HW 1 – Evaluation and Environments

CS 421 – Summer 2013

Revision 1.0

Assigned Friday, May 31, 2013
Due Friday, June 7, 2013, 11:59 PM
Extension 48 hours (20% penalty)

1 Change Log

1.0 Initial Release.

2 Objectives and Background

The purpose of this HW is to test your understanding of

- the order of evaluation of expressions in OCaml;
- the scope of variables, and the state of environments used during evaluation

Another purpose of HWs is to provide you with experience answering non-programming written questions of the kind you may experience on the midterms and final.

3 Turn-In Procedure

Using your favorite tool(s), you should put your solution in a file named `hw1.pdf`. If you have problems generating a pdf, please seek help from the course staff. Your answers to the following questions are to be submitted electronically via the handin script, just as in an MP. This assignment is named `hw1`.

4 Problem

(15 pts) Below is a fragment of OCaml code, with various program points indicated by numbers in comments.

```
let x = 9;;
let s = x * x;;
(* 1 *)
let sub_both x y = 20 - x - y;;
(* 2 *)
let s = sub_both x 2;;
(* 3 *)
let z =
    let f x = sub_both s x in
    (* 4 *)
    f x;;
(* 5 *)
```

For each of program points 1, 2, 3, 4 and 5, please describe the environment in effect after evaluation has reached that point. You may assume that the evaluation begins in an empty environment, and that the environment is cumulative thereafter. At each program point, assume that all complete preceding declarations (including local ones) have been fully evaluated. For points 1 through 4, you may name your environments (ρ_1, ρ_2, etc.) and use any combination of these names, set notation, and the update operator + in your answers. The answer for program point 5 should be written out fully in set notation without the update operator, abbreviations, or duplicate bindings (i.e., you must explicitly give the value assigned to every variable and function name).