# Big Step Semantics

$$\frac{}{\langle true, s \rangle \Downarrow true} \; (E-true)$$

$$\frac{}{\langle false, s \rangle \Downarrow false} \; (E-false)$$

$$\frac{\langle e_1, s \rangle \Downarrow v_1 \quad \langle e_2, s \rangle \Downarrow v_2}{\langle e_1 + e_2, s \rangle \Downarrow v_1 +_{Int} v_2} \; (E-add)$$

$$\frac{\langle e_1, s \rangle \Downarrow true \quad \langle e_2, s \rangle \Downarrow b_2}{\langle e_1 \wedge e_2, s \rangle \Downarrow b_2} \; (E-\text{and}-true)$$

$$\frac{\langle e_1, s \rangle \Downarrow false \quad \langle e_2, s \rangle \Downarrow b_2}{\langle e_1 \wedge e_2, s \rangle \Downarrow false} \; (E-\text{and}-false)$$

$$\frac{\langle e_1, s \rangle \Downarrow true}{\langle not\ e_1, s \rangle \Downarrow false} \; (E-\text{not}-true)$$

$$\frac{\langle e_1, s \rangle \Downarrow false}{\langle not\ e_1, s \rangle \Downarrow true} \; (E-\text{not}-false)$$

$$\frac{}{\langle skip, s \rangle \Downarrow s} \; (E-skip)$$

$$\frac{\langle e_1, s \rangle \Downarrow true \quad \langle e_2, s \rangle \Downarrow s'}{\langle if\ e_1\ then\ e_2\ else\ e_3, s \rangle \Downarrow s'} \; (E-if-true)$$

$$\frac{\langle e_1, s \rangle \Downarrow false \quad \langle e_3, s \rangle \Downarrow s''}{\langle if\ e_1\ then\ e_2\ else\ e_3, s \rangle \Downarrow s''} \; (E-if-false)$$

$$\frac{\langle a, s \rangle \Downarrow v}{\langle x := a, s \rangle \Downarrow s[v/x]} \; iff\ s(x) \neq \perp \; (E-Assign)$$

$$\frac{\langle e, s \rangle \Downarrow false}{\langle while\ e\ do\ c, s \rangle \Downarrow s} \; (E-while-false)$$

$$\frac{\langle e, s \rangle \Downarrow true \quad \langle c; while\ b\ do\ c, s \rangle \Downarrow s'}{\langle while\ e\ do\ c, s \rangle \Downarrow s'} \; (E-while-true)$$

**Safety / Preservation:**

… missing part …

**Big versus Small Step Semantics:**

[1] https://cs.stackexchange.com/questions/43294/difference-between-small-and-big-step-operational-semantics