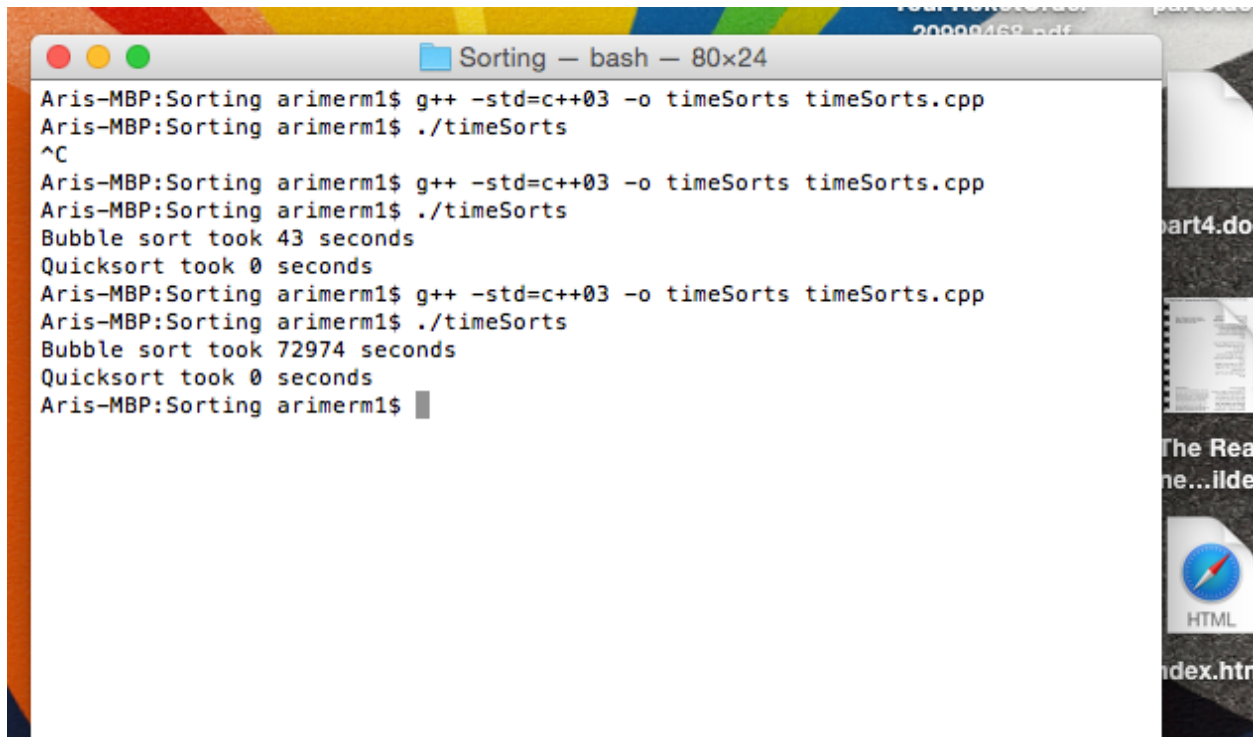


Experiment: Running bubble sort vs quicksort on randomized arrays of size 100,000 and 1 million.

A terminal window titled "Sorting — bash — 80x24" showing the execution of a C++ program. The user runs the program twice. In the first run, on a 100,000 element array, bubble sort takes 43 seconds and quicksort takes 0 seconds. In the second run, on a 1 million element array, bubble sort takes 72,974 seconds and quicksort takes 0 seconds.

```
Aris-MBP:Sorting arimerm1$ g++ -std=c++03 -o timeSorts timeSorts.cpp
Aris-MBP:Sorting arimerm1$ ./timeSorts
^C
Aris-MBP:Sorting arimerm1$ g++ -std=c++03 -o timeSorts timeSorts.cpp
Aris-MBP:Sorting arimerm1$ ./timeSorts
Bubble sort took 43 seconds
Quicksort took 0 seconds
Aris-MBP:Sorting arimerm1$ g++ -std=c++03 -o timeSorts timeSorts.cpp
Aris-MBP:Sorting arimerm1$ ./timeSorts
Bubble sort took 72974 seconds
Quicksort took 0 seconds
Aris-MBP:Sorting arimerm1$
```

Note: 72,974 seconds =

$72,974 \text{ seconds} * (1 \text{ hour} / 3600 \text{ seconds}) = 20.2 \text{ hours} = 20 \text{ hours and 12 minutes!!!!!!}$

and quicksort took a fraction of a second!!!!!!