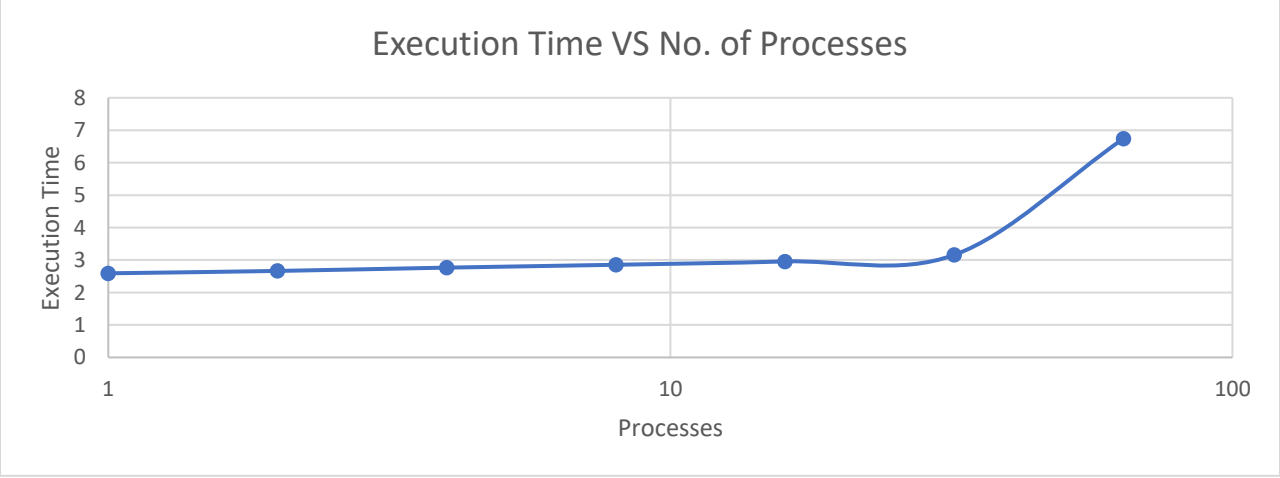
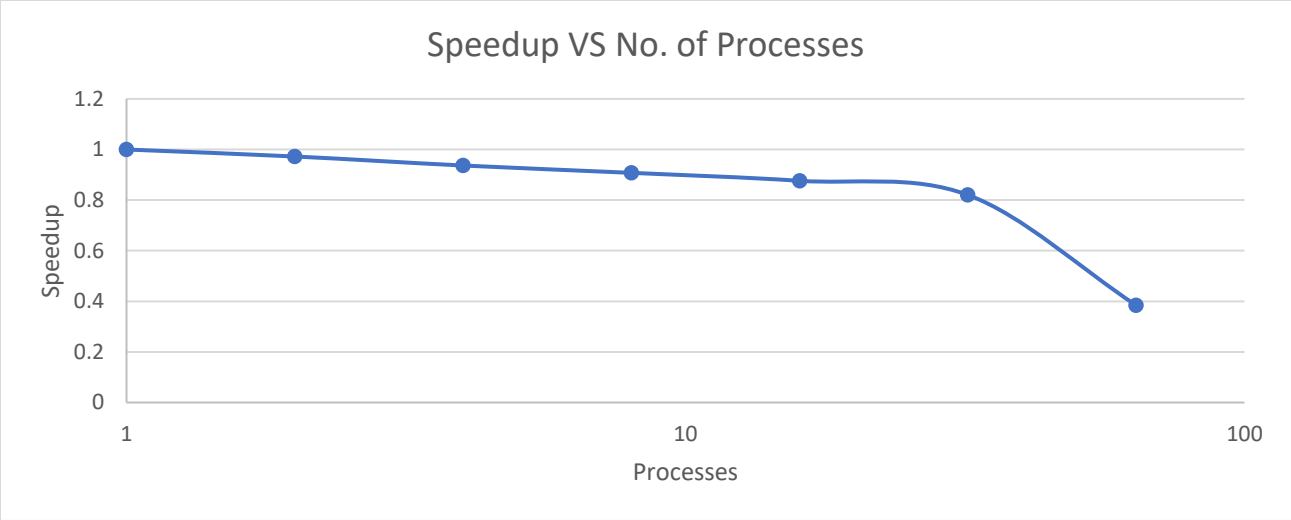
1:

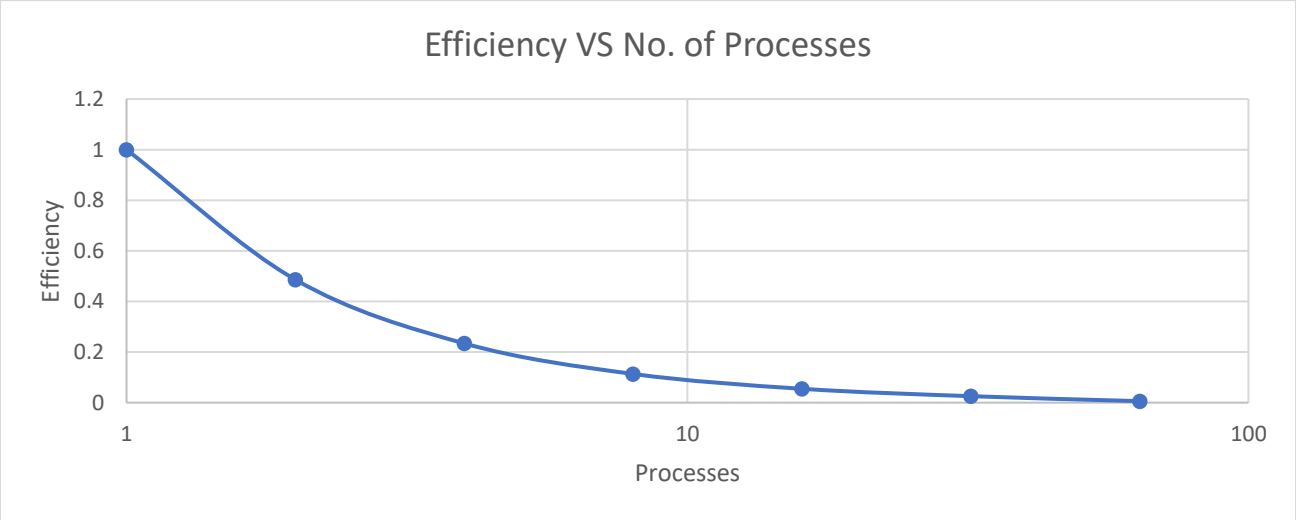
```
[sedupuganti@grace2 HW4-735]$ mpirun -np 2 ./qsort_hypercube.exe 4 -1
[Proc: 0] number of processes = 2, initial local list size = 4, hypercube quicksort time = 0.003488
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace2 HW4-735]$ mpirun -np 4 ./qsort_hypercube.exe 4 -2
[Proc: 0] number of processes = 4, initial local list size = 4, hypercube quicksort time = 0.004341
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace2 HW4-735]$ mpirun -np 8 ./qsort_hypercube.exe 4 -1
[Proc: 0] number of processes = 8, initial local list size = 4, hypercube quicksort time = 0.014173
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace2 HW4-735]$ mpirun -np 16 ./qsort_hypercube.exe 4 0
[Proc: 0] number of processes = 16, initial local list size = 4, hypercube quicksort time = 0.007746
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace2 HW4-735]$ mpirun -np 16 ./qsort_hypercube.exe 20480000 0
[Proc: 0] number of processes = 16, initial local list size = 20480000, hypercube quicksort time = 2.554811
[Proc: 0] Congratulations. The list has been sorted correctly.
```

2: Weak Scalability Study

n	p	time	speedup	efficiency
20480000	1	2.591886	1	1
20480000	2	2.665558	0.972362	0.486181
20480000	4	2.767076	0.936688	0.234172
20480000	8	2.855262	0.907758	0.11347
20480000	16	2.957713	0.876314	0.05477
20480000	32	3.159122	0.820445	0.025639
20480000	64	6.741584	0.384462	0.006007

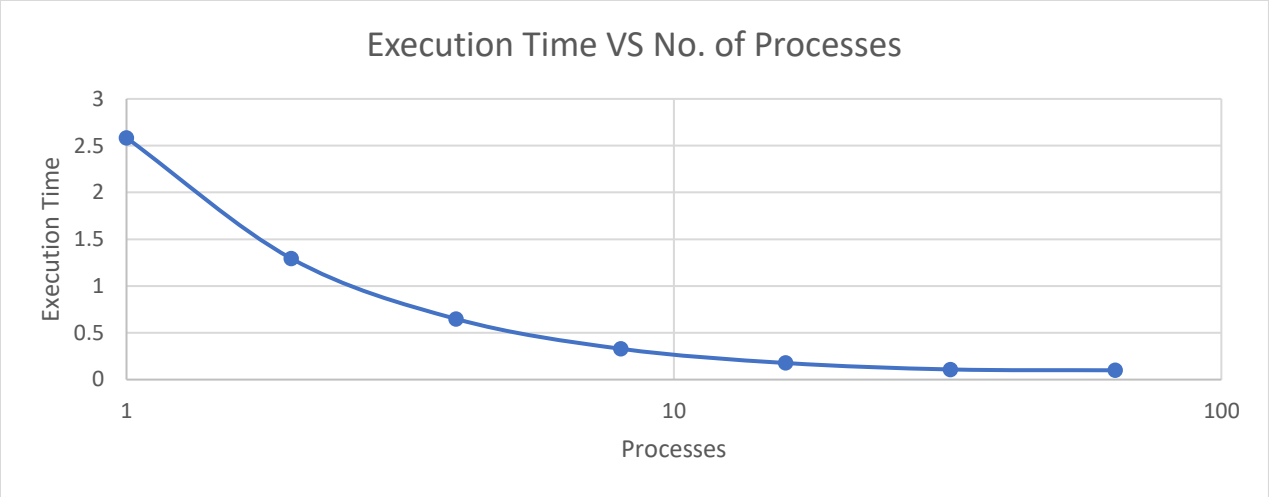


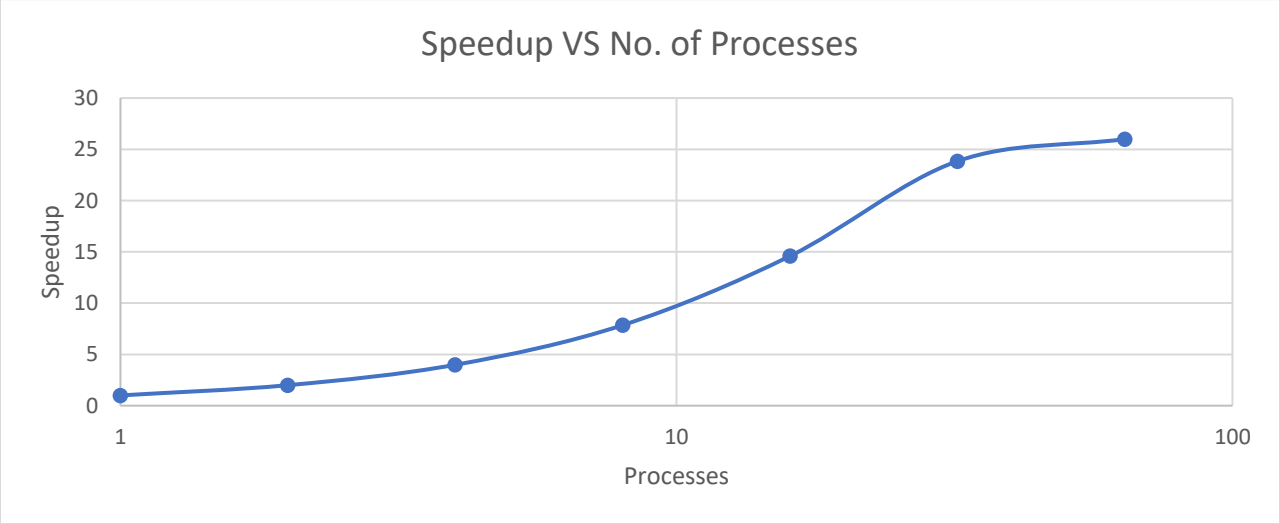


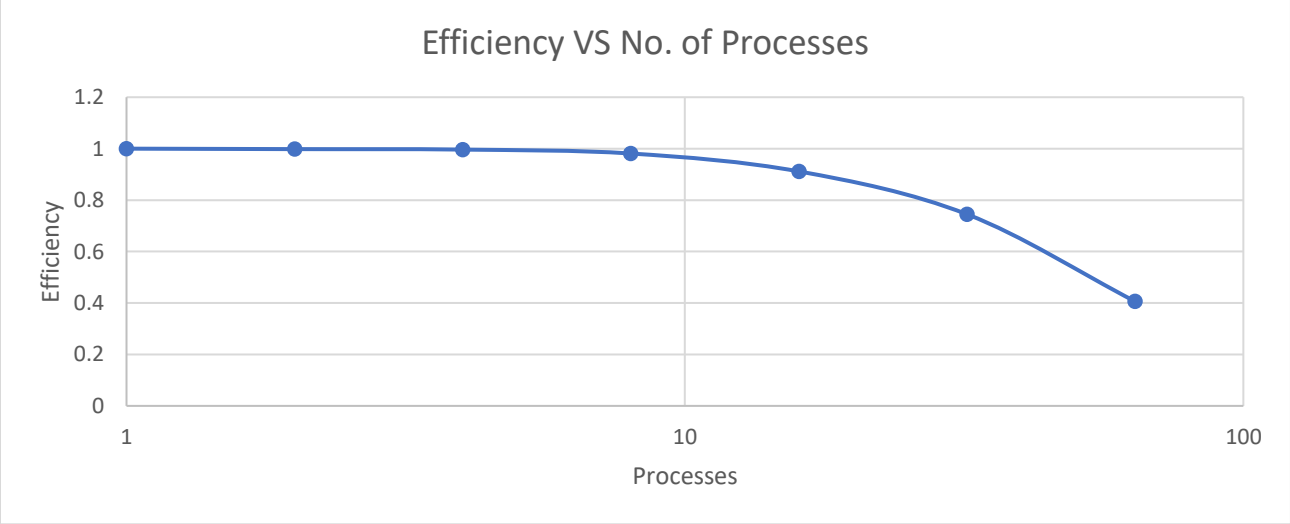


3: Strong Scalability Study

n	p	time	speedup	efficiency
20480000	1	2.584063	1	1
10240000	2	1.294288	1.996513	0.998257
5120000	4	0.648358	3.98555	0.996387
2560000	8	0.329224	7.848951	0.981119
1280000	16	0.177175	14.58481	0.91155
640000	32	0.108402	23.83778	0.744931
320000	64	0.099418	25.9919	0.406123


Execution Time VS No. of Processes
Execution Time
3
2.5
2
1.5
1
0.5
0
1
10
100
Processes


Speedup VS No. of Processes
Speedup
30
25
20
15
10
5
0
1
10
100
Processes


Efficiency VS No. of Processes
Efficiency
1.2
1
0.8
0.6
0.4
0.2
0
1
10
100
Processes

4:

```
[sedupuganti@grace5 HW4-735]$ mpirun -np 2 ./qsort_hypercube_descending.exe 4 -1
[Proc: 0] number of processes = 2, initial local list size = 4, hypercube quicksort time = 0.001712
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace5 HW4-735]$ mpirun -np 4 ./qsort_hypercube_descending.exe 4 -2
[Proc: 0] number of processes = 4, initial local list size = 4, hypercube quicksort time = 0.007118
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace5 HW4-735]$ mpirun -np 8 ./qsort_hypercube_descending.exe 4 -1
[Proc: 0] number of processes = 8, initial local list size = 4, hypercube quicksort time = 0.003615
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace5 HW4-735]$ mpirun -np 16 ./qsort_hypercube_descending.exe 4 0
[Proc: 0] number of processes = 16, initial local list size = 4, hypercube quicksort time = 0.006847
[Proc: 0] Congratulations. The list has been sorted correctly.
[sedupuganti@grace5 HW4-735]$ mpirun -np 16 ./qsort_hypercube_descending.exe 20480000 0
[Proc: 0] number of processes = 16, initial local list size = 20480000, hypercube quicksort time = 2.666604
[Proc: 0] Congratulations. The list has been sorted correctly.
```