Step 1:

Download all of the txt files and put them in the same directory as you are going to write your code. These are the full text of 10 different classic books. Feel free to read them after the lab.

Source: https://www.gutenberg.org/browse/scores/top

Step 2:

Write **code** to read `0.txt`, counting the appearance of each letter, without considering case.

Also display how long this takes using omp.h.

Note: This portion is not worth parallelizing, I tried.

Screenshot

```
Completed in 0.054314 seconds
The letter frequencies are:
A's: 76471
B's: 16601
C's: 22142
D's: 37662
E's: 114980
F's: 20476
G's: 20491
H's: 61777
I's: 64385
J's: 1061
K's: 7937
L's: 42045
M's: 22900
N's: 64556
O's: 68131
P's: 16960
Q's: 1544
R's: 51157
S's: 63106
T's: 86548
U's: 26251
V's: 8418
W's: 21774
X's: 1006
Y's: 16602
Z's: 624
```

Step 3:

Change your Step 2 code so that it reads all of the provided books, one by one, still counting the letters, by using a nested outer for loop.

Hint: Here's a really hacky way to change have the correct file name each iteration.

```c
char name[6];
name[0] = i + '0';
name[1] = '.';
name[2] = 't';
name[3] = 'x';
name[4] = 't';
name[5] = '\0';
book = fopen(name, "r");
```

Sample Run:

```
SIE-1222-11:MobyDick nicholas.dolan-stern$ clang -Xpreprocessor -fopenmp -lomp v2_serial.c
SIE-1222-11:MobyDick nicholas.dolan-stern$ ./a.out
Completed in 1.219539 seconds
The letter frequencies are:
A's: 920918
B's: 170603
C's: 285081
D's: 493528
E's: 1437151
F's: 257196
G's: 222299
H's: 752832
I's: 803829
J's: 18512
K's: 81827
L's: 450897
M's: 288796
N's: 799628
O's: 867486
P's: 199419
Q's: 11993
R's: 654194
S's: 729552
T's: 1065077
U's: 315723
V's: 118845
W's: 258211
X's: 18290
Y's: 219334
Z's: 7680
SIE-1222-11:MobyDick nicholas.dolan-stern$ █
```

Step 4:

Parallelize your step 4 code.

Try different mechanisms we learned in the video, as well as different schedulers.

Required for Step 4:

- A version that uses omp for and atomic
- A version that uses omp for and locks
- A version that uses tasks.

Included source code and named screenshots for each of these.

Which works the best for you?

See if you can beat my runs. (These were all run on one of the student iMacs) (I also didn't try to optimize anything, or set the number of threads)

Here are my screenshots, if you are way above these on the iMacs in SIE 1222, you probably have done it wrong. If your numbers are wrong, you definitely did it wrong.

For and atomic

```
SIE-1222-11:MobyDick nicholas.dolan-stern$ clang -Xpreprocessor -fopenmp -lomp v2_atomic.c
SIE-1222-11:MobyDick nicholas.dolan-stern$ ./a.out
Completed in 0.578801 seconds
The letter frequencies are:
A's: 920918
B's: 170603
C's: 285081
D's: 493528
E's: 1437151
F's: 257196
G's: 222299
H's: 752832
I's: 803829
J's: 18512
K's: 81827
L's: 450897
M's: 288796
N's: 799628
O's: 867486
P's: 199419
Q's: 11993
R's: 654194
S's: 729552
T's: 1065077
U's: 315723
V's: 118845
W's: 258211
X's: 18290
Y's: 219334
Z's: 7680
SIE-1222-11:MobyDick nicholas.dolan-stern$
```

For and locks

```
SIE-1222-11:MobyDick nicholas.dolan-stern$ clang -Xpreprocessor -fopenmp -lomp v2_locks.c
SIE-1222-11:MobyDick nicholas.dolan-stern$ ./a.out
Completed in 0.768477 seconds
The letter frequencies are:
A's: 920918
B's: 170603
C's: 285081
D's: 493528
E's: 1437151
F's: 257196
G's: 222299
H's: 752832
I's: 803829
J's: 18512
K's: 81827
L's: 450897
M's: 288796
N's: 799628
O's: 867486
P's: 199419
Q's: 11993
R's: 654194
S's: 729552
T's: 1065077
U's: 315723
V's: 118845
W's: 258211
X's: 18290
Y's: 219334
Z's: 7680
SIE-1222-11:MobyDick nicholas.dolan-stern$ █
```

With Tasks

```
SIE-1222-11:MobyDick nicholas.dolan-stern$ clang -Xpreprocessor -fopenmp -lomp v2_tasks.c
SIE-1222-11:MobyDick nicholas.dolan-stern$ ./a.out
Completed in 0.528455 seconds
The letter frequencies are:
A's: 920918
B's: 170603
C's: 285081
D's: 493528
E's: 1437151
F's: 257196
G's: 222299
H's: 752832
I's: 803829
J's: 18512
K's: 81827
L's: 450897
M's: 288796
N's: 799628
O's: 867486
P's: 199419
Q's: 11993
R's: 654194
S's: 729552
T's: 1065077
U's: 315723
V's: 118845
W's: 258211
X's: 18290
Y's: 219334
Z's: 7680
```