Syntax of Fb

concrete syntax

$v ::= \mathbb{Z} \mid True \mid False \mid Function\ x \to e \mid x$

$e ::= v \mid e + e \mid e - e \mid e = e \mid Not\ e \mid e\ Or\ e \mid e\ And\ e \mid If\ e\ Then\ e\ Else\ e \mid e\ e \mid (e)$

$\mid Let\ x = e\ In\ e$

x (variables)

metavariables

$0 \mid 1 \mid -1 \mid 2 \mid -2 \mid \ldots$

variable (parameter)

Function $a \to 0$

Operational Semantics of Fb

$e \Rightarrow v$

Valid syntax

invalid semantically

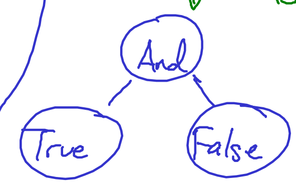
$\in$

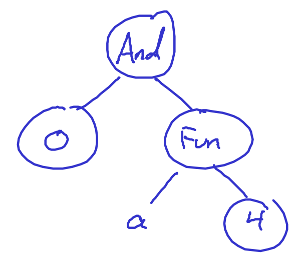
"More people have been to Russia than I have."

"Colorless green ideas sleep furiously."

abstract syntax

AST





$$\frac{}{v \Rightarrow v}$$

$$\frac{e_1 \Rightarrow v_1 \quad e_2 \Rightarrow v_2 \quad v \text{ is the logical conjunction of } v_1 \text{ and } v_2}{e_1\ And\ e_2 \Rightarrow v}$$

$$\frac{e_1 \Rightarrow v_1 \quad e_2 \Rightarrow v_2 \quad v \text{ is the integer sum of } v_1 \text{ and } v_2}{e_1 + e_2 \Rightarrow v}$$

$$\frac{e_1 \Rightarrow v \quad e_2 \Rightarrow v \quad v \in \mathbb{Z}}{e_1 = e_2 \Rightarrow True}$$

$$\frac{e_1 \Rightarrow v_1 \quad e_2 \Rightarrow v_2 \quad v_1, v_2 \in \mathbb{Z} \quad v_1 \neq v_2}{e_1 = e_2 \Rightarrow False}$$

$$\frac{e_1 \Rightarrow True \quad e_2 \Rightarrow v}{If\ e_1\ Then\ e_2\ Else\ e_3 \Rightarrow v}$$

!! $\frac{}{e \Rightarrow v}$

F6 Operational Semantics of Functions

We want:

(Function $q \to 5$) $\Rightarrow$ (Function $q \to 5$) ✓ (by Value Rule)

(Function $q \to 5$) $7 \Rightarrow 5$

(Function $q \to q+1$) $4 \Rightarrow 5$

(Function $f \to f\ 4$) (Function $k \to k+2$) $\Rightarrow 6$

(Function $n \to n+1$) True $\not\Rightarrow$

$$\text{Application}\ \frac{e_1 \Rightarrow \text{Function } x \to e' \qquad e_2 \Rightarrow v_2 \qquad e'\,[v_2 / x] \Rightarrow v}{e_1\ e_2 \Rightarrow v}$$