	-1.06			
13	84.5	84.6859	84.1789	83.993	-0.76			
14	98	96.6476	99.0976	96.2164	-2.08			
15	112.5	113.1525	113.6925	110.9475	0.26			
16	128	127.8208	127.2064	128.7424	-0.18			
17	144.5	143.7775	142.5059	144.2688	-2.04			
18	162	162.1944	164.106	164.1708	2.76			
19	180.5	186.276	181.583	179.9224	3.48			
20	200	200.28	199.6	199.84	-0.14			
					Avg. % Error Spread:	-0.447		

**Fig Above Demonstrates Error Spread with 3 Runs of 10,000 Trials*

Side Length:	Actual:	100 Trials	1,000 Trials	10,000 Trials	1,000,000 Trials			Key:
1	0.5	0.46	0.509	0.5	0.5001			+1 % ERROR
2	2	2.08	1.94	2.012	1.9987			+0.1% ERROR
3	4.5	4.05	4.203	4.5063	4.4949			-1 % ERROR
4	8	8.64	8.192	8.0224	8.0056			-0.1% ERROR
5	12.5	13.5	12.675	12.415	12.4826			
6	18	19.44	18.288	18.0864	17.9902			
7	24.5	24.99	24.157	24.4167	24.4608			
8	32	29.44	31.936	31.552	31.9791			
9	40.5	36.69	40.419	40.7025	40.546			
10	50	54	48	51.13	49.989			

**Fig Above Demonstrates Increased Accuracy Given More Trials*

Analysis:

This model was fairly accurate. Based on testing shown in the first figure there seemed to be a slight bias towards underguessing, however with such a slim margin at –0.447% error and given such a small sample size this finding is far from concrete. Further testing did reveal, however, increased accuracy with higher trial numbers. This can be seen in the second figure by comparing the number of values with error percentages at 1% and 0.1%.