COL380 Report- Assignment 1

(i) The speedup and efficiency of both parallel versions for 2, 4, 8 threads for N=10^3, N=10^5, and N=10^7 numbers.

N	**Number of threads**	**Strategy 0**		**Strategy 1**	
		Speedup	**Efficiency**	**Speedup**	**Efficiency**
10^3	2	0.936	0.468	0.88	0.44
	4	0.92	0.23	0.82	0.205
	8	0.88	0.44	0.83	0.415
10^5	2	0.96	0.48	0.93	0.465
	4	1.009	0.2522	0.95	0.2375
	8	1.012	0.1265	0.97	0.1162
10^7	2	0.97	0.485	0.91	0.455
	4	1.03	0.2575	1.02	0.255
	8	1.17	0.14625	1.13	0.1412

As we can see from the table in strategy 0, for lower values of N, the parallelization doesn’t give a good speedup but as we increase N and t, the speedup approaches 1 and finally crosses it. Strategy 1 is slower than strategy 0 because of the considerably large number of load and store operations being done in the memory in strategy1.
As we can see from the data above, threads don’t really help when N=10^3, but as N increases, more number of threads is giving a better speedup. For, low values of N, parallelizing means overhead computation which balances the little advantage in computation balances, but as N increases, the advantage in computation overpowers overhead and we can observe speedup.

(ii) According to Amdahl’s Law, Unless the entire serial program is parallelized, the possible speedup is going to be limited regardless of the number of processors by the sequential component(unparalleled fraction) of a program. So,

$$\mathbf{S \leq T_{serial} / ((1\text{-}f) * T_{serial}}$$

In this problem, one loop in which we are creating the array a is the sequential component of the program and the part which is computing the sum is the parallelized fraction. Both in strategy 1 and 0, these parts each do N number of addition operations, hence the parallelizes fraction can be taken as 0.5. Putting the value of f in the equation, we get:

$S \leq T_{serial} / ((1-f) * T_{serial}$

$S \leq 1/ (1-f)$

$S \leq 1/ (1-0.5)$

$S \leq 1/ 0.5$

$S \leq 2$

We can see in the table that in each case, the value of speedup is less than 2, so it follows Amdahl's law.