

Disambiguating grammars

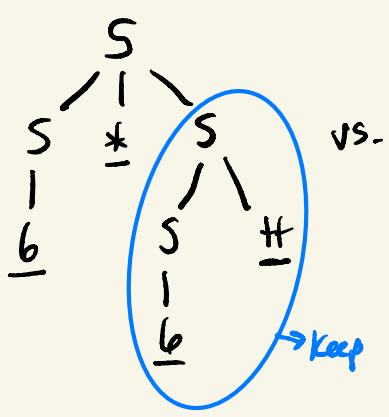
[No algorithms in general
Requires creativity]

Example 1

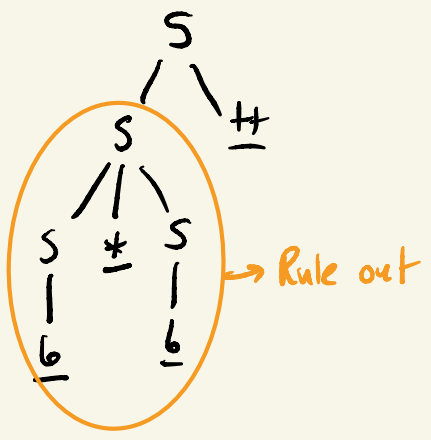
Starting grammar :

$$S ::= S * S \mid \underline{S} \# \mid 6$$

6 * 6 #

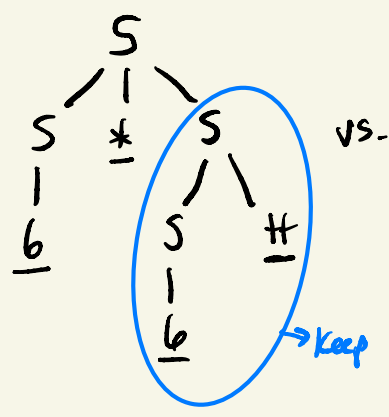


vs.

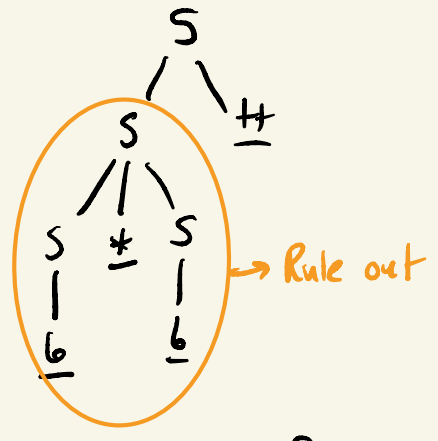


$S ::= S * S \mid \underline{S} \# \mid 6$

6 * 6 #



vs.



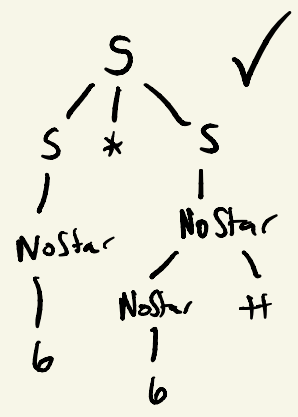
$S ::= S * S \mid \text{NoStar}$

$\text{NoStar} ::= \text{NoStar} \# \mid 6$

Unambiguous?

6 * 6 * 6

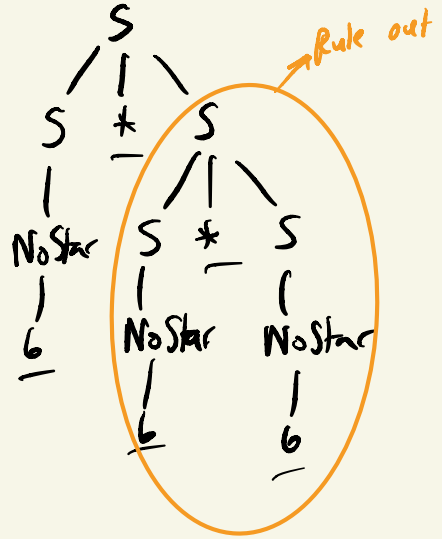
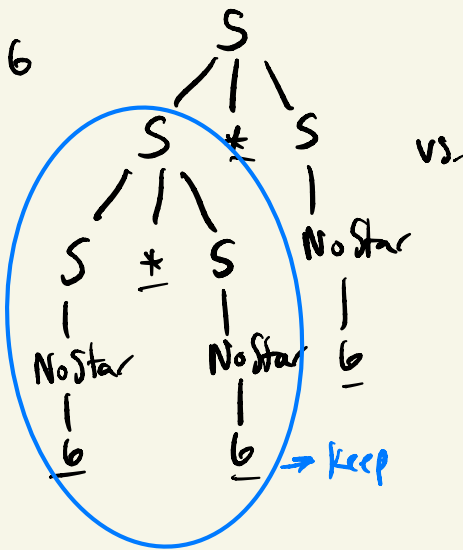
Check
6 * 6 #



$S ::= S * S \mid \text{NoStar}$

$\text{NoStar} ::= \text{NoStar} \# \mid 6$

$6 * 6 * 6$



left associative

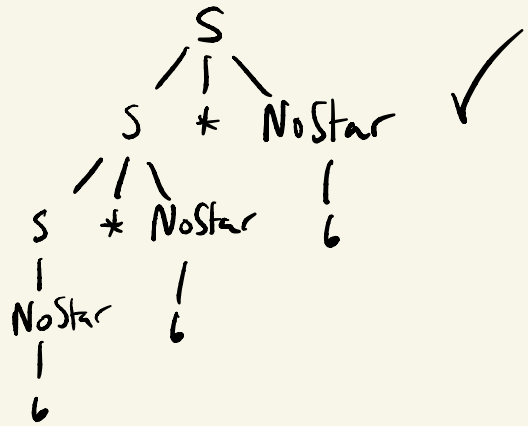
$S ::= S * \text{NoStar} \mid \text{NoStar}$

$\text{NoStar} ::= \text{NoStar} \# \mid 6$

Unambiguous now?

Prove it by induction
on depth of parse trees

Check $6 * 6 * 6$



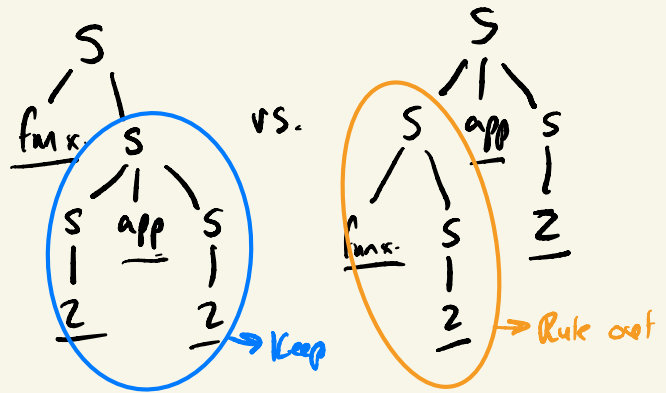
Example 2

Starting grammar:

$S ::= \text{fun } x. S \mid \underline{S} \text{ app } S \mid 2 \mid (S)$

Ambiguous?

fun x. 2 app 2



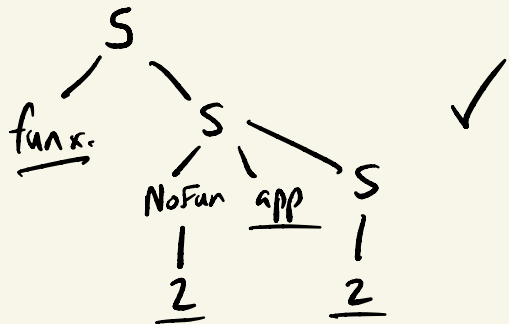
$S ::= \text{fun } x. S \mid \text{NoFun app } S \mid 2 \mid (S)$

$\text{NoFun} ::= \text{NoFun app NoFun} \mid 2 \mid (S)$

Check: fun x. 2 app 2

Unambiguous?

2 app 2 app 2



Example 3

Starting grammar:

$S ::= \text{fun } x. S \mid S * S \mid S + S \mid Z$

Precedence & Associativity Specification

right * highest precedence
left +
fun x. lowest precedence

$S ::= \text{fun } x. S \mid \text{Plus}$

$\text{Plus} ::= \text{Plus} + \text{Star} \mid \text{Star}$

$\text{Star} ::= \text{Atom} * \text{Star} \mid \text{Atom}$

$\text{Atom} ::= Z$

Missing things like

$Z * \text{fun } x. Z$

$S ::= \underline{\text{NoFun}} \mid \text{Fun}$

$\underline{\text{NoFun}} ::= \underline{\text{NoFun}} + \underline{\text{NoPlusNoFun}} \mid \underline{\text{NoPlusNoFun}}$

$\underline{\text{NoPlusNoFun}} ::= \underline{\text{NoPlusNoFunNoStar}} * \underline{\text{NoPlusNoFun}} \mid \underline{\text{NoPlusNoFunNoStar}}$

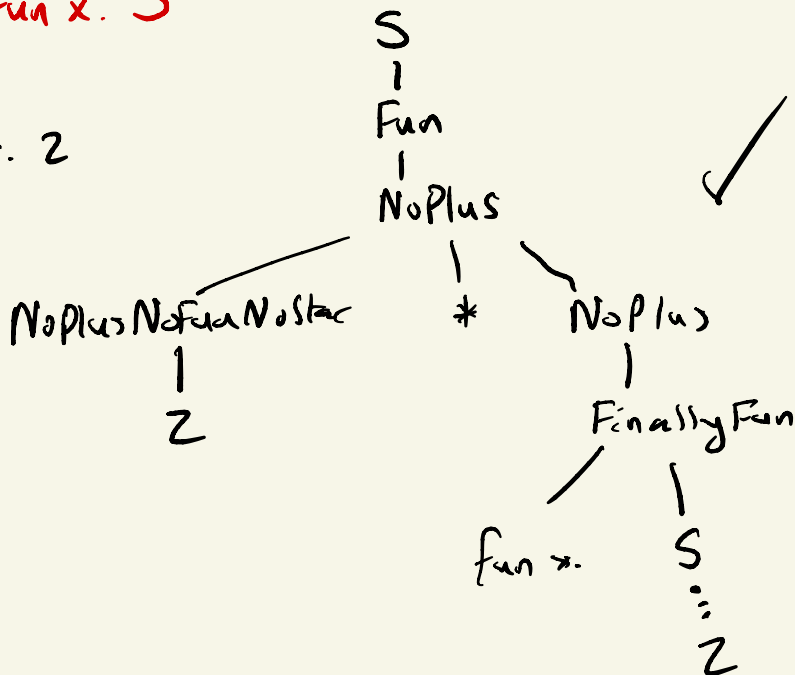
$\underline{\text{NoPlusNoFunNoStar}} ::= \underline{2}$

$\text{Fun} ::= \text{NoFun} + \text{NoPlus} \mid \text{NoPlus}$

$\text{NoPlus} ::= \text{NoPlusNoFunNoStar} * \text{NoPlus} \mid \text{FinallyFun}$

$\text{FinallyFun} ::= \text{fun } x. S$

Check: $2 * \text{fun } x. 2$



$2 * 2 + 2$