

# BNF ASSIGNMENT

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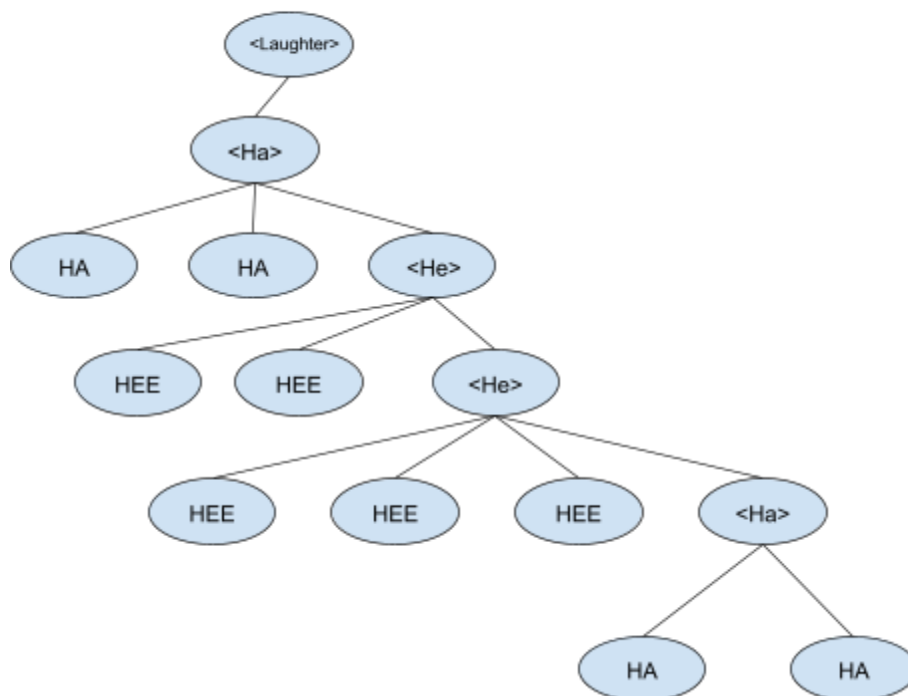
## Abstract:

An assignment to better understand and work with BNF grammars, as well as parse trees and to explain BNF in a straightforward compelling manor

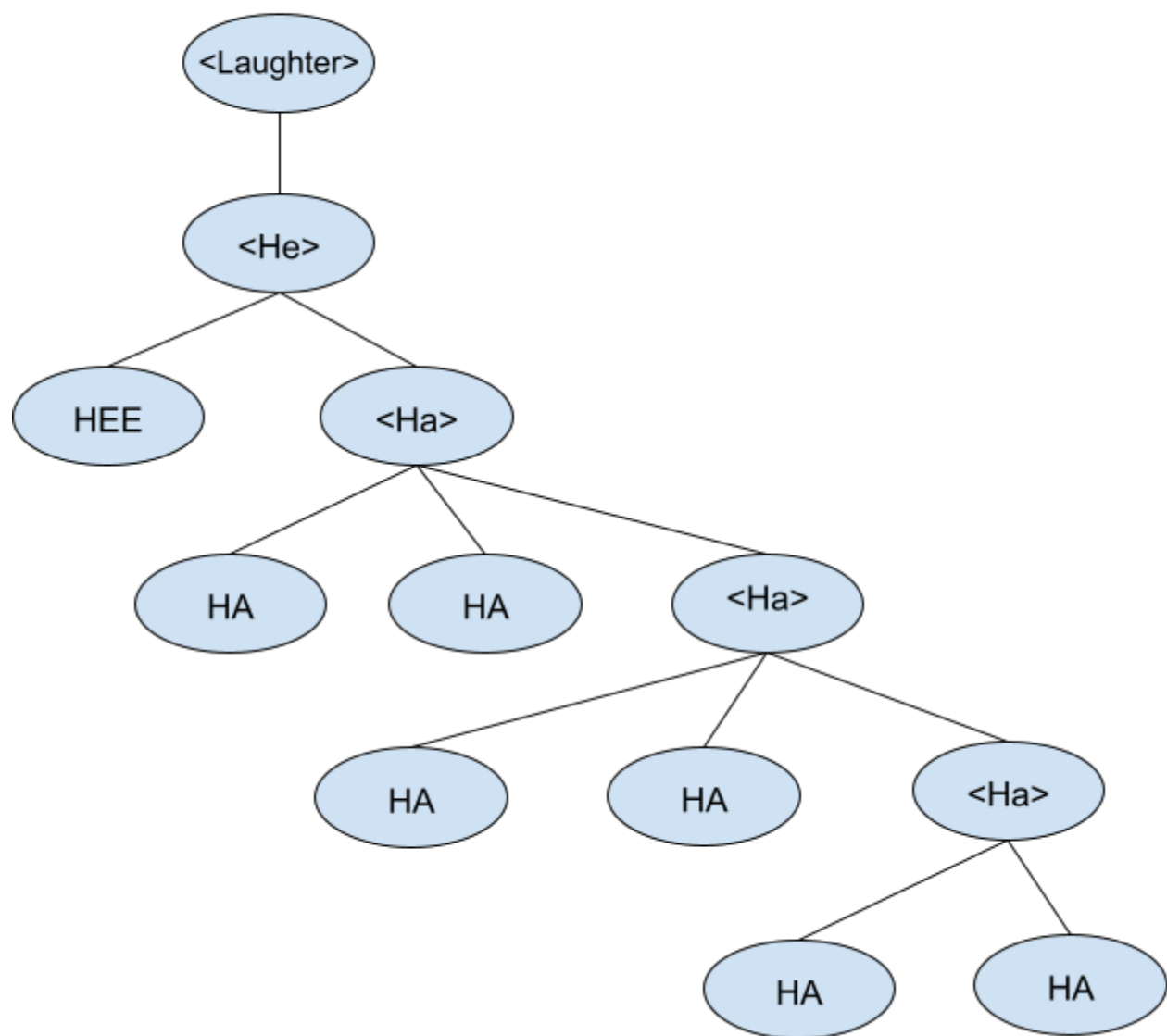
## Problem 1 - Laughter

$\langle \text{Laughter} \rangle ::= \langle \text{Ha} \rangle \mid \langle \text{He} \rangle$   
 $\langle \text{Ha} \rangle ::= \text{HA HA} \mid \text{HA HA} \langle \text{He} \rangle \mid \text{HA HA} \langle \text{Ha} \rangle$   
 $\langle \text{He} \rangle ::= \text{HEE} \mid \text{HEE HEE HEE} \mid \langle \text{He} \rangle \langle \text{Ha} \rangle \mid \text{HEE HEE} \langle \text{He} \rangle$

**PARSE LINE FOR: HA HA HEE HEE HEE HEE HEE HA HA**



# PARSE TREE FOR: HEE HA HA HA HA HA HA



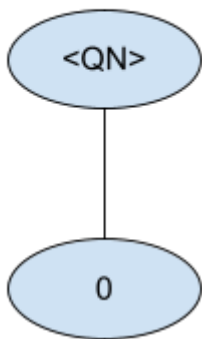
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## Problem 2 -SQN

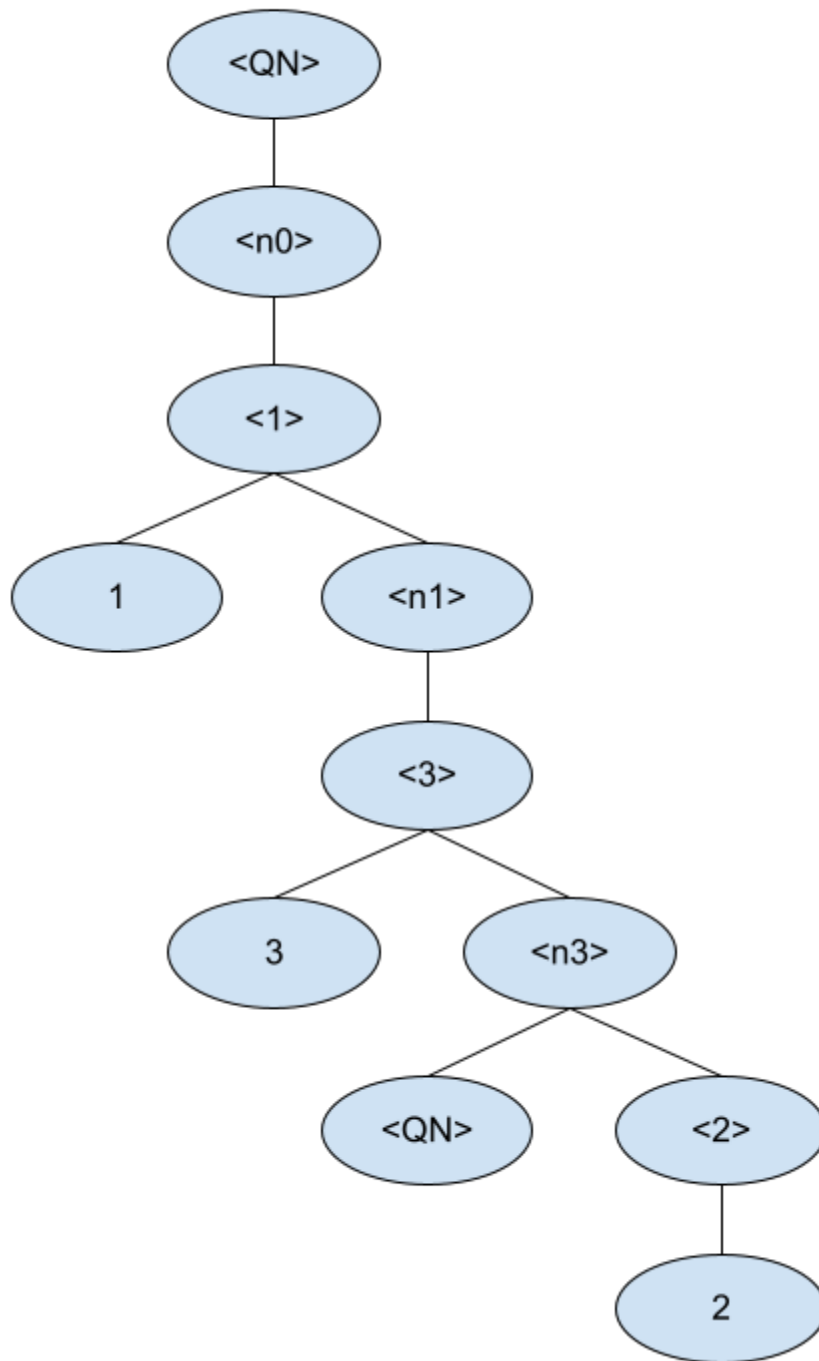
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$\langle \text{QN} \rangle ::= 0 \mid \langle \text{n0} \rangle$   
 $\langle 0 \rangle ::= 0 \mid 0 \langle \text{n0} \rangle$   
 $\langle 1 \rangle ::= 1 \mid 1 \langle \text{n1} \rangle$   
 $\langle 2 \rangle ::= 2 \mid 2 \langle \text{n2} \rangle$   
 $\langle 3 \rangle ::= 3 \mid 3 \langle \text{n3} \rangle$   
 $\langle \text{n0} \rangle ::= \langle 1 \rangle \mid \langle 2 \rangle \mid \langle 3 \rangle$   
 $\langle \text{n1} \rangle ::= \langle 0 \rangle \mid \langle 2 \rangle \mid \langle 3 \rangle$   
 $\langle \text{n2} \rangle ::= \langle 0 \rangle \mid \langle 1 \rangle \mid \langle 3 \rangle$   
 $\langle \text{n3} \rangle ::= \langle 0 \rangle \mid \langle 1 \rangle \mid \langle 2 \rangle$

**PARSE TREE FOR: 0**



## PARSE TREE FOR: 132



1223 would not be consistent with the BNF grammar. It would travel through <n0><1><2> and would be stopped at <2> due to the requirements of <2> being that either it would be just 2 or 2 accompanied by a non 2 number represented by <n2>

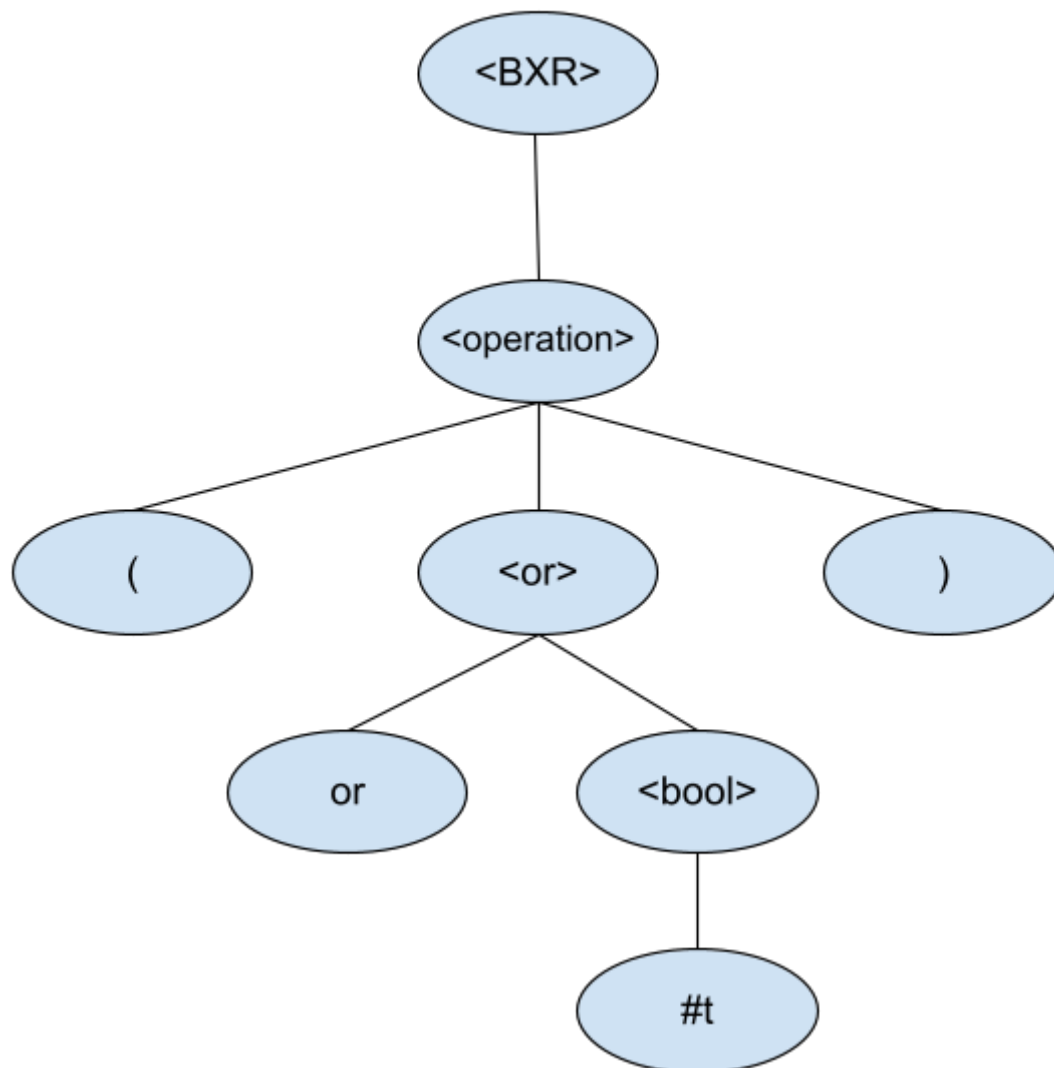
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## Problem 3 -BXR

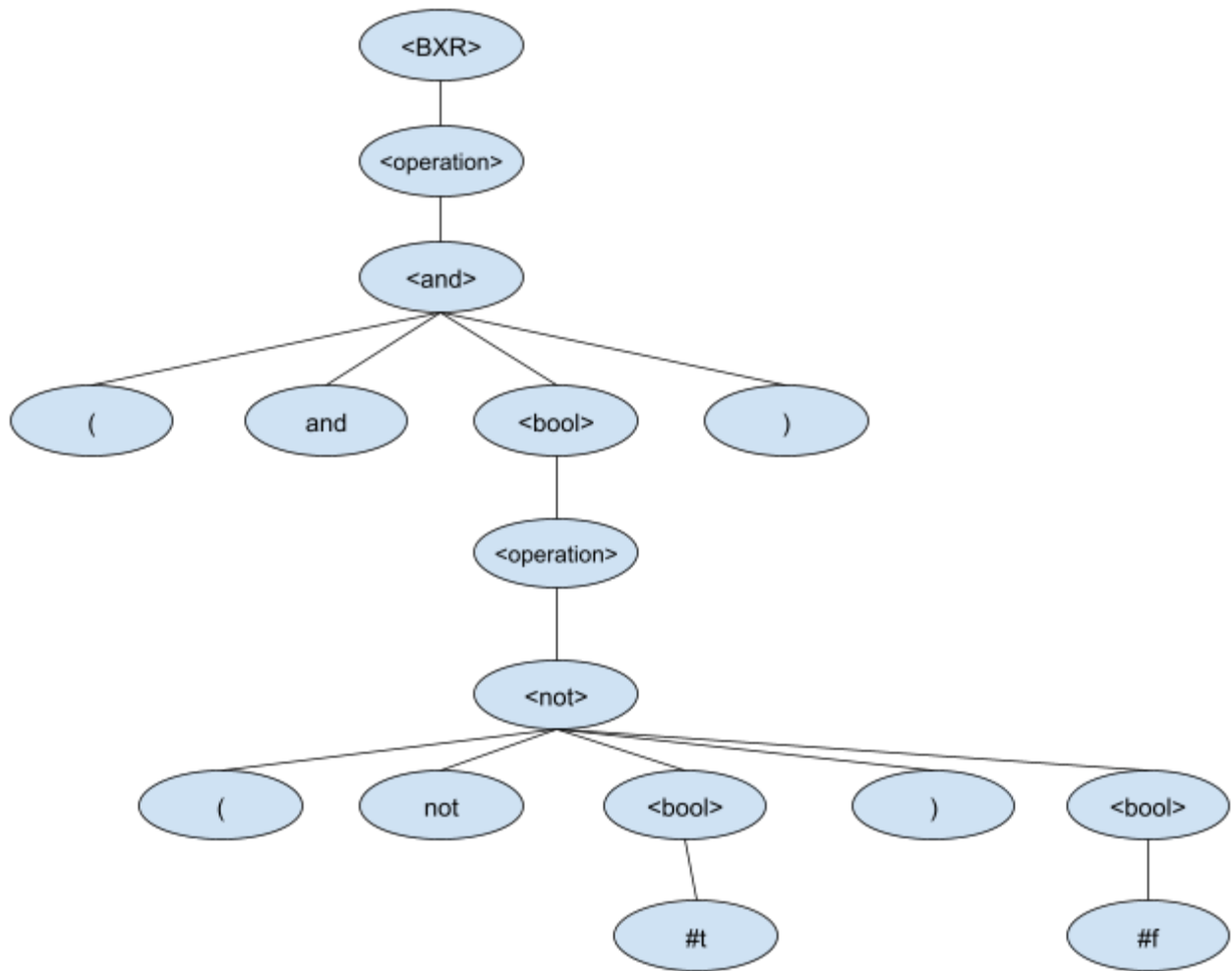
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$\langle \text{BXR} \rangle ::= \langle \text{operation} \rangle \mid \#t \mid \#f$   
 $\langle \text{operation} \rangle ::= \langle \text{and} \rangle \mid \langle \text{or} \rangle \mid \langle \text{not} \rangle$   
 $\langle \text{and} \rangle ::= ( \text{ and } \langle \text{bool} \rangle ) \mid (\text{and})$   
 $\langle \text{or} \rangle ::= ( \text{ or } \langle \text{bool} \rangle ) \mid (\text{or})$   
 $\langle \text{not} \rangle ::= ( \text{ not } \langle \text{bool} \rangle ) \mid ( \text{ not } \langle \text{bool} \rangle ) \langle \text{bool} \rangle$   
 $\langle \text{bool} \rangle ::= \#t \mid \#f \mid \langle \text{operation} \rangle$

### PARSE TREE FOR: ( or #t )



PARSE TREE FOR: ( and ( not #t ) #f )



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## Problem 4 -LSS

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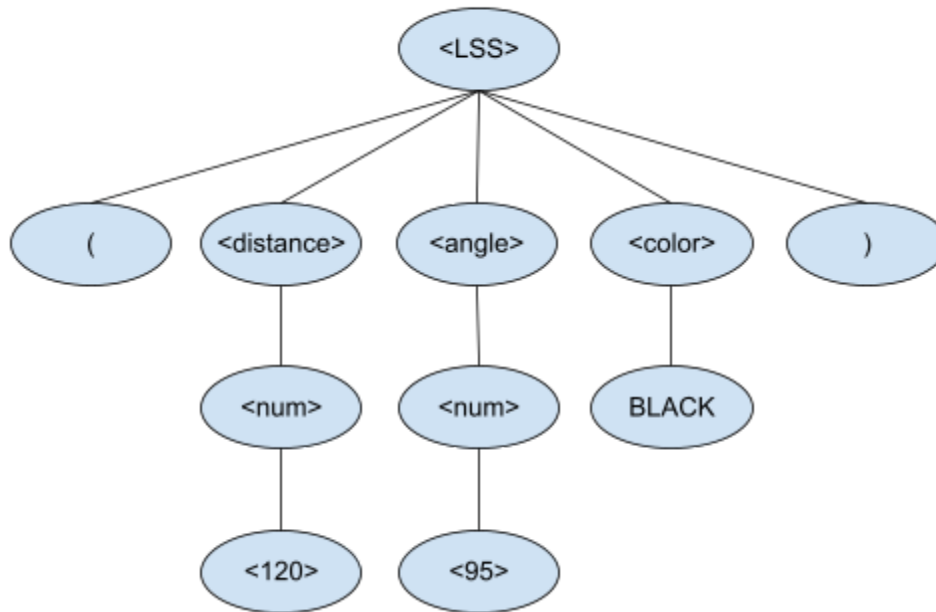
$\langle \text{LSS} \rangle ::= ( \langle \text{distance} \rangle \langle \text{angle} \rangle \langle \text{color} \rangle ) \mid \langle \text{LSS} \rangle \langle \text{LSS} \rangle$

$\langle \text{distance} \rangle ::= \langle \text{num} \rangle$

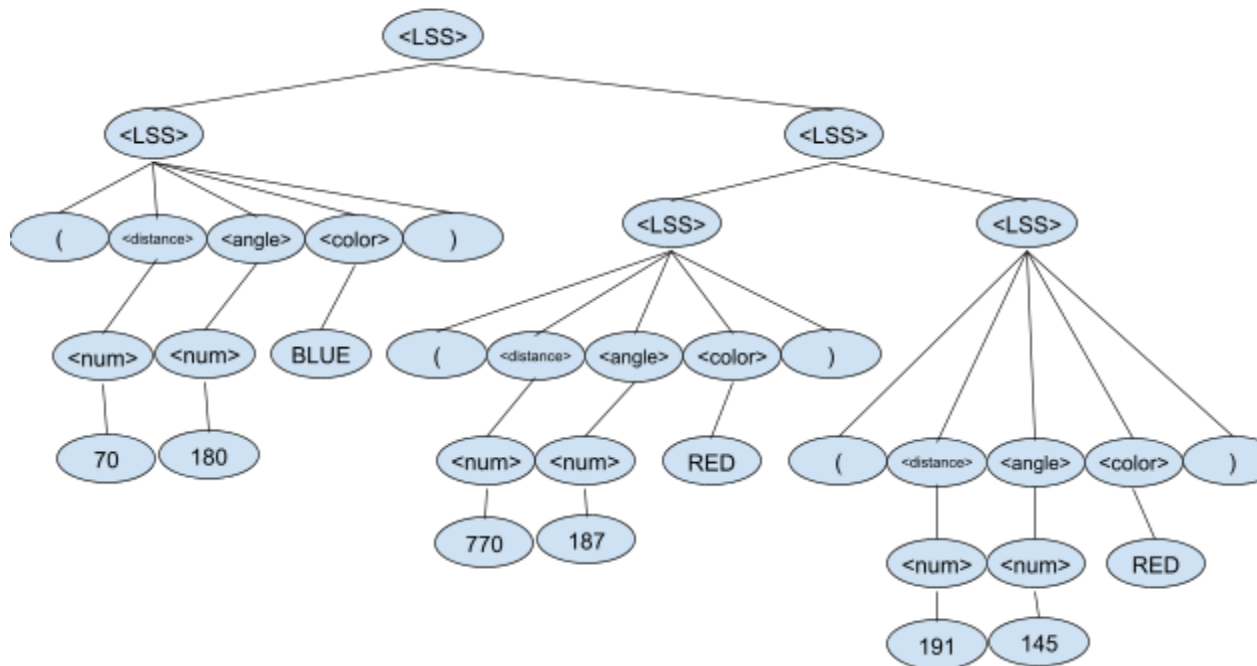
$\langle \text{angle} \rangle ::= \langle \text{num} \rangle$

$\langle \text{color} \rangle ::= \text{RED} \mid \text{BLUE} \mid \text{BLACK}$

**PARSE TREE FOR: ( 120 95 BLACK )**



**PARSE TREE FOR: ( 70 180 BLUE ) ( 770 187 RED ) ( 191 145 RED )**



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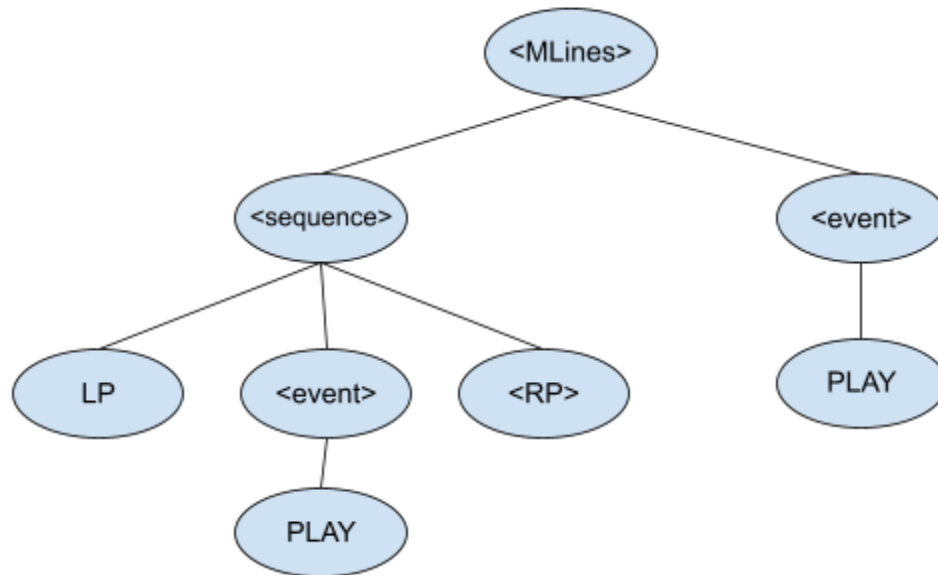
## Problem 5 -M-Lines

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$\langle \text{MLines} \rangle ::= \langle \text{ES} \rangle \mid \langle \text{empty} \rangle$

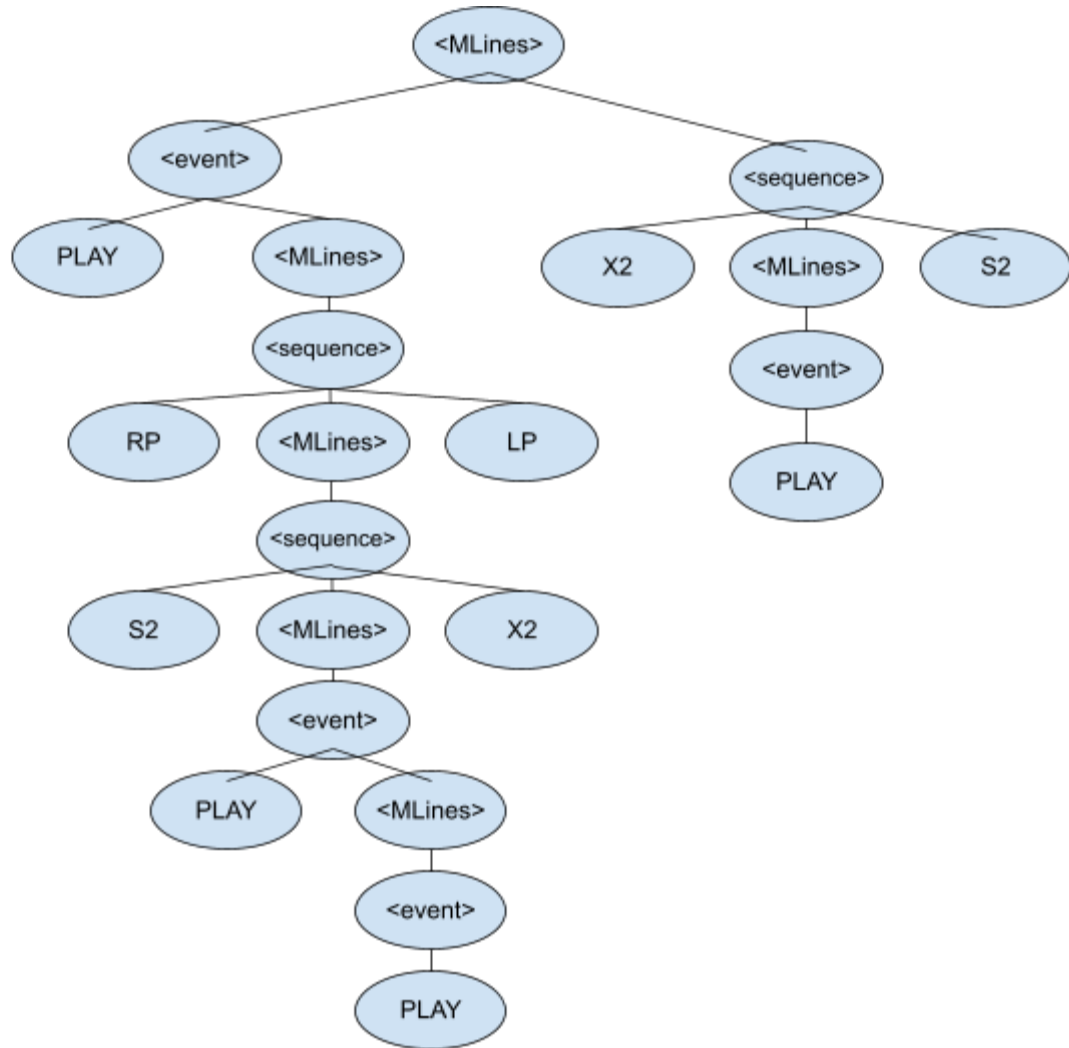
$\langle ES \rangle ::= \langle event \rangle \mid \langle sequence \rangle \mid \langle event \rangle \langle sequence \rangle \mid \langle sequence \rangle \langle event \rangle \mid \langle empty \rangle$   
 $\langle event \rangle ::= PLAY \langle ES \rangle \mid REST \langle ES \rangle \mid \langle ES \rangle PLAY \mid \langle ES \rangle REST \mid \langle empty \rangle$   
 $\langle sequence \rangle ::= RP \langle ES \rangle LP \mid LP \langle ES \rangle RP \mid S2 \langle ES \rangle X2 \mid X2 \langle ES \rangle S2 \mid S3 \langle ES \rangle X3 \mid X3 \langle ES \rangle S3 \mid \langle empty \rangle$

**PARSE TREE FOR: LP PLAY RP PLAY**





**PARSE  
TREE  
FOR:**  
PLAY RP  
S2 PLAY  
PLAY X2  
LP X2  
PLAY S2



## Problem 6 - BNF?

BNF is a way to produce a grammar to define a language. Many languages are very large, producing a grammar is a way specify characteristics of a language. The things representing BNF are tokens, nonterminal symbols, productions, and a start symbol.