

## Project #01- Monte Carlo Simulation

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**Project Number:** 01

**Project Name:** Monte Carlo Simulation

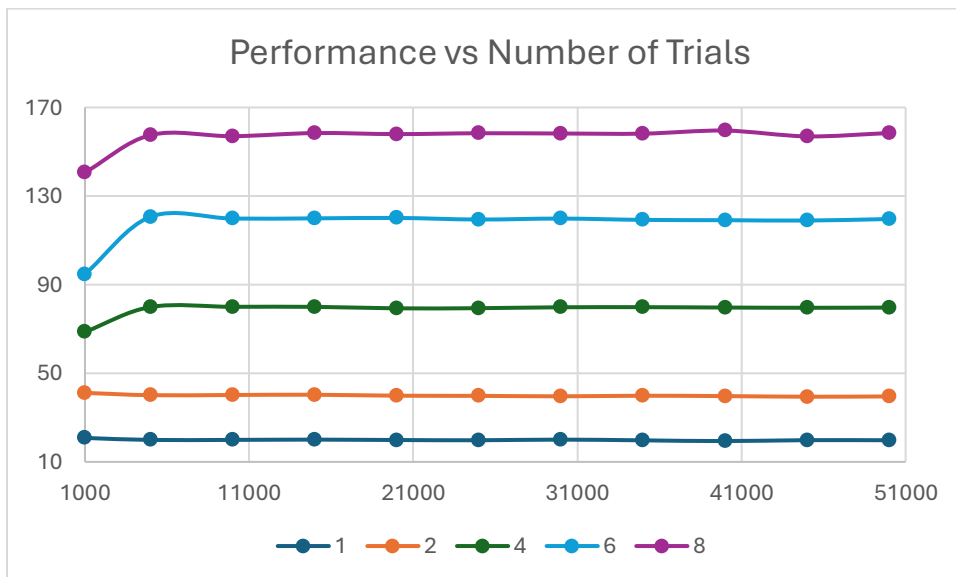


### 1. Provide a close estimate of the actual probability

	1000	5000	10000	15000	20000	25000	30000	35000	40000	45000	50000
1	20.83	19.91	19.94	20.05	19.87	19.77	20.06	19.73	19.4	19.81	19.78
2	41.15	40.11	40.21	40.31	39.88	39.81	39.61	39.87	39.7	39.42	39.56
4	68.68	79.93	80	79.99	79.32	79.39	79.8	79.85	79.68	79.57	79.65
6	94.75	120.67	119.83	119.93	120.12	119.42	119.84	119.24	119.11	118.95	119.64
8	140.62	157.56	157.02	158.44	157.97	158.36	158.24	158.17	159.56	156.95	158.44

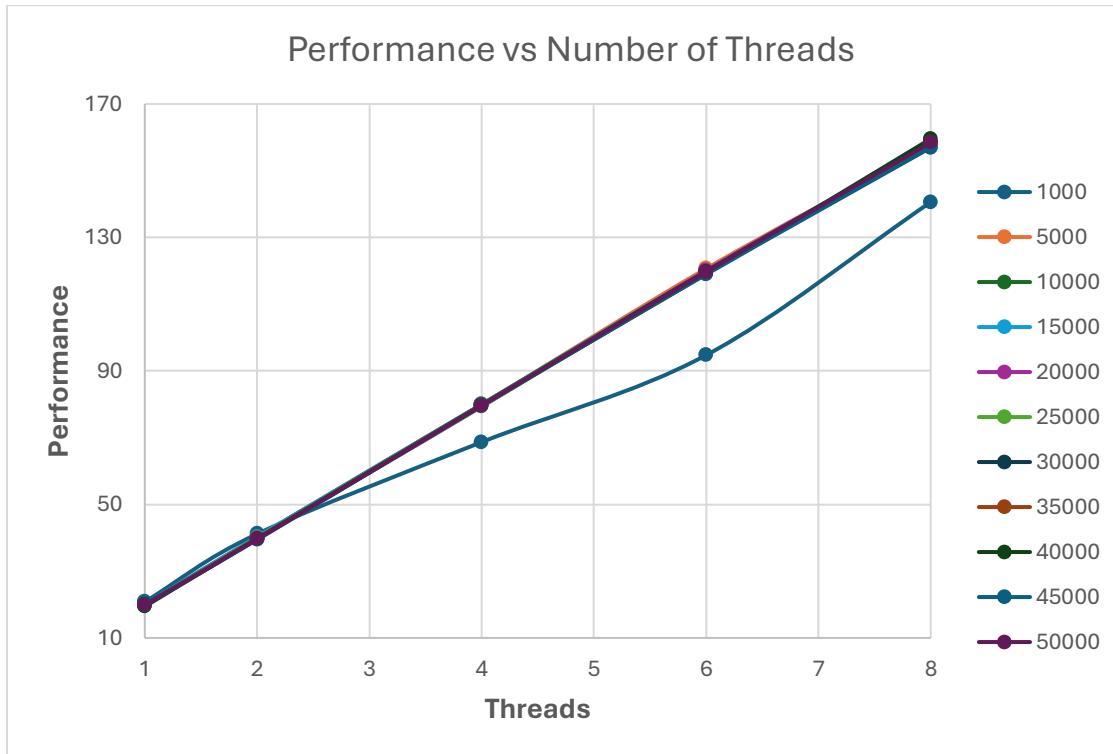
The actual probability based on the maximum performance and the number of trials is **23.35%** .

### 2. Good graph of performance vs number of trials



The graph shows how performance (MegaTrials/Sec) changes when we increase the number of trials.

### 3. Good graph of performance vs number of threads



The graph shows how performance (MegaTrials/Sec) changes with different number of threads.

### 4. Compute $F_p$ , the Parallel Fraction

To calculate  $F_{\text{parallel}}$ , we use this formula from Amdahl's Law.

$$F_p = \frac{N}{N-1} \cdot \left(1 - \frac{1}{S}\right)$$

Number of Threads = 8

Speedup = performance with 8 threads / performance with 1 thread

I have considered the performances for the 45000 trials

$$S = 156.95/19.81$$

$$S = 7.92$$

$$F_p = 8/7 * (1 - 1/7.92)$$

$$F_p = 0.998$$

### **5. Compute Smax, the maximum Speedup**

$$S_{max} = 1/(1 - F_p)$$

$$= 1/(1 - 0.998)$$

$$= 1/0.002$$

$$= 500$$