

var, x	variable		
\mathbf{n}, \mathbf{n}	name		
$type, S, T$	$::=$		type
		o	bool
		ν	name
		$S \rightarrow T$	function
		(T)	S
$term, e$	$::=$		term
		x	variable
		true	true
		false	false
		n	name
		new	new
		$e_1 = e_2$	equal
		if e_1 then e_2 else e_3	conditional
		$\lambda x:T.e$	bind x in e
		$e_1 e_2$	application
		(e)	S
		$\{e_1/x\}e_2$	M
$value, v$	$::=$		value
		true	true
		false	false
		n	name
		$\lambda x:T.e$	bind x in e
env, E	$::=$		type environment
		empty	
		$env, x : T$	
$nameset, s$	$::=$		
		$s_1 \cup s_2$	
		$\{\mathbf{n}\}$	
nat, k	$::=$		
		0	
		$k_1 + k_2$	
$formula$	$::=$		
		<i>judgement</i>	
		$x : T \in env$	
		$\mathbf{n} \in s$	
		$\mathbf{n} \notin s$	
		$\mathbf{n} / = \mathbf{n}$	
		$\vdash env$	
		$k_1 < k_2$	

<i>terminals</i>	::=		λ	
			\longrightarrow	
			\rightarrow	
			\vdash	
			\cup	
			\in	
			\notin	
			new	
			true	
			false	
			if	
			then	
			else	
<i>Jtype</i>	::=		$s; E \vdash e : T$	
<i>Jop</i>	::=		$s_1 \vdash e \Downarrow^k (s_2) v$	evaluation with a measure
<i>judgement</i>	::=		<i>Jtype</i>	
			<i>Jop</i>	
<i>user_syntax</i>	::=		<i>var</i>	
			n	
			<i>type</i>	
			<i>term</i>	
			<i>value</i>	
			<i>env</i>	
			<i>nameset</i>	
			<i>nat</i>	
			<i>formula</i>	
			<i>terminals</i>	

$s; E \vdash e : T$

$\vdash E$	
$\frac{x : T \in E}{s; E \vdash x : T}$	TYPING_VAR
$\vdash E$	
$\frac{\vdash E}{s; E \vdash \mathbf{true} : o}$	TYPING_TRUE
$\vdash E$	
$\frac{\vdash E}{s; E \vdash \mathbf{false} : o}$	TYPING_FALSE
$\vdash E$	
$\frac{\mathbf{n} \in s}{s; E \vdash \mathbf{n} : \nu}$	TYPING_NAME

$$\begin{array}{c}
\frac{}{s; E \vdash \mathbf{new} : \nu} \text{TYPING_NEW} \\
\frac{s; E \vdash e_1 : T \quad s; E \vdash e_2 : T}{s; E \vdash e_1 = e_2 : o} \text{TYPING_EQN} \\
\frac{s; E \vdash e_1 : o \quad s; E \vdash e_2 : T \quad s; E \vdash e_3 : T}{s; E \vdash \mathbf{if } e_1 \mathbf{ then } e_2 \mathbf{ else } e_3 : T} \text{TYPING_COND} \\
\frac{s; E, x : S \vdash e : T}{s; E \vdash \lambda x : S. e : S \rightarrow T} \text{TYPING_ABS} \\
\frac{s; E \vdash e_1 : S \rightarrow T \quad s; E \vdash e_2 : S}{s; E \vdash e_1 e_2 : T} \text{TYPING_APPLY}
\end{array}$$

$s_1 \vdash e \Downarrow^k (s_2) v$

evaluation with a measure

$$\begin{array}{c}
\frac{}{s \vdash v \Downarrow^k () v} \text{CAN} \\
\frac{s_1 \vdash e_1 \Downarrow^{k_1} (s_2) \mathbf{true} \quad s_1 \cup s_2 \vdash e_2 \Downarrow^{k_2} (s_3) v \quad k_1 + k_2 < k}{s_1 \vdash \mathbf{if } e_1 \mathbf{ then } e_2 \mathbf{ else } e_3 \Downarrow^k (s_2 \cup s_3) v} \text{COND1} \\
\frac{s_1 \vdash e_1 \Downarrow^{k_1} (s_2) \mathbf{false} \quad s_1 \cup s_2 \vdash e_3 \Downarrow^{k_2} (s_3) v \quad k_1 + k_2 < k}{s_1 \vdash \mathbf{if } e_1 \mathbf{ then } e_2 \mathbf{ else } e_3 \Downarrow^k (s_2 \cup s_3) v} \text{COND2} \\
\frac{s_1 \vdash e_1 \Downarrow^{k_1} (s_2) \lambda x : T. e_3 \quad s_1 \cup s_2 \vdash e_2 \Downarrow^{k_2} (s_3) v_4 \quad s_1 \cup s_2 \cup s_3 \vdash (\lambda x : T. e_3) v_4 \Downarrow^{k_2} (s_4) v \quad k_1 + k_2 + k_3 < k}{s_1 \vdash e_1 e_2 \Downarrow^k (s_2 \cup s_3 \cup s_4) v} \text{APP} \\
\frac{s_1 \vdash e_1 \Downarrow^{k_1} (s_2) \mathbf{n} \quad s_1 \cup s_2 \vdash e_2 \Downarrow^{k_2} (s_3) \mathbf{n} \quad k_1 + k_2 < k}{s_1 \vdash e_1 = e_2 \Downarrow^k (s_2 \cup s_3) \mathbf{true}} \text{EQ1} \\
\frac{s_1 \vdash e_1 \Downarrow^{k_1} (s_2) \mathbf{n} \quad s_1 \cup s_2 \vdash e_2 \Downarrow^{k_2} (s_3) \mathbf{n} \quad \mathbf{n} / = \mathbf{n} \quad k_1 + k_2 < k}{s_1 \vdash e_1 = e_2 \Downarrow^k (s_2 \cup s_3) \mathbf{true}} \text{EQ2} \\
\frac{\mathbf{n} \notin s \quad 0 < k}{s \vdash \mathbf{new} \Downarrow^k (\{\mathbf{n}\}) \mathbf{n}} \text{AX_APP}
\end{array}$$

Definition rules: 16 good 0 bad
Definition rule clauses: 50 good 0 bad