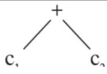
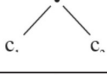



**Nullable:** It gives two results 'true' or 'false'. It is true if the empty string is a member of strings generated by the sub-expression rooted by n and false otherwise.

The construction of firstpos is made according to the following table.

	nullable(n)	firstpos(n)	lastpos(n)
leaf labelled $\epsilon$	true	$\Phi$	$\Phi$
leaf labelled with position i	false	$\{i\}$	$\{i\}$
	nullable( $c_1$ ) or nullable( $c_2$ )	$\text{firstpos}(c_1) \cup \text{firstpos}(c_2)$	$\text{lastpos}(c_1) \cup \text{lastpos}(c_2)$
	nullable( $c_1$ ) and nullable( $c_2$ )	if (nullable( $c_1$ )) $\text{firstpos}(c_1) \cup \text{firstpos}(c_2)$ else $\text{firstpos}(c_1)$	if (nullable( $c_2$ )) $\text{lastpos}(c_1) \cup \text{lastpos}(c_2)$ else $\text{lastpos}(c_2)$
	true	$\text{firstpos}(c_1)$	$\text{lastpos}(c_1)$

followpos is constructed only for the leaf nodes. It is constructed in the following way.

- If n is a dot (.) node containing the left child  $c_1$  and the right child  $c_2$ , and i is a position in  $\text{lastpos}(c_1)$ , then all positions in  $\text{firstpos}(c_2)$  belong to  $\text{followpos}(i)$ .
- If n is a star node, and i is a position in  $\text{lastpos}(n)$ , then all positions in  $\text{firstpos}(n)$  belong to  $\text{followpos}(i)$ .

The DFA is constructed by the following steps:

**Step I:** Make the RE R as augmented by placing an end marker #, and making it  $M\#$ .

Generate a parse tree from  $M\#$ .

**Step II:** Calculate the firstpos and lastpos for all the internal and leaf nodes Calculate the followpos for the leaf nodes.

**Step III:** Take the firstpos(root) as an unmarked state S of the constructing DFA.

**Step IV:** while (there exists an unmarked state S in the states of DFA)

do

Mark S and construct a transition from S using the following process for each input symbol 'a' as an alphabet of R

do

let S contain 'a' in position  $i_1, i_2, \dots, i_n$ , then

$$S' = \text{followpos}(i_1) \cup \dots \cup \text{followpos}(i_n)$$

$$\delta(S, a) = S'$$

if ( $S'$  is not empty and have not appeared in the states of the DFA)

put  $S'$  as an unmarked state into the states of the DFA.