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6.1120 Fall 2025

Miniquiz #9

5 Minutes

1. Consider the extension to IMP that we saw last lecture, which adds heaps to the language.

- a) Suppose we would like to define a new type of statement $x^* = e$, which evaluates the expression e and stores its result to the heap at the address that variable x maps to. Write the inference rule for the statement $x^* = e$:

$$\frac{}{(\sigma, h, x^* = e) \rightarrow}$$

- b) Now suppose the language also supports a new type of statement $x \leq y$, whose semantics is defined by the following inference rule:

$$\frac{\sigma(y) = a \quad \sigma[x : a] = \sigma'}{(\sigma, h, x \leq y) \rightarrow (\sigma', h)}$$

Assuming an initial frame $\sigma = \{x : 100\}$ and an initial heap $h = \{100 : 1\}$, what is a possible set of frame and heap after the following program is executed?

```
y <= x;  
y * = 2 + 3;  
z = x * y;
```