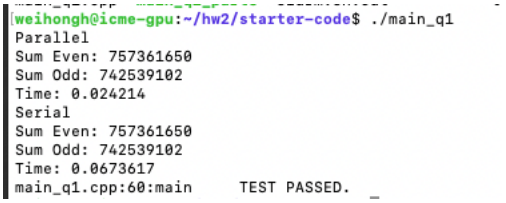
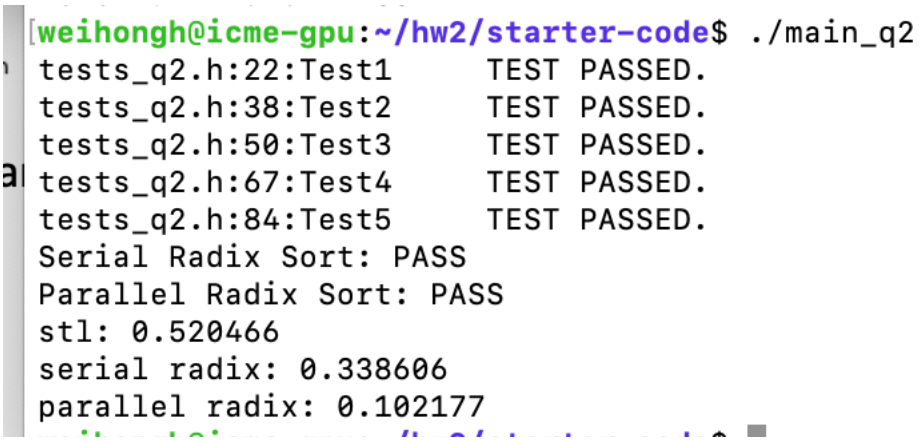
CME 213 Homework 2

P1.1



We see that parallelizing the operation resulted in a 3 times faster run time

P2.1-2.5



P2.6

We can see from the following table that 8 threads and 8 blocks give us optimal timing of 0.015 seconds. There's no significant improvement as we increase beyond 8 threads, but performance did decrease significantly if we goes below 8 threads.
Similarly, lower blocks below 8 significantly increases performance time, while increasing beyond 8 will increase performance time(not as significantly).

```
[weihongh@icme-gpu:~/hw2/starter-code$ srun --cpus-per-task=16 -p CME main_q2_part6
tests_q2.h:22:Test1     TEST PASSED.
tests_q2.h:38:Test2     TEST PASSED.
tests_q2.h:50:Test3     TEST PASSED.
tests_q2.h:67:Test4     TEST PASSED.
tests_q2.h:84:Test5     TEST PASSED.
Serial Radix Sort: PASS
Parallel Radix Sort: PASS
stl: 0.310644
serial radix: 0.0462193
parallel radix: 0.0322174
Threads Blocks / Timing
         1       2       4       8      12      16      24      32      40      48
   1    0.059   0.057   0.057   0.061   0.064   0.064   0.077   0.073   0.079   0.083
   2    0.055   0.044   0.043   0.044   0.053   0.049   0.043   0.042   0.056   0.054
   4    0.056   0.044   0.026   0.021   0.028   0.023   0.032   0.029   0.032   0.044
   8    0.060   0.036   0.025   0.015   0.018   0.016   0.023   0.023   0.025   0.037
  12    0.061   0.041   0.027   0.018   0.019   0.021   0.022   0.026   0.029   0.037
  16    0.062   0.043   0.030   0.020   0.019   0.018   0.024   0.026   0.030   0.041
  24    0.059   0.043   0.038   0.025   0.024   0.024   0.029   0.028   0.030   0.045
  32    0.062   0.047   0.035   0.026   0.025   0.025   0.029   0.033   0.035   0.040
  40    0.070   0.045   0.037   0.025   0.023   0.023   0.028   0.029   0.029   0.043
  48    0.062   0.044   0.037   0.023   0.024   0.025   0.027   0.028   0.034   0.041
Benchmark runs: PASS
```

submission

```
[weihongh@cardinal2:~/hw2/starter-code$ /afs/ir.stanford.edu/class/cme213/script/]
submit.py hw2 .
Submission for assignment 'hw2' as user 'weihongh'
Attempt 1/10
Time stamp: 2022-04-19 15:35
List of files being copied:
    ./sum.h      [795 bytes]
    ./parallel_radix_sort.h      [6746 bytes]

Your files were copied successfully.
Directory where files were copied: /afs/ir.stanford.edu/class/cme213/submissions
/hw2/weihongh/1
List of files in this directory:
    sum.h        [795 bytes]
    parallel_radix_sort.h        [6746 bytes]
    metadata     [126 bytes]

This completes the submission process. Thank you!
weihongh@cardinal2:~/hw2/starter-code$
```