

CS263. Homework Assignment 1

(solutions due February 1)

January 26, 2007

Exercise 1: Comment on some aspect from Hoare's papers "Hints on programming-language design" that relates to your programming experience. Try to provide additional evidence in favor of one his points and against one of his points. A couple of paragraphs should be enough.

Exercise 2: This exercise is meant to help you refresh your knowledge of set theory and functions. Let X and Y be sets. Show that there is a 1-1 correspondence between the sets $X \rightarrow \mathcal{P}(Y)$ and $\mathcal{P}(X \times Y)$. This correspondence will allow us to use functional notation for certain sets. Note that \mathcal{P} is the notation for powerset (the set of all subsets). (Exercise 1.4 from Winskel's book, pag. 8)

Exercise 3: Consider the IMP language discussed in class, with the expression sub-language extended with a division operator. Explain what changes must be made to the operational semantics (big-step only). Hint: think how is the division operation different than addition or multiplication.

Exercise 4: Extend the operational semantics of the IMP language with a "do until(e)" construct. Show the extension both for the big-step semantics and for the contextual small-step semantics.

Exercise 5: Consider the IMP language with a new command construct "let $x = e$ in c ". The informal semantics of this construct is that the expression e is evaluated and then a new local variable x is created with lexical scope c and initialized with the result of evaluating e . Then the command c is evaluated.

- Extend the natural-style operational semantics judgment $\langle c, \sigma \rangle \Downarrow \sigma'$ with one new rule for dealing with the `let` command. Make sure you handle properly the scope of the newly declared variable.
- Extend the set of redexes and contexts for the contextual-style operational semantics that we discussed in class to account for the `let` command.