Assignment 2

COS30023 - Languages in Software Development

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1. Problem 1

1.1. Hoare Triple

```
{a > 4, b = 7}
  x := b;
  y := a;
{a > 4, b = 7, x = 7, y > 4}
```

1.2. Rules

$$\text{C} =^{\text{def}} \text{C.Target} := \text{C.Source} : \frac{true}{\{Q[C.Target\ C.Source]\}C\{Q\}}$$

$$\text{C} =^{\text{def}} \text{C}_1; \text{C}_2 : \frac{\{P\}C_1\{R\} \quad \{R\}C_2\{Q\}}{\{P\}C_1; C_2\{Q\}}$$

1.3. Proof

$$\frac{\{a > 4, b = 7\}x := b\{R\} \quad \{R\}y := a\{a > 4, b = 7, x = 7, y > 4\}}{\{a > 4, b = 7\}x := b; y := a; \{a > 4, b = 7, x = 7, y > 4\}}$$

$\{R\}C_2 : y := a; \{a > 4, b = 7, x = 7, y > 4\}$

$$\begin{aligned}\{R\} &= \{a > 4, b = 7, x = 7, y > 4\}[y \backslash a] \\ &= \{a > 4, b = 7, x = 7, a > 4\} \\ &= \{a > 4, b = 7, x = 7, \cancel{a > 4}\}\end{aligned}$$

$\{R\} = \{a > 4, b = 7, x = 7\}$

$\{a > 4, b = 7\}C_1 : x := b; \{R : a > 4, b = 7, x = 7\}$

$$\begin{aligned}\{a > 4, b = 7\} &= \{a > 4, b = 7, x = 7\}[x \backslash b] \\ &= \{a > 4, b = 7, b = 7\} \\ &= \{a > 4, b = 7, \cancel{b = 7}\} \\ \{a > 4, b = 7\} &= \{a > 4, b = 7\}\end{aligned}$$