

$$\langle \mathbf{skip}, \sigma \rangle \longrightarrow_1 \sigma$$

$$\langle x := a \rangle \longrightarrow_1 \sigma[x \mapsto A[a]\sigma]$$

$$\frac{\langle s_1, \sigma \rangle \longrightarrow_1 \langle s'_1, \sigma' \rangle}{\langle s_1; s_2, \sigma \rangle \longrightarrow_1 \langle s'_1, s_2, \sigma' \rangle}$$

$$\frac{\langle s_1, \sigma \rangle \longrightarrow_1 \sigma'}{\langle s_1; s_2, \sigma \rangle \longrightarrow_1 \langle s_2, \sigma' \rangle}$$

$$\langle \mathbf{if } b \mathbf{ then } s_1 \mathbf{ else } s_2, \sigma \rangle \longrightarrow_1 \langle s_1, \sigma \rangle \quad \text{for } B[b]\sigma = tt$$

$$\langle \mathbf{if } b \mathbf{ then } s_1 \mathbf{ else } s_2, \sigma \rangle \longrightarrow_1 \langle s_2, \sigma \rangle \quad \text{for } B[b]\sigma = ff$$

$$\langle \mathbf{while } b \mathbf{ do } s, \sigma \rangle \longrightarrow_1 \langle \mathbf{if } b \mathbf{ then } s; \mathbf{while } b \mathbf{ do } s \mathbf{ else skip}, \sigma \rangle$$