

Using the following grammar, show whether it is possible to generate a parse tree for the statements given. If so, show its leftmost derivation.  $\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\langle \text{id} \rangle \rightarrow A \mid B \mid C$

$\langle \text{expr} \rangle \rightarrow \langle \text{expr} \rangle + \langle \text{term} \rangle \mid \langle \text{term} \rangle$

$\langle \text{term} \rangle \rightarrow \langle \text{term} \rangle * \langle \text{factor} \rangle \mid \langle \text{factor} \rangle$

$\langle \text{factor} \rangle \rightarrow ( \langle \text{expr} \rangle ) \mid \langle \text{id} \rangle$

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

Answer:

1.  $\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\rightarrow A = \langle \text{expr} \rangle + \langle \text{term} \rangle$

$\rightarrow A = \langle \text{term} \rangle + \langle \text{term} \rangle * \langle \text{factor} \rangle$

$\rightarrow A = \langle \text{term} \rangle * \langle \text{factor} \rangle + \langle \text{factor} \rangle * \langle \text{id} \rangle$

$\rightarrow A = \langle \text{factor} \rangle * \langle \text{id} \rangle + \langle \text{id} \rangle * A$

$\rightarrow A = \langle \text{id} \rangle * B + C * A$

$\rightarrow A = A * B + C * A$

2.  $\langle \text{assign} \rangle \rightarrow \langle \text{id} \rangle = \langle \text{expr} \rangle$

$\rightarrow A = \langle \text{expr} \rangle + \langle \text{term} \rangle$

$\rightarrow A = \langle \text{term} \rangle + \langle \text{term} \rangle$

$\rightarrow A = \langle \text{factor} \rangle + \langle \text{term} \rangle * \langle \text{factor} \rangle$

$\rightarrow A = \langle \text{id} \rangle + \langle \text{factor} \rangle * (\langle \text{expr} \rangle)$

$\rightarrow A = B + \langle \text{id} \rangle * (\langle \text{expr} \rangle + \langle \text{term} \rangle)$

$\rightarrow A = B + C * (\langle \text{term} \rangle + \langle \text{factor} \rangle)$

$\rightarrow A = B + C * (\langle \text{factor} \rangle + \langle \text{id} \rangle)$

$\rightarrow A = B + C * (\langle \text{id} \rangle + B)$

$\rightarrow A = B + C * (A + B)$