First Problem Set: BNF

Task 1 - BNF?

BNF is a tool to explicitly define a computer programming language. It allows you to create a set of instructions to follow to give structure and create relations between symbols in a given language. BNF is made up of terminal and non-terminal parts. These parts are then related to one another by assigning non-terminals a value which could be made up of any combination of terminal and non-terminal parts. The terminal values can be thought of as constants, like symbols, text, numbers while the non-terminals are more abstract and can be thought of as an equation.

Task 2 - BNF Description of L1

<STRING> ::= <M-STRING> <STRING> | < P-STRING > <STRING> | <empty>

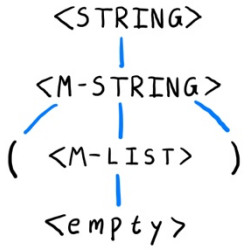
<M-STRING> ::= (< M-LIST>)

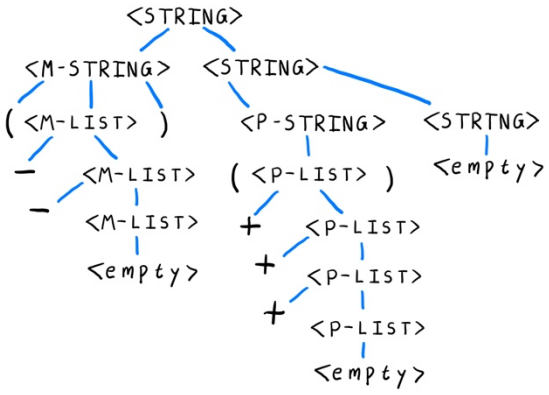
<P-STRING> ::= (< P-LIST >)

< M-LIST > ::= - <M-LIST> | <empty>

< P-LIST > ::= + <P-LIST> | <empty>

Task 3 - Parse Trees for L1





Task 4 - BNF Description of L2

<STRING> ::= <NUM-LIST > | 0

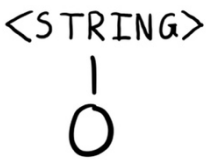
<NUM-LIST > ::= <NON-Z-NUM> <Z-LIST> < NUM-LIST > | <empty>

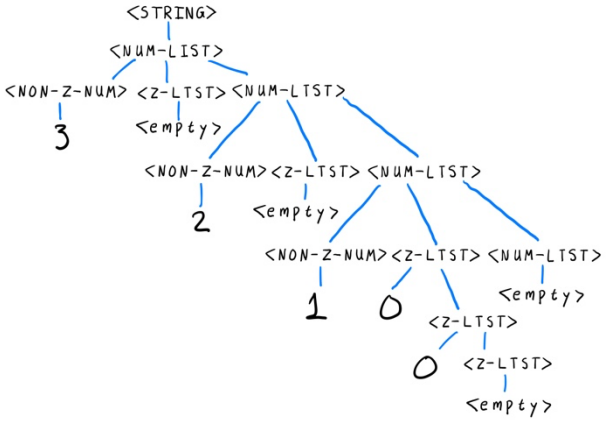
< Z-LIST > ::= 0 <Z-LIST> | <empty>

< NON-Z-NUM > ::= 1 | 2 | 3

Task 5 - Parse Trees for L2

Draw a parse tree for each of the following L2 sentences.





Task 6 - BNF Description of L3

<EXP> ::= <AND> | <OR> | <NOT> | #t | #f

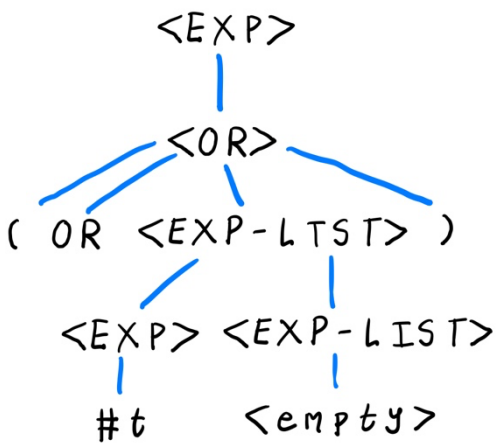
<EXP-LIST> ::= <EXP> <EXP-LIST> | <empty>

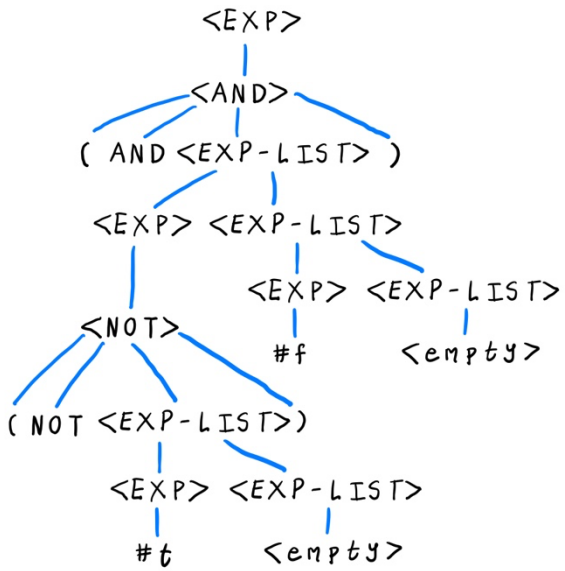
<AND> ::= (and <EXP-LIST>)

<OR> ::= (or <EXP-LIST>)

<NOT> ::= (not <EXP>)

Task 7 - Parse Trees for L3





Task 8 - BNF Description of L4

<NUM-WORD> ::= <HUNDREDS> | <TENS> | <ONES>

<HUNDREDS> ::= <ONES-WORD> hundred <TENS>

<TENS> ::= <TENS-WORD> | <TEENS-WORD>

<ONES> ::= <ONES-WORD> | <zero>

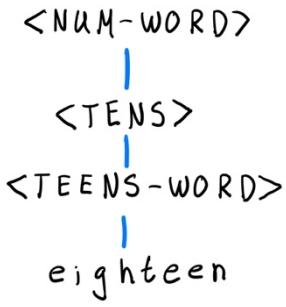
<TEENS-WORD> ::= ten | eleven| twelve| thirteen | fourteen | fifteen| sixteen| seventeen| eighteen | nineteen

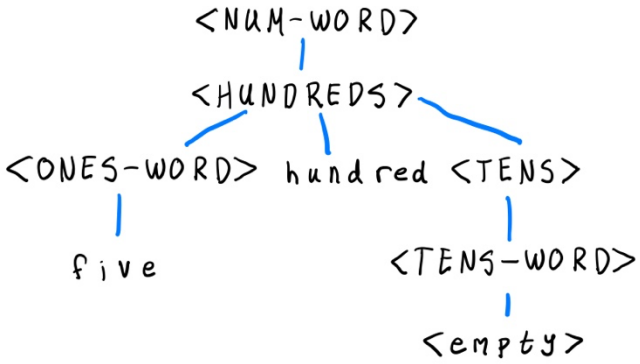
<ONES-WORD > ::= one | two | three | four | five | six | seven | eight | nine | <empty>

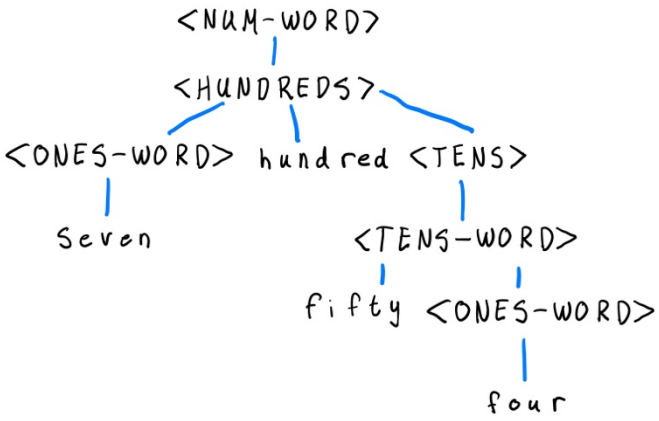
<TENS-WORD> ::= twenty <ONES-WORD> | thirty <ONES-WORD> | forty <ONES-WORD> | fifty <ONES-WORD> | sixty <ONES-WORD> | seventy <ONES-WORD> | eighty <ONES-WORD> | ninety <ONES-WORD> | <ONES-WORD> | <empty>

<zero> ::= zero

Task 9 - Parse Trees for L4







Task 10 - BNF Description of L5

<EXPRESSION> ::= <ADD> | <DESCRIBE> | <SHOW> | <COLORS> | <exit>

<ADD> ::= add <COLOR> <COLOR-NAME>

<DESCRIBE> ::= describe <COLOR-NAME>

<SHOW> ::= show <COLOR-NAME>

<COLOR> ::= (<RGB> <ALPHA>)

<RGB > ::= <NUM> <NUM> <NUM>

<ALPHA> ::= <NUM> | <empty>

<COLORS> ::= colors

<COLOR-NAME> ::= <string>

<exit> ::= exit

Task 11 - Parse Trees for L5