FIRST and FOLLOW are two functions associated with grammar that help us fill in the entries of an M-table.

**FIRST ()**− It is a function that gives the set of terminals that begin the strings derived from the production rule.

A symbol c is in FIRST (α) if and only if α ⇒ cβ for some sequence β of grammar symbols.

A terminal symbol a is in FOLLOW (N) if and only if there is a derivation from the start symbol S of the grammar such that S ⇒ αNαβ, where α and β are a (possible empty) sequence of grammar symbols. In other words, a terminal c is in FOLLOW (N) if c can follow N at some point in a derivation.

**Benefit of FIRST ( ) and FOLLOW ( )**

* It can be used to prove the LL (K) characteristic of grammar.
* It can be used to promote in the construction of predictive parsing tables.
* It provides selection information for recursive descent parsers.

**Computation of FIRST**

FIRST (α) is defined as the collection of terminal symbols which are the first letters of strings derived from α.

FIRST (α) = {α |α →∗ αβ for some string β }

**If X is Grammar Symbol, then First (X) will be −**

* If X is a terminal symbol, then FIRST(X) = {X}
* If X → ε, then FIRST(X) = {ε}
* If X is non-terminal & X → a α, then FIRST (X) = {a}
* If X → Y1, Y2, Y3, then FIRST (X) will be

(a) If Y is terminal, then

      FIRST (X) = FIRST (Y1, Y2, Y3) = {Y1}

(b) If Y1 is Non-terminal and

      If Y1 does not derive to an empty string i.e., If FIRST (Y1) does not contain ε then, FIRST (X) = FIRST (Y1, Y2, Y3) = FIRST(Y1)

(c) If FIRST (Y1) contains ε, then.

     FIRST (X) = FIRST (Y1, Y2, Y3) = FIRST(Y1) − {ε} ∪ FIRST(Y2, Y3)

Similarly, FIRST (Y2, Y3) = {Y2}, If Y2 is terminal otherwise if Y2 is Non-terminal then

* FIRST (Y2, Y3) = FIRST (Y2), if FIRST (Y2) does not contain ε.
* If FIRST (Y2) contain ε, then
* FIRST (Y2, Y3) = FIRST (Y2) − {ε} ∪ FIRST (Y3)

Similarly, this method will be repeated for further Grammar symbols, i.e., for Y4, Y5, Y6 … . YK.

**Computation of FOLLOW**

**Follow (A) is defined as the collection of terminal symbols that occur directly to the right of A.**

FOLLOW(A) = {a|S ⇒\* αAaβ where α, β can be any strings}

**Rules to find FOLLOW**

* If S is the start symbol, FOLLOW (S) ={$}
* If production is of form A → α B β, β ≠ ε.

(a) If FIRST (β) does not contain ε then, FOLLOW (B) = {FIRST (β)}

Or

(b) If FIRST (β) contains ε (i. e. , β ⇒\* ε), then

        FOLLOW (B) = FIRST (β) − {ε} ∪ FOLLOW (A)

∵ when β derives ε, then terminal after A will follow B.

* If production is of form A → αB, then Follow (B) ={FOLLOW (A)}.