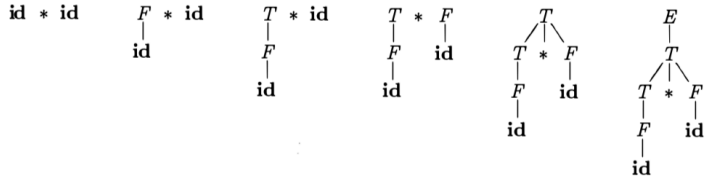
Bottom-Up Parsing

A bottom-up parse corresponds to the construction of a parse tree for an input string beginning at the leaves and working up towards the root.



Reductions

We can think of bottom-up parsing as the process of “reducing” a string w to the start symbol of the grammar.
At each reduction step, a specific substring matching the body of a production is replaced by the nonterminal at the head of that production

The key decisions during bottom-up parsing are about when to reduce and about what production to apply, as the parse proceeds

Handle Pruning

Bottom-up parsing during a left-to-right scan of the input constructs a right-most derivation in reverse. Informally, a “handle” is a substring that matches the body of a production, and whose reduction represents one step along the reverse of rightmost derivation.

A rightmost derivation in reverse can be obtained by “handle pruning”. That is, we start with a string of terminals w to be parse. If w is a sentence of the grammar at hand, then let w=yn, where yn is the nth right-right-sentential form of some as yet unknown rightmost derivation.

Shift-Reduce Parsing

Shift-reduce parsing is a form of a botton-up parsing in which a stack holds grammar symbols and an input buffer holds the rest of the string to be parsed.

Operations:

Shift.- Shift the next input symbol onto the top of the stack

Reduce. The right end of the string to be reduced must be at the top of the stack. Locate the left end of the string within the stack and decide with what nonterminal to replace the string.

Accept.- Annoince successful competition of parsing
Error.- Discover a syntax error and call an error recovery routine

Conflicts During Shift-Reduce Parsing

There are context-free grammars for which shift-reduce parsing cannot be used. Every shift-reduce parser for such a grammar can reach a configuration in which the parser, knowing the entire stack contents and the next input symbol, cannot decide whether to shift or to reduce or cannot decide which of several reductions to make.