CS3723 HOMEWORK #6, DUE: 9AM, 10/13/10

HISTORY OF ALGOL / PROCEDURAL PROGRAMMING

1. List five important features of Algol 60 that distinguished it from Lisp and/or Fortran.

2. List two reasons Algol 68 was not a huge success, especially in the United States.

3. Pascal was derived from a language called Algol-W, which in turn was derived from Algol 60.
   (a) Algol 60 was designed to express algorithms. Pascal had an additional emphasis. What was it? (Hint: It’s the name of a lower-division computer science course.)
   (b) What is more expressive about Pascal in order to facilitate this goal?

4. Why was Pascal more successful than Algol 68?

5. Why did C eventually eclipse Pascal as a production programming language?

6. C is said to be ‘weakly typed.’
   (a) What does this mean?
   (b) What data type was provided by the B language?
   (c) What is unusual about C’s memory model (hint: arrays)?

CORE ML

7. List two aspects of ML’s type system that distinguish it from prior procedural languages like C.

8. What is the ML’s analog to Lisp’s lambda special form?

9. ML/Scala ‘vals’ are different from C/Java variables.
   (a) What is semantically different about a val in ML and Scala compared to variables a language like C?
   (b) What does ML call a memory location which can be modified and updated like a variable in C?
   (c) What keyword do you use in ML to create one of these memory locations?
   (d) What operator do you use in ML to update the contents of one of these memory locations?
   (e) What operator do you use in ML to read the contents of one of these memory locations?

ML EXPRESSIONS/TYPES

10. For each of the following ML expressions, give its type:
    (a) $3 \times (\sim 5 - 2) \text{ div } 6$
    (b) $\text{ceil}(5.0 / 2.4)$
    (c) $\text{true andalso } 5 < 3$
(d) "ML is a " ^ "function-oriented language"

(e) size("Hello World");

(f) let
    val x = 3.5;
    in
    x / 2.0;
    Real.toString(x)
    end

(g) (3, 5.0)

(h) (5.0, #2("hello", 3, 3.5))

(i) (5.0, 3, (false, "A", "B", "C"))

(j) ["A", "B", "C"]

(k) "Z" :: "Y" :: ["A", "B", "C"];

(l) tl("xyz" :: "abc" :: ["d", "e", "f"])

(m) {abc=3, ghi=(#stu{mno="pqr", stu=6.1})}

11. For each of the expressions from 1, state what the expression evaluates to by giving the canonical representation of that value (i.e., what Standard ML of New Jersey prints out as that value).

12. For each of the following types, give an expression of that type:

   (a) unit

   (b) real * real * real

   (c) (int * string) list

   (d) {x:real, y:bool * string}

Note: If you collaborated with your classmates or used their notes, please note which classmates you collaborated with. If you use an external source, besides the text book, lectures, notes provided by the instructor, and your own intellect, please cite that source. Use quote marks if you are quoting material word-for-word from any source (including the text book).