Syntax

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

Projection To Python

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

$$
(\!|Exp.id|\!)^A = (\!|Exp|\!)^A.id
$$

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

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

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

$$
(\!|Exp\ BinOp\ Exp|\!)^A = \begin{cases} (\!|Exp|\!)^A\ BinOp\ (\!|Exp|\!)^A & \text{if } \text{roleOf}(Exp) = \{A\} \\ \texttt{Unit.id}((\!|Exp|\!)^A, (\!|Exp|\!)^A) & \text{if } \text{roleOf}(Exp) = \{A'\} \end{cases}
$$

$$
\text{rolesOf}(lit@(\overline{B})) = \overline{B}
$$

$$
\text{rolesOf}(Exp.id) = \overline{B} \quad \text{if } \exists T.\text{typeOf}(Exp.id) = T@(\overline{B})
$$

$$
\text{typeOf} : Exp \to Type
$$

$$
\text{rolesOf}(id_{Fun}.(\overline{Exp})) = \overline{B} \quad \text{if } \exists T.\text{typeOf}(id_{Fun}.(\overline{Exp})) = T@(\overline{B})
$$