

$$\text{first}(\text{RETURN}) = \text{first}(\text{return FACTOR semi}) = \{\text{return}\}$$

$$\begin{aligned}\text{first}(\text{FACTOR}) &= \text{first}(\text{lparen EXPR rparen}) \cup \text{first}(\text{id}) \cup \text{first}(\text{num}) \cup \text{first}(\text{float}) \\ &= \{\text{lparen}\} \cup \{\text{id}\} \cup \{\text{num}\} \cup \{\text{float}\} = \{\text{lparen}, \text{id}, \text{num}, \text{float}\}\end{aligned}$$

$$\begin{aligned}\text{first}(\text{TERM}) &= \text{first}(\text{FACTOR multdiv TERM}) \cup \text{first}(\text{FACTOR}) = \text{first}(\text{FACTOR}) \\ &= \{\text{lparen}, \text{id}, \text{num}, \text{float}\}\end{aligned}$$

$$\text{first}(\text{COND}) = \text{first}(\text{FACTOR comp FACTOR}) = \text{first}(\text{FACTOR}) = \{\text{lparen}, \text{id}, \text{num}, \text{float}\}$$

$$\text{first}(\text{EXPR}) = \text{first}(\text{TERM addsub EXPR}) \cup \text{first}(\text{TERM}) = \text{first}(\text{TERM}) = \{\text{lparen}, \text{id}, \text{num}, \text{float}\}$$

$$\begin{aligned}\text{first}(\text{RHS}) &= \text{first}(\text{EXPR}) \cup \text{first}(\text{literal}) = \{\text{lparen}, \text{id}, \text{num}, \text{float}\} \cup \{\text{literal}\} \\ &= \{\text{lparen}, \text{id}, \text{num}, \text{float}, \text{literal}\}\end{aligned}$$

$$\text{first}(\text{ELSE}) = \text{first}(\text{else lbrace BLOCK rbrace}) \cup \text{first}(\epsilon) = \{\text{else}\} \cup \{\epsilon\} = \{\text{else}, \epsilon\}$$

$$\begin{aligned}\text{first}(\text{STMT}) &= \text{first}(\text{for lparen ASSIGN semi COND semi ASSIGN rparen lbrace BLOCK rbrace}) \\ &\quad \cup \text{first}(\text{while lparen COND rparen lbrace BLOCK rbrace}) \\ &\quad \cup \text{first}(\text{is lparen COND rparen lbrace BLOCK rbrace ELSE}) \\ &\quad \cup \text{first}(\text{VDECL}) \cup \text{first}(\text{ASSIGN semi}) \\ &= \text{first}(\text{for}) \cup \text{first}(\text{while}) \cup \text{first}(\text{is}) \cup \text{first}(\text{VDECL}) \cup \text{first}(\text{ASSIGN}) \\ &= \{\text{for}, \text{while}, \text{is}, \text{vtype}, \text{id}\}\end{aligned}$$

$$\text{first}(\text{VDECL}) = \text{first}(\text{vtype id semi}) \cup \text{first}(\text{vtype ASSIGN semi}) = \text{first}(\text{vtype}) = \{\text{vtype}\}$$

$$\text{first}(\text{ASSIGN}) = \text{first}(\text{id assign RHS}) = \text{first}(\text{id}) = \{\text{id}\}$$

$$\begin{aligned}\text{first}(\text{BLOCK}) &= \text{first}(\text{STMT BLOCK}) \cup \text{first}(\epsilon) = \text{first}(\text{STMT}) \cup \{\epsilon\} \\ &= \{\text{for}, \text{while}, \text{is}, \text{vtype}, \text{id}, \epsilon\}\end{aligned}$$

$$\text{first}(\text{MOREARGS}) = \text{first}(\text{comma vtype id MOREARGS}) \cup \text{first}(\epsilon) = \text{first}(\text{comma}) \cup \{\epsilon\} = \{\text{comma}, \epsilon\}$$

$$\text{first}(\text{ARG}) = \text{first}(\text{vtype id MOREARGS}) \cup \text{first}(\epsilon) = \text{first}(\text{vtype}) \cup \{\epsilon\} = \{\text{vtype}, \epsilon\}$$

$$\begin{aligned}\text{first}(\text{FDECL}) &= \text{first}(\text{vtype id lparen ARG rparen lbrace BLOCK RETURN rbrace}) \\ &= \text{first}(\text{vtype}) = \{\text{vtype}\}\end{aligned}$$

$$\begin{aligned}\text{first}(\text{CODE}) &= \text{first}(\text{VDECL CODE}) \cup \text{first}(\text{FDECL CODE}) \cup \text{first}(\epsilon) \\ &= \text{first}(\text{VDECL}) \cup \text{first}(\text{FDECL}) \cup \{\epsilon\} \\ &= \{\text{vtype}, \epsilon\}\end{aligned}$$

$$\text{first}(\text{GOAL}) = \text{first}(\text{CODE}) = \{\text{vtype}, \epsilon\}$$