

## 14F-1 Bookkeeping

- 0 pts Correct

## Exercise 4F-2. VCGen for Let.

We use a fresh variable  $t$ , which is never used before, to express the let statement.  $\text{let } x = e \text{ in } c$  is equivalent to  $t := x; x := e; c; x := t$ .

Therefore

$$\begin{aligned} \text{VC}(\text{let } x = e \text{ in } c, B) &\equiv \text{VC}(t := x; x := e; c; x := t) \\ &\equiv \text{VC}(t := x, \text{VC}(x := e; c; x := t, B)) \\ &\equiv [x/t]\text{VC}(x := e; c; x := t, B) \\ &\equiv [x/t]\text{VC}(x := e, \text{VC}(c; x := t, B)) \\ &\equiv [x/t][e/x]\text{VC}(c; x := t, B) \\ &\equiv [x/t][e/x]\text{VC}(c, \text{VC}(x := t, B)) \\ &\equiv [x/t][e/x]\text{VC}(c, [t/x]B) \end{aligned}$$

## Exercise 4F-3. VCGen Mistakes.

1.  $c$  is  $\text{let } x = 12 \text{ in } y := 1$
2.  $B$  is  $x = 12$
3.  $\sigma$  with  $\sigma(x) = 13$
4.  $\sigma(x) = 13 \models \text{VC}(c, B)$  since  $12 = 12$
5.  $\sigma'(x) = 13$  because the let command is supposed to restore the original value
6.  $\sigma' \not\models B$  since  $\sigma'(x) = 13 \not\models x = 12$

## Exercise 4F-4. Axiomatic Do-While.

The statement  $\text{do } c \text{ while } b$  is equivalent to  $c; \text{while } b \text{ do } c$ . The Hoare for the equivalent statement is

$$\frac{\vdash \{A\}c\{B\} \quad \vdash \{B\}\text{while } b \text{ do } c\{C\}}{\vdash \{A\}c; \text{while } b \text{ do } c\{C\}}$$

Hence the final rule is

$$\frac{\vdash \{A\}c\{B\} \quad \vdash \{B\}\text{while } b \text{ do } c\{C\}}{\vdash \{A\}\text{do } b \text{ while } c\{C\}}$$

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