CS558 Programming Languages – Winter 2021 – Study Questions Lecture 4a

These questions are intended for self-study, to help review and deepen your understanding of the lecture. Sample answers are available. There is nothing to hand in.

1. Consider the definitions on slide 5.
Suppose \( E = \{ a \mapsto L_1, b \mapsto L_2 \} \) and \( S = \{ L_1 \mapsto 10, L_2 \mapsto 20, L_3 \mapsto 30 \} \).

   a. What is \( E(a) \) ?
   b. What is \( E(c) \) ?
   c. What is \( \text{Dom}(E) \) ?
   d. What is \( E + \{ d \mapsto L_2 \} \) ?
   e. What is \( E + \{ b \mapsto L_3 \} \) ?
   f. What is \( S(L_2) \) ?
   g. What is \( S(E(a)) \) ?
   h. What is \( \text{Dom}(S) \) ?
   i. What is \( S - \{ L_2 \} \) ?

2. Draw a derivation tree for \( \text{let } x 10 (+ x (:= x 21)) \) in an empty environment and store.

3. (a) Suppose we want to add a sequencing expression to our language, where \( \text{after } \text{exp1} \text{ exp2} \) evaluates \( \text{exp1} \) and then \( \text{exp2} \), and returns the value of \( \text{exp2} \). Write down a suitable operational semantics rule for these expressions.

   (b) Do we really need to have such a new kind of expression in our language? I.e., is there is an equivalent way to get the same behavior using existing expressions?