$\rho \in \mathbf{Env}$	=	$\mathbf{Var} \mapsto \mathbf{Value}$	Environments
$v \in \mathbf{Value}$	=	$\mathbf{Constant} \cup \mathbf{Closure}$	Values
$\mathbf{Closure}$	::=	$[(\textbf{fn}\ x \Rightarrow e_0), \rho]$	Closures

$\boxed{\text{eval}(\rho, e) = v}$ iff "e evaluates to v under ρ"

- $\text{eval}(\rho, e) = v$ can also be read as an specification for building an interpreter for the Fun language.
- We will use this specification just as a aid to help us understand the 0-CFA specification.

Rules

$$\text{eval}(\rho, c^\ell) = c$$

$$\text{eval}(\rho, x^\ell) = \rho(x)$$

$$\text{eval}(\rho, (t_1^{\ell_1}\ \textit{op}\ t_2^{\ell_2})^\ell) = \text{apply}(\textit{op}, \text{eval}(\rho, t_1^{\ell_1}), \text{eval}(\rho, t_2^{\ell_2}))$$
$$\textit{where}\ \ \text{apply} : \mathbf{Op} \times \mathbf{Constant} \times \mathbf{Constant} \to \mathbf{Constant}$$

$$\text{eval}(\rho, (\textbf{if}\ t_0^{\ell_0}\ \textbf{then}\ t_1^{\ell_1}\ \textbf{else}\ t_2^{\ell_2})^\ell) = v$$
$$\textit{where}\ \ v = \begin{cases} \text{eval}(\rho, t_1^{\ell_1}) & \text{eval}(\rho, t_0^{\ell_0}) = \texttt{true} \\ \text{eval}(\rho, t_2^{\ell_2}) & \text{eval}(\rho, t_0^{\ell_0}) = \texttt{false} \end{cases}$$

$$\text{eval}(\rho, (\textbf{fn}\ x \Rightarrow e_0)^{\ell}) = [(\textbf{fn}\ x \Rightarrow e_0), \rho]$$ closure creation

$$\text{eval}(\rho, (\textbf{let}\ x = t_1^{\ell_1}\ \textbf{in}\ t_2^{\ell_2})^{\ell}) = \text{eval}(\rho[x \mapsto v_1], t_2^{\ell_2}) \quad \textit{where}\ \ v_1 = \text{eval}(\rho, t_1^{\ell_1})$$

$$\text{eval}(\rho, (t_1^{\ell_1}\ t_2^{\ell_2})^{\ell}) = \text{eval}(\rho_0[x \mapsto v_2], e_0)$$ function application

$$\textit{where}\quad \text{eval}(\rho, t_1^{\ell_1}) = [(\textbf{fn}\ x \Rightarrow e_0), \rho_0] \wedge \text{eval}(\rho, t_2^{\ell_2}) = v_2$$