BNF推导

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Problem description:

Using the following grammar, show whether it is possible to generate a parse tree for the statements given. If so, show its leftmost derivation.

```
<assign> -> <id> = <expr>
<id> -> A | B | C
<expr> -> <expr> + <term> | <term>
<term> -> <term> * <factor> | <factor>
<factor> -> ( <expr> ) | <id>
```

1. $A = A * B + C * A$
2. $A = B + C * (A + B)$

Answer:

1. It is possible to generate a parse tree for the statements given.

   Leftmost derivation:

- $< assign >=>$
  $< id >=< expr >$
  $=> A =< expr >$
  $=> A =< expr > + < term >$
  $=> A =< term > + < term >$
  $=> A =< term > * < factor > + < term >$
  $=> A =< factor > * < factor > + < term >$
  $=> A =< id > * < factor > + < term >$
  $=> A = A* < factor > + < term >$
  $=> A = A* < id > + < term >$
  $=> A = A * B+ < term >$
  $=> A = A * B+ < term > * < factor >$
  $=> A = A * B+ < factor > * < factor >$
  $=> A = A * B+ < id > * < factor >$
  $=> A = A * B + C* < factor >$
  $=> A = A * B + C* < id >$
  $=> A = A * B + C * A$

2. It is possible to generate a parse tree for the statements given.

   Leftmost derivation:

- $< assign >=>$
  $< id >=< expr >$
  $=> A =< expr >$
  $=> A =< expr > + < term >$
  $=> A =< term > + < term >$
  $=> A =< factor > + < term >$
  $=> A =< id > + < term >$
  $=> A = B+ < term >$
  $=> A = B+ < term > * < factor >$
  $=> A = B+ < factor > * < factor >$
  $=> A = B+ < id > * < factor >$
  $=> A = B + C* < factor >$
  $=> A = B + C * (< expr >)$
  $=> A = B + C * (< expr > + < term >)$
  $=> A = B + C * (< term > + < term >)$
  $=> A = B + C * (< factor > + < term >)$
  $=> A = B + C * (< id > + < term >)$
  $=> A = B + C * (A+ < term >)$
  $=> A = B + C * (A+ < factor >)$
  $=> A = B + C * (A+ < id >)$
  $=> A = B + C * (A + B)$