If a context free grammar **G** has more than one derivation tree for some string **w ∈ L(G)**, it is called an **ambiguous grammar**. There exist multiple right-most or left-most derivations for some string generated from that grammar.

Problem

Check whether the grammar G with production rules −

X → X+X | X\*X |X| a

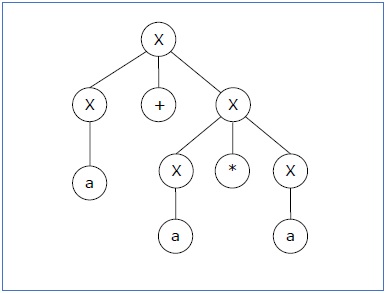
is ambiguous or not.

Solution

Let’s find out the derivation tree for the string "a+a\*a". It has two leftmost derivations.

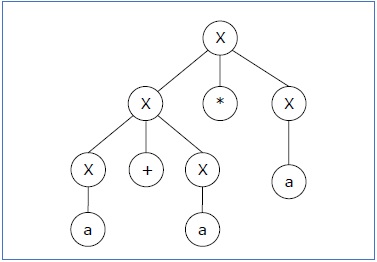
**Derivation 1** − X → X+X → a +X → a+ X\*X → a+a\*X → a+a\*a

**Parse tree 1** −



**Derivation 2** − X → X\*X → X+X\*X → a+ X\*X → a+a\*X → a+a\*a

**Parse tree 2** −



Since there are two parse trees for a single string "a+a\*a", the grammar **G** is ambiguous.