EIGHTH (AND LAST!) QUIZ

You have 15 minutes from the start of class to complete this quiz. Give partial answers if you can’t give complete ones. Read the questions with care; work with deliberate speed. Don’t give us more than we ask for. The usual instructions apply. Good luck!

Problem 1 (10 points)

These are some steps and results involved in determining the performance of a given segment of code:

A. O-notation
B. Polynomial
C. Add the operations you’re counting; multiply loop bodies by number of times through loop, ...
D. Recurrence relation
E. Remove lower-order terms, remove lower-order O-notations, remove constants
F. Count operations for the base case; count operations for the recursive case (usually in terms of the next smaller case)
G. Solve the recurrence

(a) (4 points) Describe the process of deriving an O-notation from iterative code by filling in each blank ((a.1) through (a.4)) in the diagram below with a letter (A through G) from the list above; you won’t use every letter. (Hint: The arrows contain verbs or verb phrases; the boxes contain nouns or noun phrases.)

Iterative code

(a.1) (a.2) (a.3) (a.4)

(b) (6 points) Describe the process of deriving an O-notation from recursive code by filling in each blank ((b.1) through (b.6)) in the diagram below with a letter (A through G) from the list above; you won’t use every letter. (Hint: The arrows contain verbs or verb phrases; the boxes contain nouns or noun phrases.)

Recursive code

(b.1) (b.2) (b.3) (b.4) (b.5) (b.6)

Problem 2 (5 points)

Which of the following are accurate statements about sorting algorithms and the film Sorting out Sorting? (Answer true or false.)

_____ All the algorithms shown in the film were either O(n log n) or O(n^2).
_____ We sometimes distinguish comparisons from data movements because comparisons are slower.
_____ Using a tree-based sort guarantees you at least O(n log n) performance.
_____ Exchange sorts swap values’ positions to bring them closer to the correct order.
_____ With some O(n^2) sorting algorithms, as n gets larger, the amount of time required levels off.
Problem 3 (10 points)

These are some programming languages we discussed in class: Fortran, Cobol, Algol (58/60), Lisp, Basic, PL/I, Simula, Algol 68, Pascal, C, Scheme, Ada, Common Lisp, C++, Java, Python, C#, F#.

(a) (1 point) List at least two languages from the list above in which functional programming is required, or at least a common programming idiom.

(b) (1 point) List at least three languages from the list above that were designed to support object-oriented programming.

(c) (1 point) List at least three languages from the list above that were developed before 1960.

(d) (1 point) List at least one language from the list above that was developed with simplicity or minimalism as a major design goal.

(e) (3 points) Write the name of the appropriate language from the list above next to its developer’s name below. For full credit, you only need three correct matches; there is no penalty for wrong guesses. You may use the same language name more than once. Some names may match more than one language (but only one correctly matching language is required for credit).

_________ John Backus  _________ Grace Hopper  _________ Dennis Ritchie
_________ Noam Chomsky  _________ John Kemeny  _________ Guy Steele
_________ Alain Colmerauer  _________ John McCarthy  _________ Bjarne Stroustrup
_________ Matthias Felleisen  _________ Donald Knuth  _________ Guido van Rossum
_________ James Gosling  _________ Thomas Kurtz  _________ Niklaus Wirth

(f) (3 points) Write the name of the appropriate language next to each item below. For full credit, you only need to match three items correctly; there is no penalty for wrong guesses. You may use the same language name more than once. Some items may match more than one language (but only one correctly matching language is required for credit).

______ Adopted syntax similar to C and C++ but a different type-safety philosophy
______ The first language designed for interactive programming
______ Programs look superficially like English
______ Combined features of Fortran, Cobol, and Algol
______ A scripting language, convenient for “gluing” other applications together