

First Problem Set Assignment Solution

Learning abstract: In this assignment I learned to make BNF grammars and see how they work visually through pars trees

Task 1: What is BNF

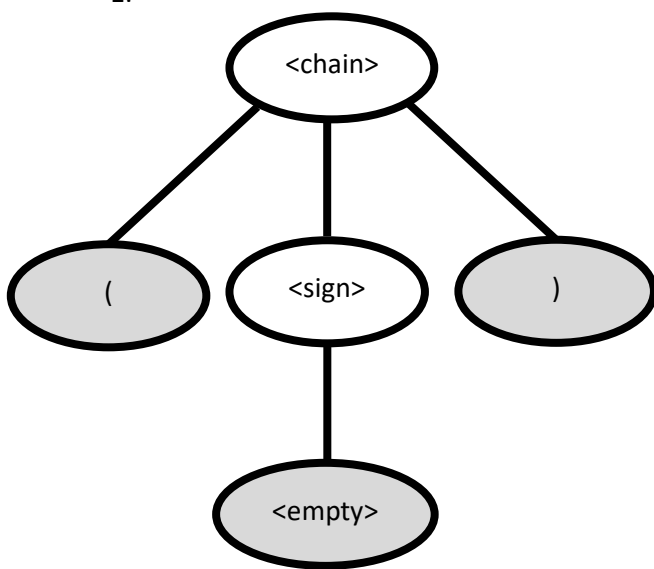
BNF, full name Backus-Naur form, is a notation used to describe a given set of rules. BNF can be used to explain nearly anything that has a set of structured rules that must be followed whether it be a language, functions within a given language, or even the steps you have to take to go to the grocery story. To make BNF grammar you must right an instruction word, this instruction word must contain instruction word(s) on how to fulfill the parent instruction. This process is repeated until you have reached a value that cannot be broken down.

Task 2: L1 BNF

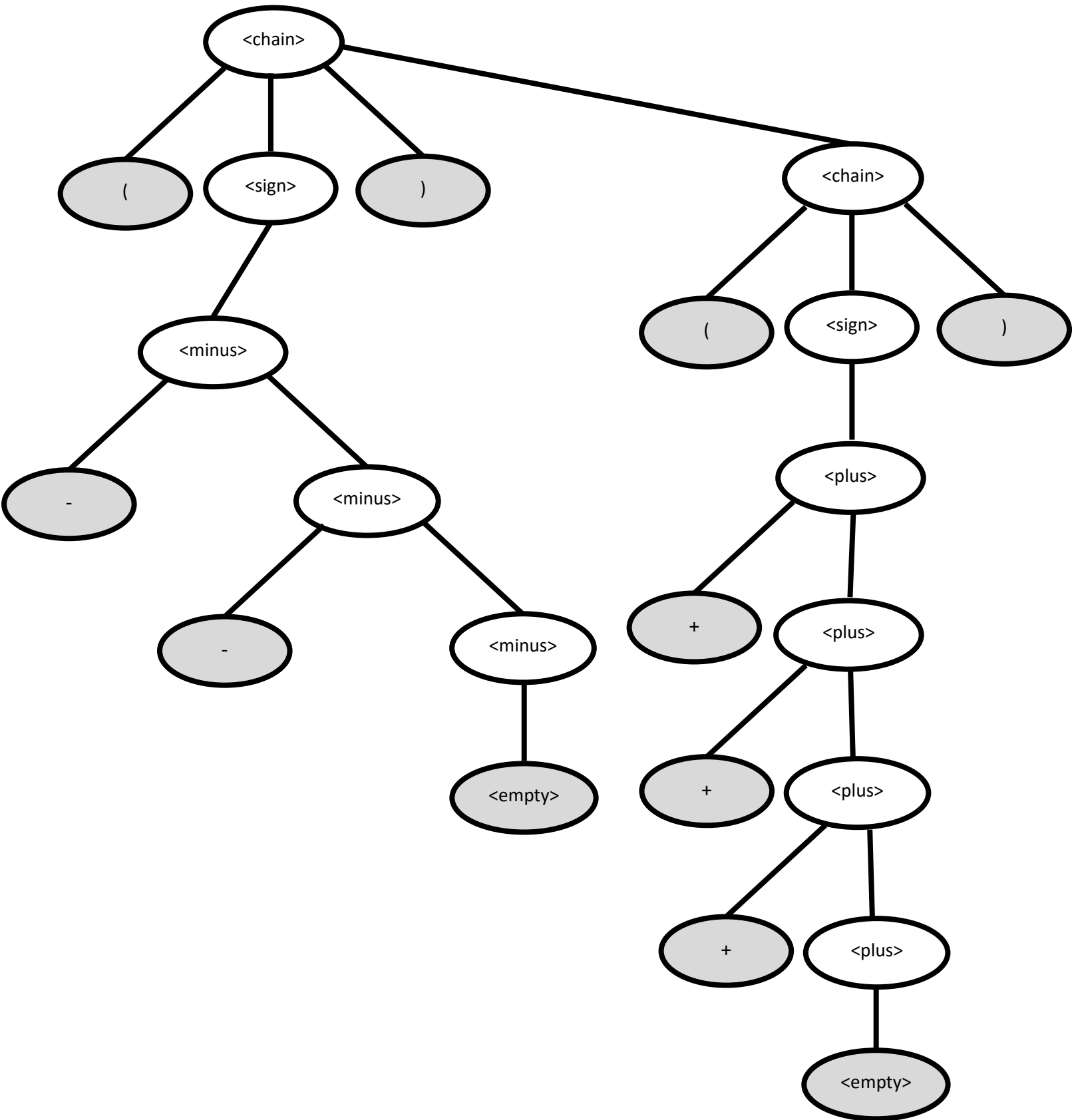
$\langle \text{chain} \rangle ::= (\langle \text{sign} \rangle \langle \text{chain} \rangle \mid \langle \text{sign} \rangle)$
 $\langle \text{sign} \rangle ::= \langle \text{plus} \rangle \mid \langle \text{minus} \rangle \mid \langle \text{empty} \rangle$
 $\langle \text{plus} \rangle ::= +\langle \text{plus} \rangle \mid \langle \text{empty} \rangle$
 $\langle \text{minus} \rangle ::= -\langle \text{minus} \rangle \mid \langle \text{empty} \rangle$

Task 3: Parse Trees for L1

1.



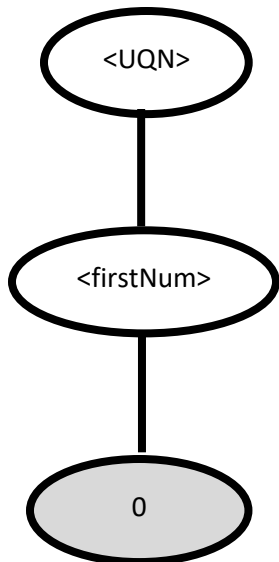
2.



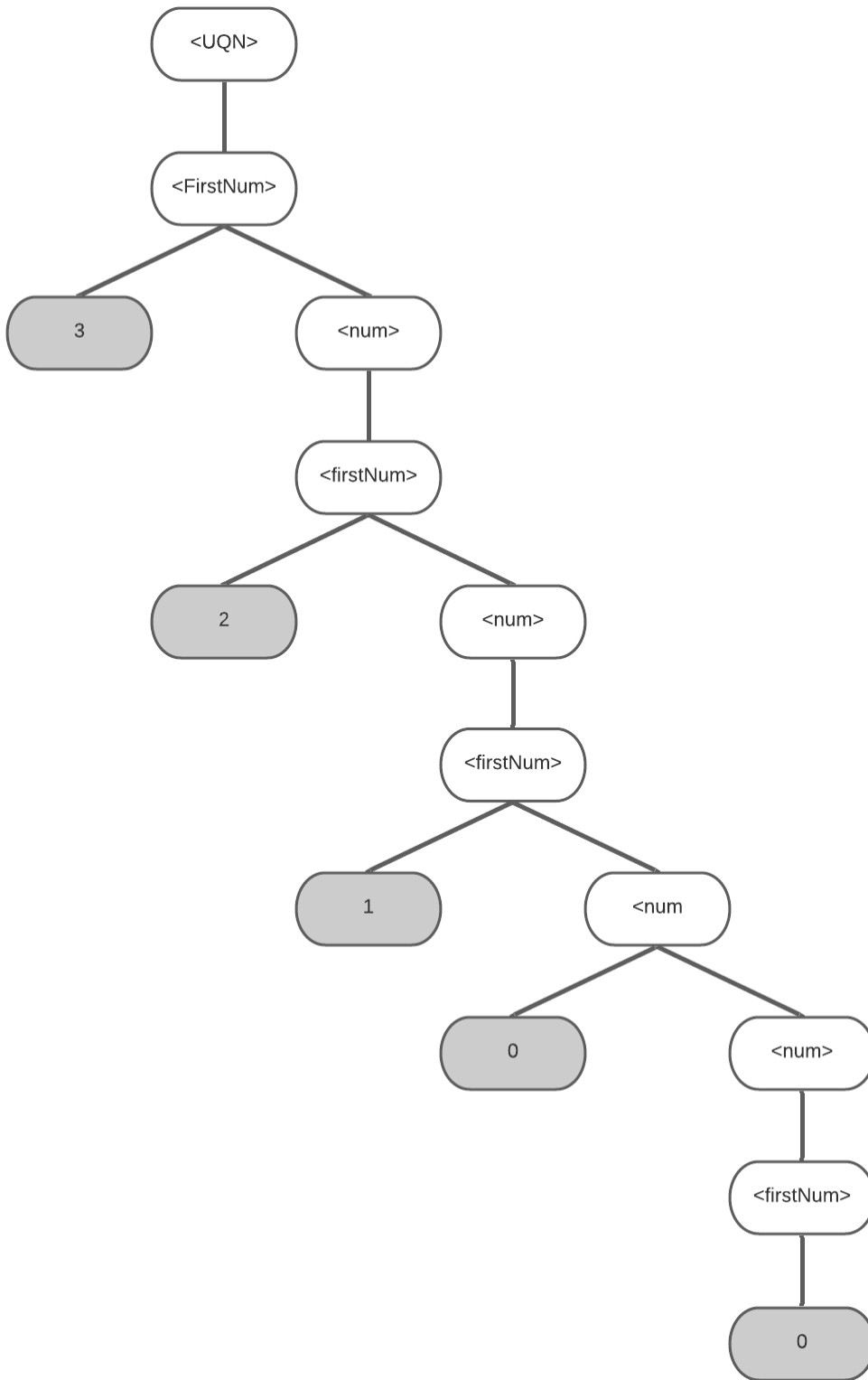
Task 4: L2 BNF
$$\langle \text{UQN} \rangle ::= \langle \text{firstNum} \rangle$$
$$\langle \text{firstNum} \rangle ::= 1\langle \text{num} \rangle \mid 2\langle \text{num} \rangle \mid 3\langle \text{num} \rangle \mid 0$$
$$\langle \text{num} \rangle ::= \langle \text{firstNum} \rangle \mid 0\langle \text{num} \rangle \mid \langle \text{empty} \rangle$$

Task 5: Parse Trees for L2

1.



2.



Task 6: L3 BNF

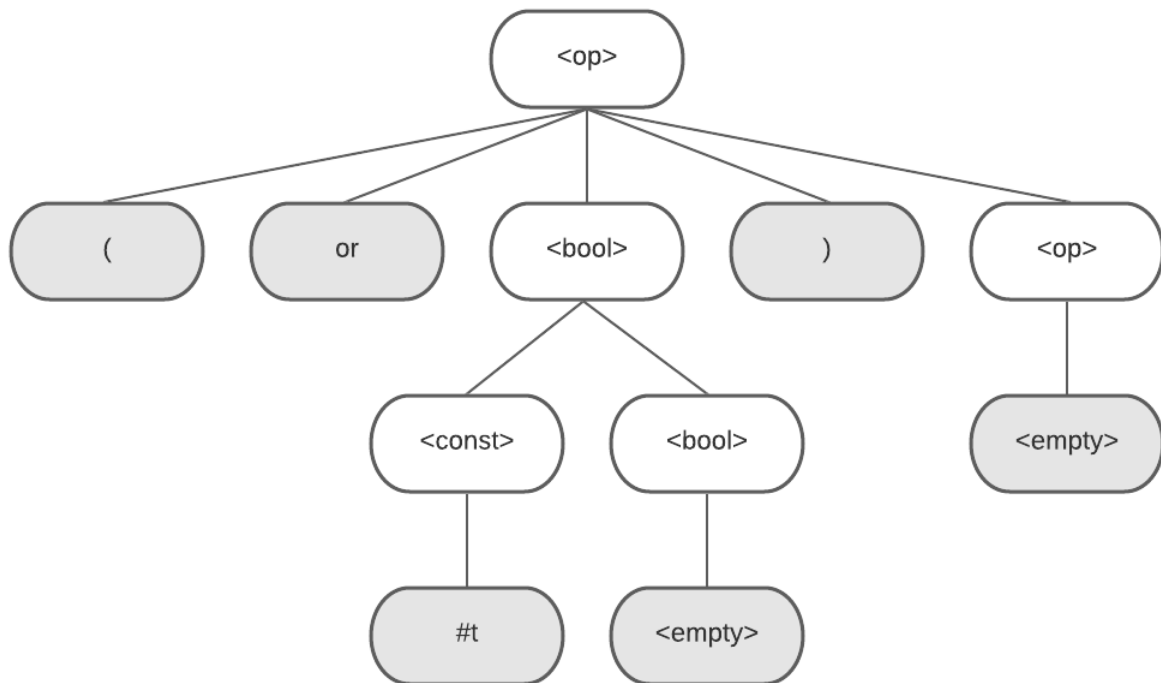
$\langle op \rangle ::= (\text{ and } \langle bool \rangle) \langle op \rangle \mid (\text{ or } \langle bool \rangle) \langle op \rangle \mid (\text{ not } \langle const \rangle) \langle op \rangle \mid \langle const \rangle \mid \langle empty \rangle$

$\langle bool \rangle ::= \langle const \rangle \langle bool \rangle \mid \langle op \rangle \langle bool \rangle \mid \langle empty \rangle$

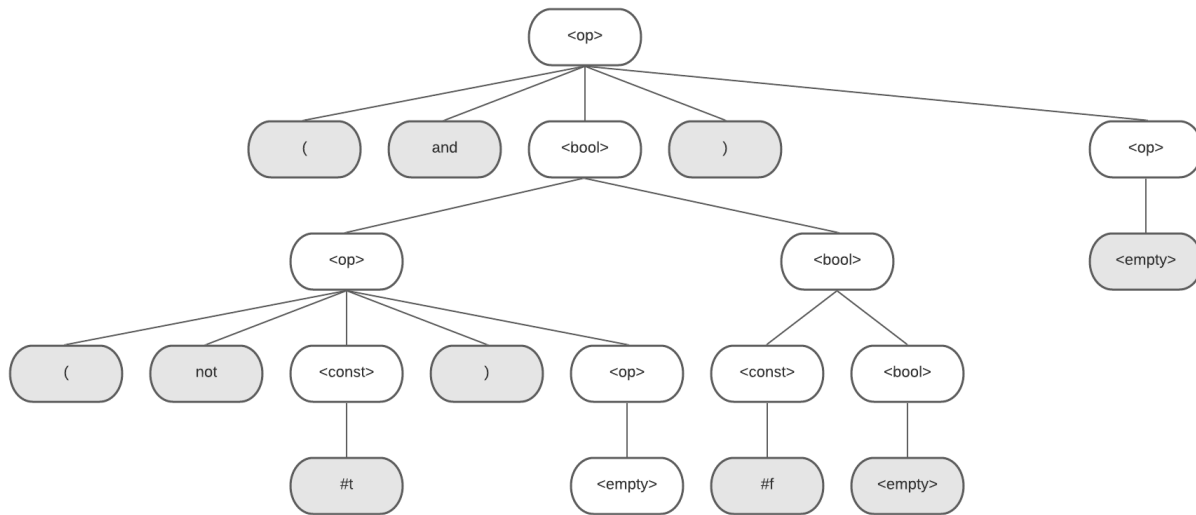
$\langle const \rangle ::= \#t \mid \#f$

Task 7: Parse Trees for L3

1.



2.



Task 8: L4 BNF

<number> ::= zero | <ones> | <teens> | <tens> | <hundreds>

<ones> ::= one | two | three | four | five | six | seven | eight | nine | <empty>

<teens> ::= ten | eleven | twelve | thirteen | fourteen | fifteen | sixteen | seventeen | eighteen | nineteen

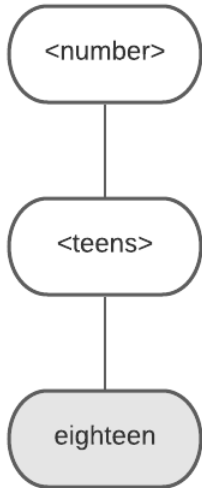
<tensBase> ::= twenty | thirty | forty | fifty | sixty | seventy | eighty | ninety

<tens> ::= <tensBase> <ones>

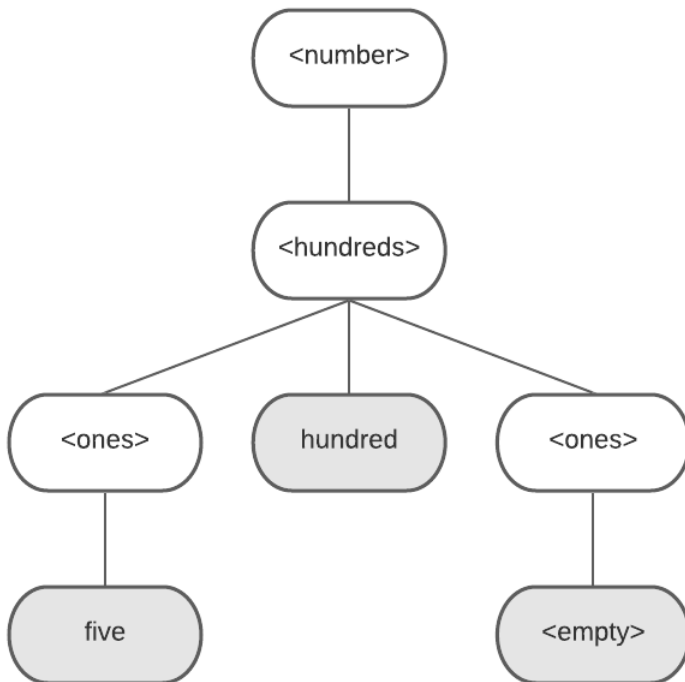
<hundreds> ::= <ones> hundred <ones> | <ones> hundred <teens> | <ones> hundred <tens>

Task 9: Parse Trees for L4

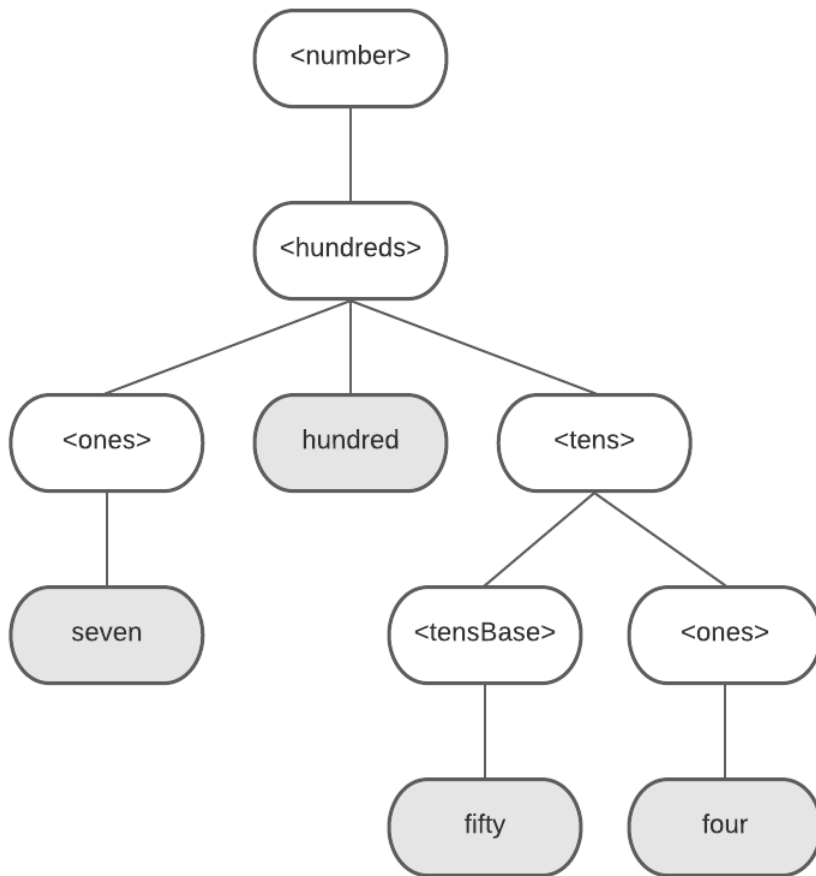
1.



2.



3.



Task 10: L5 BNF

$\langle cf \rangle ::= \langle add \rangle \mid \langle show \rangle \mid \text{colors} \mid \langle describe \rangle \mid \text{exit}$

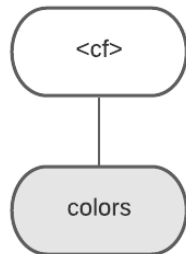
$\langle add \rangle ::= \text{add} (\langle rgb \rangle) \langle ID \rangle$

$\langle show \rangle ::= \text{show} \langle ID \rangle$

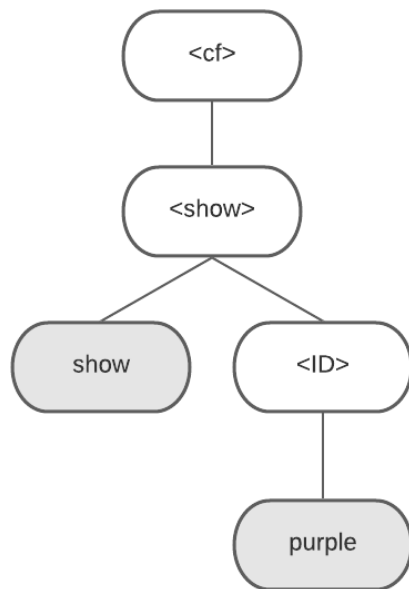
$\langle describe \rangle ::= \text{describe} \langle ID \rangle$

Task 11: Parse Trees for L5

1.



2.



3.

