1 Syntax

$$e ::= c \in \mathbb{Z} \mid \mathsf{x} \in Var \mid e_1 + e_2$$

$$s ::= skip \mid s_1; s_2 \mid \mathsf{x} := e \mid if\ (e > 0)\ s_1\ s_2$$

$$e_e ::= \cdot +_1 e \mid \cdot +_2 \cdot$$

$$s_e ::= \mathsf{x} :=_1 \cdot \mid \cdot ;_1 s_2 \mid if_1\ s_1\ s_2$$

2 Semantics

2.1 Expressions

RED-CONST
$$\frac{}{E, c \Downarrow c}$$

RED-VAR
$$\frac{}{E, \mathsf{x} \Downarrow E[\mathsf{x}]}\ \mathsf{x} \in dom(E)$$

RED-VAR-UNDEF
$$\frac{}{E, \mathsf{x} \Downarrow err}\ \mathsf{x} \notin dom(E)$$

RED-ADD
$$\frac{E, e_1 \Downarrow r \qquad E, r, \cdot +_1 e_2 \Downarrow r'}{E, e_1 + e_2 \Downarrow r'}$$

RED-ADD-1
$$\frac{E, e_2 \Downarrow r \qquad E, v_1, r, \cdot +_2 \cdot \Downarrow r'}{E, v_1, \cdot +_1 e_2 \Downarrow r'}$$

RED-ADD-2
$$\frac{}{E, v_1, v_2, \cdot +_2 \cdot \Downarrow v_1 + v_2}$$

2.2 Statements

RED-SKIP
$$\frac{}{E, skip \Downarrow E}$$

RED-SEQ
$$\frac{E, s_1 \Downarrow r \qquad r, \cdot ;_1 s_2 \Downarrow r'}{E, s_1; s_2 \Downarrow r'}$$

RED-SEQ-1
$$\frac{E, s_2 \Downarrow r}{E, \cdot ;_1 s_2 \Downarrow r}$$

RED-ASN
$$\frac{E, e \Downarrow r \qquad E, r, \mathsf{x} :=_1 \cdot \Downarrow r'}{E, \mathsf{x} := e \Downarrow r'}$$

RED-ASN-1
$$\frac{}{E, v, \mathsf{x} :=_1 \cdot \Downarrow E[\mathsf{x} \leftarrow v]}$$

RED-IF
$$\frac{E, e \Downarrow r \qquad E, r, if_1\ s_1\ s_2 \Downarrow r'}{E, if\ (e > 0)\ s_1\ s_2 \Downarrow r'}$$

RED-IF-1-POS
$$\frac{E, s_1 \Downarrow r}{E, v, if_1\ s_1\ s_2 \Downarrow r}\ v > 0$$

RED-IF-1-NEG
$$\frac{E, s_2 \Downarrow r}{E, v, if_1\ s_1\ s_2 \Downarrow r}\ v \leqslant 0$$

2.3 Aborting Rules

RED-ERROR-EXPR
$$\frac{}{\sigma, e \Downarrow err}\ \mathbf{abort}\ \sigma$$

RED-ERROR-STAT
$$\frac{}{\sigma, s \Downarrow err}\ \mathbf{abort}\ \sigma$$

$$\frac{\sigma = C\,[\,err\,]}{\mathbf{abort}\,\sigma}$$