

# Regole di inferenza

## Semantica big-step

$$\mathbf{B-Num} \frac{-}{\langle n, s \rangle \Downarrow n}$$

$$\mathbf{B-Loc} \frac{-}{\langle l, s \rangle \Downarrow s(l)}$$

$$\mathbf{B-Skip} \frac{-}{\langle skip, s \rangle \Downarrow s}$$

$$\mathbf{B-Add} \frac{\langle E_1, s \rangle \Downarrow n_1 \quad \langle E_2, s \rangle \Downarrow n_2}{\langle E_1 + E_2 \rangle \Downarrow n_3} n_3 = add(n_1, n_2)$$

$$\mathbf{B-Assign} \frac{\langle E, s \rangle \Downarrow n}{\langle l := e, s \rangle \Downarrow s[l \mapsto n]}$$

$$\mathbf{B-Assign.s} \frac{\langle E, s \rangle \Downarrow n}{\langle l := e, s \rangle \Downarrow \langle skip, s[l \mapsto n] \rangle}$$

$$\mathbf{B-Seq} \frac{\langle C_1, s \rangle \Downarrow s_1 \quad \langle C_2, s_1 \rangle \Downarrow s'}{\langle C_1; C_2, s \rangle \Downarrow s'}$$

$$\mathbf{B-Seq.s} \frac{\langle C_1, s \rangle \Downarrow \langle skip, s_1 \rangle \quad \langle C_2, s_1 \rangle \Downarrow \langle r, s' \rangle}{\langle C_1; C_2, s \rangle \Downarrow \langle r, s' \rangle}$$

$$\mathbf{B-If.T} \frac{\langle B, s \rangle \Downarrow true \quad \langle C_1, s \rangle \Downarrow s'}{\langle \text{if } B \text{ then } C_1 \text{ else } C_2, s \rangle \Downarrow \langle r, s \rangle}$$

$$\mathbf{B-If.F} \frac{\langle B, s \rangle \Downarrow false \quad \langle C_2, s \rangle \Downarrow s'}{\langle \text{if } B \text{ then } C_1 \text{ else } C_2, s \rangle \Downarrow \langle r, s \rangle}$$

## Semantica small-step

$$\mathbf{S-Left} \frac{E_1 \rightarrow E'_1}{E_1 + E_2 \rightarrow E'_1 + E_2}$$

$$\mathbf{S-N.Right} \frac{E_2 \rightarrow E'_2}{n_1 + E_2 \rightarrow n_1 + E'_2}$$

$$\mathbf{S-Add} \frac{-}{n_1 + n_2 \rightarrow n_3} n_3 = \text{add}(n_1, n_2)$$

$$\mathbf{S-Left} \frac{E_1 \rightarrow_{ch} E'_1}{E_1 + E_2 \rightarrow_{ch} E'_1 + E_2}$$

$$\mathbf{S-Right} \frac{E_2 \rightarrow_{ch} E'_2}{E_1 + E_2 \rightarrow_{ch} E_1 + E'_2}$$

$$\mathbf{op+} \frac{-}{\langle n_1 + n_2, s \rangle \rightarrow \langle n, s \rangle} n = \text{add}(n_1, n_2)$$

$$\mathbf{op-geq} \frac{-}{\langle n_1 \geq n_2, s \rangle \rightarrow \langle b, s \rangle} b = \text{geq}(n_1, n_2)$$

$$\mathbf{op1} \frac{\langle e_1, s \rangle \rightarrow \langle e'_1, s' \rangle}{\langle e_1 + e_2, s \rangle \rightarrow \langle e'_1 + e_2, s' \rangle}$$

$$\mathbf{op2} \frac{\langle e_2, s \rangle \rightarrow \langle e'_2, s' \rangle}{\langle v + e_2, s \rangle \rightarrow \langle v + e'_2, s' \rangle}$$

$$\mathbf{op1b} \frac{\langle e_2, s \rangle \rightarrow \langle e'_2, s' \rangle}{\langle e_1 + e_2, s \rangle \rightarrow \langle e_1 + e'_2, s' \rangle}$$

$$\mathbf{op2b} \frac{\langle e_1, s \rangle \rightarrow \langle e'_1, s' \rangle}{\langle e_1 + v, s \rangle \rightarrow \langle e'_1 + v', s' \rangle}$$

$$\mathbf{deref1} \frac{-}{\langle !l, s \rangle \rightarrow \langle v, s \rangle} \text{if } l \in \text{dom}(s) \wedge s(l) = v$$

$$\mathbf{deref2} \frac{\langle e, s \rangle \rightarrow \langle e', s' \rangle}{\langle !e, s \rangle \rightarrow \langle !e', s' \rangle}$$

$$\mathbf{ref1} \frac{-}{\langle \text{ref } v, s \rangle \rightarrow \langle l, s[l \mapsto v] \rangle} l \notin \text{dom}(s)$$

$$\mathbf{ref2} \frac{\langle e, s \rangle \rightarrow \langle e', s' \rangle}{\langle \text{ref } e, s \rangle \rightarrow \langle \text{ref } e', s' \rangle}$$

$$\mathbf{assign1} \frac{-}{\langle l := v, s \rangle \rightarrow \langle \text{skip}, s[l \mapsto v] \rangle} \text{if } l \in \text{dom}(s)$$

$$\mathbf{assign2} \frac{\langle e, s \rangle \rightarrow \langle e', s' \rangle}{\langle l := e, s \rangle \rightarrow \langle l := e', s' \rangle}$$

$$\mathbf{assign3} \frac{\langle e_1, s \rangle \rightarrow \langle e'_1, s' \rangle}{\langle e_1 := e_2, s \rangle \rightarrow \langle e'_1 := e_2, s' \rangle}$$

$$\mathbf{if-tt} \frac{-}{\langle \text{if } \text{true} \text{ then } e_1 \text{ else } e_2, s \rangle \rightarrow \langle e_1, s \rangle}$$

$$\mathbf{if-ff} \frac{-}{\langle \text{if } \text{false} \text{ then } e_1 \text{ else } e_2, s \rangle \rightarrow \langle e_2, s \rangle}$$

$$\mathbf{if} \frac{\langle e, s \rangle \rightarrow \langle e', s' \rangle}{\langle \text{if } e \text{ then } e_1 \text{ else } e_2, s \rangle \rightarrow \langle \text{if } e' \text{ then } e_1 \text{ else } e_2, s' \rangle}$$

$$\mathbf{while} \frac{-}{\langle \text{while } e \text{ do } e_1, s \rangle \rightarrow \langle \text{if } e \text{ then } (e_1; \text{while } e \text{ do } e_1) \text{ else } \text{skip}, s \rangle}$$

$$\mathbf{assign1b} \frac{-}{\langle l := n, s \rangle \rightarrow \langle n, s[l \mapsto n] \rangle} l \in \text{dom}(s)$$

$$\mathbf{seq.skip} \frac{-}{\langle \text{skip}; e_2, s \rangle \rightarrow \langle e_2, s \rangle}$$

$$\mathbf{seq} \frac{\langle e_1, s \rangle \rightarrow \langle e'_1, s' \rangle}{\langle e_1; e_2, s \rangle \rightarrow \langle e'_1; e_2, s' \rangle}$$

$$\mathbf{seq.skipb} \frac{-}{\langle v; e_2, s \rangle \rightarrow \langle e_2, s \rangle}$$