

Syntax

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

Projection To Python

$$\begin{aligned}
(Exp) \quad \langle lit@(\overline{B}) \rangle^A &= \begin{cases} lit & \text{if } A \in \overline{B} \\ \text{Unit.id} & \text{otherwise} \end{cases} \\
\langle Exp.id \rangle^A &= \begin{cases} \langle Exp \rangle^A.id & \text{if } A \in \text{rolesOf}(Exp.id) \\ \text{absent} & \text{otherwise} \end{cases} \\
\langle id_{Fun}(\overline{Exp}) \rangle^A &= \begin{cases} id_{Fun}(\langle Exp \rangle^A) & \text{if } A \in \text{rolesOf}(id_{Fun}(\overline{Exp})) \\ \text{Unit.id}_{Fun}(\langle Exp \rangle^A) & \text{otherwise} \end{cases} \\
\langle Exp.id_{Fun}(\overline{Exp}) \rangle^A &= \begin{cases} \langle Exp \rangle^A.id_{Fun}(\langle Exp \rangle^A) & \text{if } A \in \text{rolesOf}(Exp) \\ \text{Unit.id}_{Fun}(\langle Exp \rangle^A, \langle Exp \rangle^A) & \text{otherwise} \end{cases} \\
\langle id_{Cls}@(\overline{B})(\overline{Exp}) \rangle^A &= \begin{cases} \langle id_{Cls}@(\overline{B}) \rangle^A(\langle Exp \rangle^A) & A \in \overline{B} \\ \text{Unit.id}_{Cls}(\langle Exp \rangle^A) & \text{otherwise} \end{cases} \\
\text{rolesOf}(lit@(\overline{B}) : \tau@(\overline{B})) &= \overline{B} \\
\text{rolesOf}(Exp.id : \tau@(\overline{B})) &= \overline{B} \\
\text{rolesOf}(Exp.id : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(Exp) = \overline{B} \\
\text{rolesOf}(id_{Fun}(\overline{Exp}) : \tau@(\overline{B})) &= \overline{B} \\
\text{rolesOf}(id_{Fun}(\overline{Exp}) : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(\overline{Exp}) = \overline{B} \\
\text{rolesOf}(Exp.id_{Fun}(\overline{Exp}) : \tau@(\overline{B})) &= \overline{B} \\
\text{rolesOf}(Exp.id_{Fun}(\overline{Exp}) : \tau) &= \overline{B} \quad \text{if } \text{rolesOf}(Exp) = \overline{B} \\
\text{rolesOf}(id_{Cls}@(\overline{B}).(\overline{Exp}) : \tau@(\overline{B})) &= \overline{B}
\end{aligned}$$