

Andrew Brown

Dr. Rhona Hoenigmn

CSCI 2275 Programming and Data Structures

25 September 2020

Runtime Analysis of Homework 2

Assignment 2 starts out with 2 constant operations, calling the default constructor and saving `argv[1]` to the filename variable. Then the `readFile` method from `messageboard.h` is called, which has 4 constant operations before the first loop, which has 12 constant operations in it and a call to the `checkForMatch` method. `checkForMatch` is one big loop which runs n times and has 7 constant operations in it. There are also 2 constant operations after this loop. The loop in `readFile` will then run m times, effectively making this a nested loop with runtime $m*n + 27$. However if the file given at the start could not be opened, `readFile` will simply give an error and the program will have a runtime of 9.

Assignment 2 will then call the `printItemsRemaining` method, which has a loop and runs p times and has 7 constant operations in it. Its runtime will be $7p$, bringing our total runtime to $m*n + 7p + 27$.

Assignment 2 then has 4 constant operations before the next loop, which runs until the user quits the program. Within this loop there are 4 cases in a switch statement with 3 cases that do not end the program, giving the loop a runtime of $q + r + 3 + 2$.

The first case has 9 constant operations and a call to the `postItemToMessageboard` method. The `postItemToMessageboard` method has 4 constant operations as well as a call to the `checkForMatch` method, which, as stated before, has a runtime of $n + 9$. This brings the total runtime of case 1 to $n + 22$.

The second case also has 9 constant operations and a call to the `postItemToMessageboard` method. Given what we already know, this brings our runtime for case 2 to $n + 22$ also.

The third case has only 1 constant operation and a call to the `printItemsRemaining` method. We know that the `printItemsRemaining` method has a runtime of $7p$, bringing the runtime of case 3 to $7p + 1$.

The fourth case is simply to end the loop, and it has 2 constant operations. There is also a single constant operator that exists the loop if case 4 happens, and a single constant operation at the end of the while loop, so the total runtime of case 4 is 3 and the runtime of the whole loop too $q(n + 23) + r(n + 23) + s(7p + 2) + 3$.

There is only one more constant operation after this. This brings the runtime total to $m*n+7p+q(n+23)+r(n+23)+s(7p+2)+35$ or, just 9.