Project 1

Monte Carlo Experiment

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The results of the execution of the program are as follows:

Threads	NumTrials	Probability	Max Performance
1	1	0	0.53
1	10	20	2.76
1	100	26	9.25
1	1000	30.8	9.35
1	10000	28.82	9.55
1	100000	29.33	21.75
1	500000	29.07	21.65
1	1000000	29	21.73
2	1	0	0.24
2	10	30	1.91
2	100	26	11.75
2	1000	29.8	18.45
2	10000	29.13	17.07
2	100000	29.08	25.99
2	500000	29.11	41.49
2	1000000	29.03	41.53
4	1	100	0.21
4	10	30	2.3
4	100	31	12.79
4	1000	31	35.48
4	10000	30.01	35.09
4	100000	29.14	41.46
4	500000	29.15	81.54
4	1000000	29.1	81.19
8	1	0	0.21
8	10	20	1.96
8	100	28	19.9
8	1000	28.3	59.68
8	10000	28.88	68.81
8	100000	29.06	77.28
8	500000	29.08	98.42
8	1000000	29.12	124.03
12	1	0	0.15
12	10	50	1.79
12	100	28	15.95
12	1000	27.8	48.95
12	10000	29.14	104.78
12	100000	29.1	101.17
12	500000	28.95	147.63
12	1000000	29.06	194.42
16	1	0	0.11

16	10	30	1.38
16	100	28	13.05
16	1000	29.1	59.07
16	10000	29.47	79.4
16	100000	29.21	135.39
16	500000	29.26	178.08
16	1000000	29.21	226.85
20	1	100	0.11
20	10	20	1.32
20	100	26	11.32
20	1000	30.7	58.75
20	10000	29.57	109.78
20	100000	29.24	116.58
20	500000	29.18	174.41
20	1000000	29.23	212.15
24	1	0	0.1
24	10	20	0.9
24	100	26	10.35
24	1000	30.5	61.18
24	10000	29.14	123.65
24	100000	28.97	138.95
24	500000	29	177.62
24	1000000	29.04	229.87
32	1	100	0.09
32	10	30	1
32	100	40	8.74
32	1000	29.6	0.43
32	10000	29.61	202.68
32	100000	29.06	236.96
32	500000	29.23	224.61
32	1000000	29.16	264.03

Pivot Table:

	A	B	C	D	E	F	G	H	I	J
1						**NumTrials**				
2			**1**	**10**	**100**	**1000**	**10000**	**100000**	**500000**	**1000000**
3		1	0.53	2.76	9.25	9.35	9.55	21.75	21.65	21.73
4		2	0.24	1.91	11.75	18.45	17.07	25.99	41.49	41.53
5		4	0.21	2.3	12.79	35.48	35.09	41.46	81.54	81.19
6		8	0.21	1.96	19.9	59.68	68.81	77.28	98.42	124.03
7	Threads	12	0.15	1.79	15.95	48.95	104.78	101.17	147.63	194.42
8		16	0.11	1.38	13.05	59.07	79.4	135.39	178.08	226.85
9		20	0.11	1.32	11.32	58.75	109.78	116.58	174.41	212.15
10		24	0.1	0.9	10.35	61.18	123.65	138.95	177.62	229.87
11		32	0.09	1	8.74	0.43	202.68	236.96	224.61	264.03

Graph for Performance vs Number of Trials:
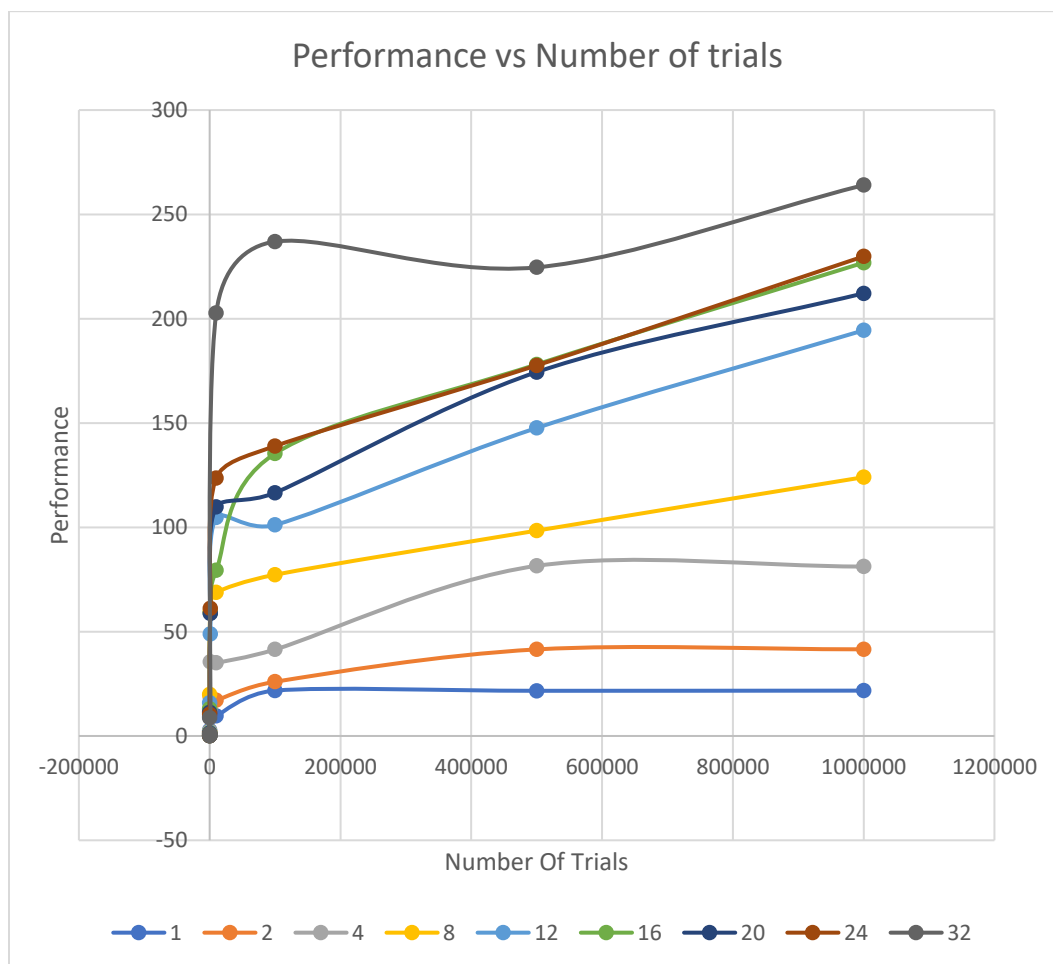
We can see that initially as the Number of trials were less, the performance was also less. But as the requirement increased, the performance also increased.

Graph for Performance vs Number of Cores:
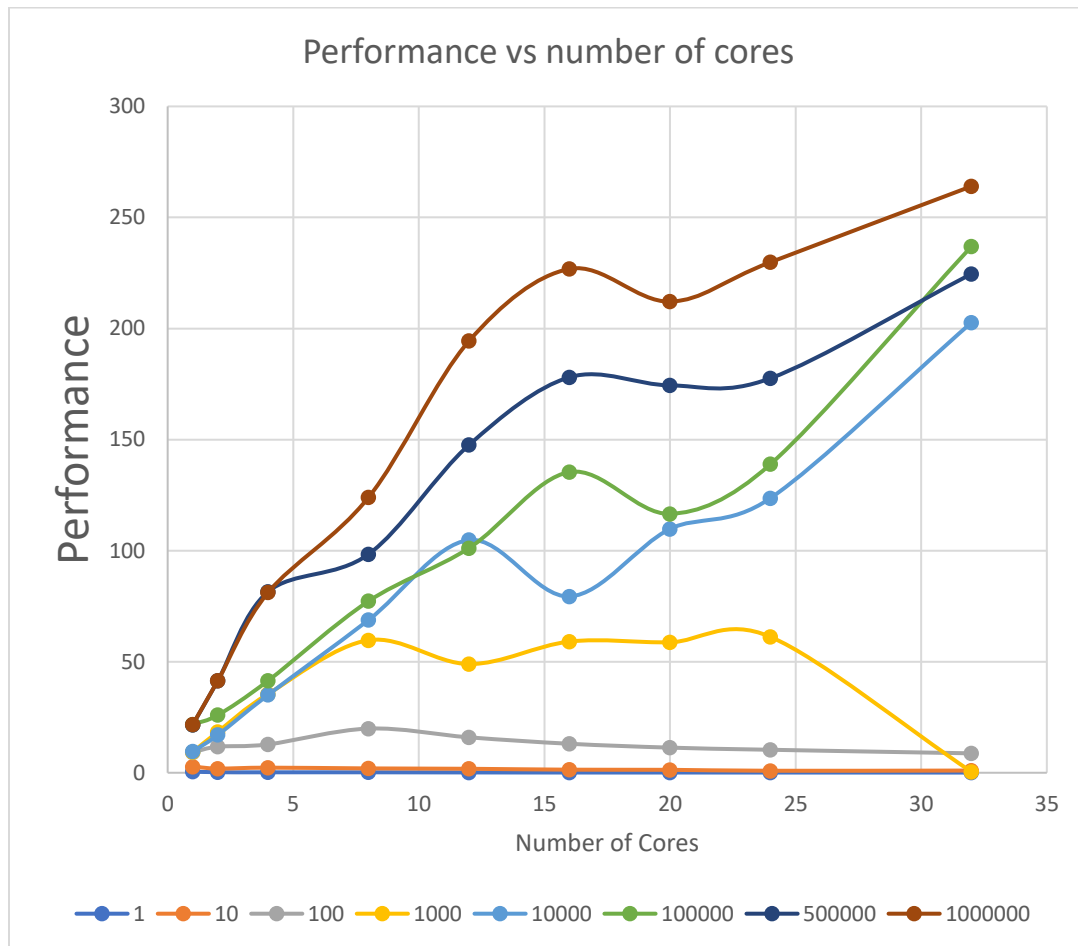
We can see that as the number of cores increased for the number of trials, the performance increased by a good margin. But we can observe a drop in performance for an instance in every case, this is because the GPU isn't dedicated to only this task. Hence, other task also require the GPU which dips the performance.

Probability:

34	12	1	0	0.15
35	12	10	50	1.79
36	12	100	28	15.95
37	12	1000	27.8	48.95
38	12	10000	29.14	104.78
39	12	100000	29.1	101.17
40	12	500000	28.95	147.63
41	12	1000000	29.06	194.42

We can see in the above example that the probability got stagnated around 29 after performing higher number of numTrials. This justifies that the highest probability of this approximately 29.

Parallel Fraction:

To compute the Parallel fraction, the first process is to calculate speedup,

Speedup(S) = Performance with 32 threads / Performance with 1 thread

Speedup(S) = 264.03/21.73 = 12.15048

Now, Calculating the Parallel Fraction

Fp(n,S) = n(1-1/S) / (n-1) = 32(1-1/12.15048)/(32-1) = ~0.94730190932