

a) What problems you encountered completing the assignment and how you overcame them:

I had trouble in finding out how to count the number of occurrences in parallel and I was able to solve it within 2 hours by figuring out how to use parallelism correctly which took me a few attempts to accomplish.

b) Any problems you weren't able to overcome, or any bugs still left in the program:

There weren't any problems left to overcome, but I could improve the way of displaying the results of the program.

c) About how long it took you to complete the assignment:

The assignment took me about 3 hours to complete in total.

d) Performance measurements (given in seconds) for 1, 2, 4, and 8 threads:

For 1 thread:

```
Time for counting hate was: 0.08046770095825195
Time for counting love was: 0.07393431663513184
Time for counting death was: 0.07490134239196777
Time for counting night was: 0.0724027156829834
Time for counting sleep was: 0.07291889190673828
Time for counting time was: 0.07408833503723145
Time for counting henry was: 0.07297039031982422
Time for counting hamlet was: 0.06980061531066895
Time for counting you was: 0.07354569435119629
Time for counting my was: 0.07143735885620117
Time for counting blood was: 0.07341146469116211
Time for counting poison was: 0.07142424583435059
Time for counting macbeth was: 0.0700674057006836
Time for counting king was: 0.07160258293151855
Time for counting heart was: 0.07358145713806152
Time for counting honest was: 0.07113027572631836
Time for Total Instances of All Words: 1.3204684257507324 when running with 1 thread
```

For 2 threads:

```
Time for counting hate was: 0.10857772827148438
Time for counting love was: 0.07295536994934082
Time for counting death was: 0.07004952430725098
Time for counting night was: 0.07171797752380371
Time for counting sleep was: 0.07576990127563477
Time for counting time was: 0.07868766784667969
Time for counting henry was: 0.08056402206420898
Time for counting hamlet was: 0.07296371459960938
Time for counting you was: 0.07287216186523438
Time for counting my was: 0.07634758949279785
Time for counting blood was: 0.07839655876159668
Time for counting poison was: 0.07596540451049805
Time for counting macbeth was: 0.07202529907226562
Time for counting king was: 0.07354044914245605
Time for counting heart was: 0.07319045066833496
Time for counting honest was: 0.07672810554504395
Time for Total Instances of All Words: 1.3900043964385986 when running with 2 threads
```

For 4 threads:

```

Time for counting love was: 0.11397194862365723
Time for counting hate was: 0.11447668075561523
Time for counting sleep was: 0.08122420310974121
Time for counting night was: 0.08279728889465332
Time for counting death was: 0.12038183212280273
Time for counting hamlet was: 0.07536435127258301
Time for counting time was: 0.10819125175476074
Time for counting henry was: 0.11168384552001953
Time for counting my was: 0.07765746116638184
Time for counting you was: 0.10409021377563477
Time for counting blood was: 0.0995366573337402
Time for counting macbeth was: 0.08054709434509277
Time for counting poison was: 0.10347437858581543
Time for counting king was: 0.12853407859802246
Time for counting heart was: 0.0987393856048584
Time for counting honest was: 0.09040021896362305
Time for Total Instances of All Words: 0.7129814624786377 when running with 4 threads

```

For 8 threads:

```

Time for counting death was: 0.14702534675598145
Time for counting hate was: 0.16947197914123535
Time for counting love was: 0.20689749717712402
Time for counting hamlet was: 0.13875675201416016
Time for counting you was: 0.19864392280578613
Time for counting time was: 0.2810797691345215
Time for counting night was: 0.31545281410217285
Time for counting sleep was: 0.3182671070098877
Time for counting blood was: 0.15799593925476074
Time for counting my was: 0.2425069808959961
Time for counting henry was: 0.3591771125793457
Time for counting macbeth was: 0.146439790725708
Time for counting king was: 0.12761306762695312
Time for counting poison was: 0.17316293716430664
Time for counting honest was: 0.1073296070098877
Time for counting heart was: 0.1496596336364746
Time for Total Instances of All Words: 0.7197723388671875 when running with 8 threads

```

e) A short analysis of why the program behaves as it does with an increasing number of threads:

The total time of the word count is significantly smaller when running with four or eight threads in comparison with one or two threads mainly because the computer makes use of the threads available for the program. Additionally, running the program with four threads gives the best performance (for my case is the fastest because it makes use of all four threads available in my computer).

f) Any observations or comments you had while doing the assignment:

I thought that the program was going to be longer, it took fewer lines than expected.

g) Output from the dumpCPUInfo.sh program:

```

student@linux-40ae:~/pythonTestProgs> dumpCPUInfo.sh cpuinfo.txt
model name      : Intel(R) Core(TM) i7-10750H CPU @ 2.60GHz
4              36              220

```