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CS3460: Data Structures

Lab 00: Asymptotic Analysis

Total Points: 10

Problems

1. **Fun with Empirical Testing (10 points):** You have been provided five (5) Java programs for which you have only the compiled bytecode, and in this assignment you will perform empirical analysis on them. The files Prog1.class through Prog5.class each accept a non-negative integer value as a command line argument, representing an input size to run the algorithm realized by those programs.

   For instance, to run Prog1.class with an input size of 1000, you would type the following command[1] into a Linux terminal (followed by a possible output)

```
$ time java Prog1 1000
real 0m2.252s
user 0m2.269s
sys 0m0.048s
```

   The time command in Linux runs the program and gives back information regarding how long the program took to run, with the "real" time referring to wall-clock time, and "user"/"sys" referring to time spent in user and kernel modes, respectively. For the purpose of this assignment, we will focus on real time.

   Please fill in the cells in the following table with the real time taken for each program to run with the indicated input sizes. If an entry takes longer than two minutes, you may terminate it early and record the entry as TLE (Time Limit Exceeded).

Input Size	Prog1	Prog2	Prog 3	Prog4	Prog5
100	1.45	I=10:0.09	0.15	0.82	1000:0.22
1000	1.45	1=15:0.11	0.23	0.86	2000:0.42
10000	1.44	1=20:0.25	0.79	0.88	3000:0.74
100000	1.43	I = 25:2.78	6.83	0.90	4000:1.19
1000000	1.44	1=30:84.24	62.33	0.91	5000:1.75
$O(f(n))$	0(1)	O(n^2)	O(n)	O(log n)	O(n log n)

   In the last row, you will attempt to deduce the asymptotic behavior of each program. To do so, it may be necessary to run the program with input sizes outside of the ones indicated in the table.

   Submission: Submit your table in a nicely typeset pdf document named lab00.pdf

[1] in the referenced command, note that the $ symbol is used to denote the beginning of a user-entered command, and should not be manually entered