

14F-1 Bookkeeping

- 0 pts Correct

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$$4F-2 \quad \forall c (\text{let } x=c \text{ in } C, B) = [\lambda/a][e/x] \forall c (c, [a/x]B)$$

where a is a fresh variable.

for x in B , it should not be replaced by " e "
so, replacing x in B with a fresh variable first
then replacing it back after " c " is executed.

2 4F-2 VCGen for Let

- 0 pts Correct

4F-3 C: let $x=10$ in $z=z+x$

B: $x+z > 10$

G: A state so that $\sigma[x] = -2$, $\sigma[z] = 1$

According to the buggy rule, $\forall C(\text{let } x=10 \text{ in } z=z+x, x+z > 10) = [\sigma/x] \forall C(z=z+x, x+z > 10)$
 $= [\sigma/x] [\sigma/z/z](x+z > 10)$
 $= [\sigma/x](x+x+z > 10)$
 $= 20+z > 10 \Rightarrow z > -10$

so, $\sigma \models z > -10$ is true as $\sigma[z] = 1$

$\langle C, \sigma \rangle = \langle \text{let } x=10 \text{ in } z=z+x, \sigma \rangle \Vdash C$ where $\sigma[x] = -2$, $\sigma[z] = 1$

$\sigma \not\models x+z > 10$ in this case as $x+z = 9$

3 4F-3 VCGen Mistakes

- 0 pts Correct

4F-4 Show $\text{do } c \text{ while } b \Leftrightarrow c; \text{ while } b \text{ do } c$

We have $\frac{\vdash \{A\} c \{B\} \quad \vdash \{B \wedge b\} c \{B\}}{\vdash \{A\} c; \text{ while } b \text{ do } c \{B \wedge \neg b\}}$

Then writing in "do while b" $\frac{\vdash \{A\} c \{B\} \quad \vdash \{B \wedge b\} c \{B\}}{\vdash \{A\} \text{ do } c \text{ while } b \{B \wedge \neg b\}}$

4 4F-4 Axiomatic Do-While

- 0 pts Correct