`salt0`: Straight Line Programs

`CS392-M1`: *Rust, In Practice and in Theory*

Syntax

x	(variables, $\mathcal{V}$)
n	(integers, $\mathbb{Z}$)
$e ::= \texttt{()} \mid n \mid x$	(expressions, $\mathcal{E}$)
$s ::= \texttt{let}\ x\ \texttt{=}\ e$	(statements, $\mathcal{S}$)
$p ::= e \mid s\ \texttt{;}\ p$	(programs, $\mathcal{P}$)

Typing

$t ::= \texttt{()} \mid \texttt{i32}$ (types, $\mathcal{T}$)

$\Gamma \in \mathcal{V} \mapsto \mathcal{T}$ (contexts)

$\Gamma \vdash e : t$ (expressions)
$\Gamma \vdash s \dashv \Gamma$ (statments)
$\Gamma \vdash p : t$ (programs)

$$\frac{}{\Gamma \vdash \texttt{()} : \texttt{()}}\ \textsc{unit} \qquad \frac{n \in \mathbb{Z}}{\Gamma \vdash n : \texttt{i32}}\ \textsc{int} \qquad \frac{(x \mapsto t) \in \Gamma}{\Gamma \vdash x : t}\ \textsc{var}$$

$$\frac{x \notin \mathrm{dom}(\Gamma) \qquad \Gamma \vdash e : t}{\Gamma \vdash \texttt{let}\ x\ \texttt{=}\ e \dashv \Gamma[x \mapsto t]}\ \textsc{let} \qquad \frac{\Gamma_1 \vdash s \dashv \Gamma_2 \qquad \Gamma_2 \vdash p : t}{\Gamma_1 \vdash s\ \texttt{;}\ p : t}\ \textsc{prog}$$

Evaluation

$$v ::= \texttt{()} \mid n \qquad \text{(values, } \mathbb{V}\text{)}$$

$$S \in \mathcal{V} \mapsto \mathbb{V} \qquad \text{(store)}$$

$$S \vdash e \Downarrow v \qquad \text{(expressions)}$$
$$S \vdash s \dashv S \qquad \text{(statements)}$$
$$S \vdash p \Downarrow v \qquad \text{(programs)}$$

$$\frac{}{S \vdash \texttt{()} \Downarrow \texttt{()}}\ \textsc{unit} \qquad \frac{n \in \mathbb{Z}}{S \vdash n \Downarrow n}\ \textsc{int} \qquad \frac{(x \mapsto v) \in S}{S \vdash x \Downarrow v}\ \textsc{var}$$

$$\frac{S \vdash e \Downarrow v}{S \vdash \texttt{let}\ x\ \texttt{=}\ e \dashv S[x \mapsto v]}\ \textsc{let} \qquad \frac{S_1 \vdash s \dashv S_2 \qquad S_2 \vdash p \Downarrow v}{S_1 \vdash s\ \texttt{;}\ p \Downarrow v}\ \textsc{prog}$$