LL(k) FIRST AND FOLLOW SETS

- The **k-prefix** of a string of terminals w is a string consisting of the first k terminals in w. If |w|≤k, then the k-prefix of w is w.
- The **$First_k$ set** of a non-terminal S is the set of all k-prefixes of all strings of terminals derivable from S.
- The **$First_k$ set** of a string γ of terminals and non-terminals is the set of all k-prefixes of all strings of terminals derivable from γ.
- The **$Follow_k$ set** of a non-terminal S is the set of all k-prefixes of all strings of terminals that can follow S in a partial derivation.
- Note that First and Follow are $First_1$ and $Follow_1$.

LL(k) PARSE TABLES

A parse table for an LL(k) grammar G is created as follows:

- Calculate
  - $First_k$ and $Follow_k$ for all non-terminals
  - $First_k(\gamma)$ for all productions $A \rightarrow \gamma$
- The rows of the table are labeled with G's non-terminals
- Create a column in the table for each string of terminals of length k (strings can be shorter than k if they end with $)
- Each entry of the table is either empty, or contains the rhs of a production.
- To create entries in the table:
  Look at each production $A \rightarrow \gamma$
  - If $\gamma=\varepsilon$, $\forall\alpha \in Follow_k(A)$ $Table(A,\alpha) = \gamma = \varepsilon$
  - Otherwise, $\forall\alpha \in First_k(\gamma)$
    If $length(\alpha)=k$ $Table(A,\alpha) = \gamma$
    If $length(\alpha)<k$ $\forall\beta \in Follow_{k-length(\alpha)}(A)$ $Table(A,\alpha\beta) = \gamma$

EXAMPLE 2

S → ASSIGN | FNCALL | WHILE
ASSIGN → id = RHS
FNCALL → id ( )
WHILE → while true do S od
RHS → id | FNCALL