Syntax

Literals	lit	$::= None \mid True \mid False \mid \text{"}a\text{"} \mid \ldots \mid 1 \mid \ldots$
Expression	Exp	$::= lit@(\overline{A}) \mid Exp.id \mid id_{Fun}(\overline{Exp})$
		$\mid Exp.id_{Fun}(\overline{Exp}) \mid id_{Cls}@(\overline{A}).(\overline{Exp})$
Expression	$TExp$	$::= lit@(\overline{A}) : \tau \mid \ldots$
	id_{Fun}	$::= f \mid g \mid \ldots$
	id_{Cls}	$::= C \mid D \mid \ldots$
Assign Op.	$AsgOp$	$\in \{\texttt{=}, \texttt{+=}, \texttt{-=}, \texttt{*=}, \texttt{/=}, \texttt{\%=}, \texttt{//=}\}$
Binary Op.	$BinOp$	$\in \{\texttt{||}, \texttt{\&\&}, \texttt{|}, \texttt{\&}, \texttt{==}, \texttt{!=}, \texttt{<}, \texttt{>}, \texttt{<=}, \texttt{>=}, \texttt{+}, \texttt{-}, \texttt{*}, \texttt{/}, \texttt{\%}, \texttt{**}\}$

Projection To Python

$$(Exp) \quad (\!|lit@(\overline{B}) : \tau|\!)^A = \begin{cases} lit & \text{if } A \in \overline{B} \\ \texttt{Unit.id} & \text{otherwise} \end{cases}$$

$$(\!|Exp.id : \tau|\!)^A = \begin{cases} (\!|Exp|\!)^A.id & \text{if } A \in \text{rolesOf}(Exp.id) \\ \text{absent} & \text{otherwise} \end{cases}$$

$$(\!|id_{Fun}(\overline{Exp}) : \tau|\!)^A = \begin{cases} id_{Fun}(\overline{(\!|Exp|\!)^A}) & \text{if } A \in \text{rolesOf}(\overline{Exp}) \\ id_{Fun}((\!|\texttt{Unit.id}|\!)^A) & \\ \qquad \text{if } A \notin \text{rolesOf}(\overline{Exp}) \wedge A \in \text{rolesOf}(id_{Fun}(\overline{Exp})) & \\ \texttt{Unit.id}_{\texttt{Fun}}(\overline{(\!|Exp|\!)^A}) & \text{otherwise} \end{cases}$$

$$(\!|Exp.id_{Fun}(\overline{Exp}) : \tau|\!)^A = \begin{cases} (\!|Exp|\!)^A.id_{Fun}(\overline{(\!|Exp|\!)^A}) & \\ \qquad \text{if } A \in \text{rolesOf}(Exp) \wedge A \in \text{rolesOf}(\overline{Exp}) & \\ (\!|Exp|\!)^A.id_{Fun}((\!|\texttt{Unit.id}|\!)^A) & \\ \qquad \text{if } A \in \text{rolesOf}(Exp) \wedge A \notin \text{rolesOf}(\overline{Exp}) & \\ \texttt{Unit.id}_{\texttt{Fun}}((\!|Exp|\!)^A, \overline{(\!|Exp|\!)^A}) & \text{otherwise} \end{cases}$$

$$(\!|id_{Cls}@(\overline{B})(\overline{Exp}) : \tau|\!)^A = \begin{cases} (\!|id_{Cls}@(\overline{B})|\!)^A(\overline{(\!|Exp|\!)^A}) & A \in \overline{B} \\ \texttt{Unit.id}_{\texttt{Cls}}(\overline{(\!|Exp|\!)^A}) & \text{otherwise} \end{cases}$$

$$\text{rolesOf}(\_ : \tau@(\overline{B}) = \overline{B}$$

$$\text{rolesOf}(Exp.id : \tau) = \overline{B} \quad \text{if} \quad \text{rolesOf}(Exp) = \overline{B}$$

$$\text{rolesOf}(id_{Fun}(\overline{Exp}) : \tau) = \overline{B} \quad \text{if} \quad \text{rolesOf}(\overline{Exp}) = \overline{B}$$

$$\text{rolesOf}(Exp.id_{Fun}(\overline{Exp}) : \tau) = \overline{B} \quad \text{if} \quad \text{rolesOf}(Exp) = \overline{B}$$