First Order Logic Compiler

How to run the program

- Ensure the following prerequisites are installed:
  - Python, version 3.7.4
  - Python modules ‘sys’, ‘re’, ‘operator’, ‘networkx’, ‘matplotlib’
  - Command-line terminal
- Place input text file in the same directory as parser.py
- In a command-line window, run ‘python parser.txt <yourfile>.txt’, replacing <yourfile>.txt with the name of the input file
- Result:
  - If your input file is valid, the production rules for first-order logic using the input sets will be saved to <yourfile>.grammar.txt and displayed in the terminal. If not, the program will indicate where the problem is and immediately exit.
  - The program will tell you if your formula is valid or not. If not, it will indicate where the problem is and immediately exit.
  - If your formula is valid, its parse tree will be saved to <yourfile>.png.
  - A log file, <yourfile>.log.txt, will be produced, containing information about the validity of the input file and formula. This information is also displayed in the terminal as it is added.

Input file format

- The input file must contain the 7 set names, each followed by the contents of that set.
- The set names are as follows:
  - variables
  - constants
  - predicates
  - equality
  - connectives
  - quantifiers
  - formula
- Sets ‘variables’ and ‘constants’ can have any finite cardinality >= 0, and each element must be alphanumeric (including underscores)
- Set ‘predicates’ can also have any finite cardinality, and each element must have an alphanumeric (including underscores) string followed by a number in square brackets (e.g. P[3])
- Set ‘equality’ contains exactly one string corresponding to =. This string must be alphanumeric including underscores, equals signs and backslashes.
- Set ‘connectives’ contains exactly five strings corresponding to $\wedge, \vee, \Rightarrow, \Leftrightarrow, \neg$ in that order. These strings must be alphanumeric including underscores and backslashes.
- Set ‘quantifiers’ contains exactly two strings corresponding to $\exists, \forall$ in that order. These strings must be alphanumeric including underscores and backslashes.

- Set ‘formula’ contains a formula constructed only from the elements of the previous six along with the characters ‘(‘, ‘)’ and ‘,’
- Newlines and spaces are removed in the program and therefore have no effect on the input file.
- Example input files (valid and invalid) are provided in the Examples/ folder.

Output file format

- The grammar file will contain the grammar of the provided language and the formula itself. The grammar consists of the following sets:
    - Terminal symbols
    - Non-terminal symbols
    - Start symbol
    - Production rules
- The parse tree image will contain the parse tree itself and the legend for the parse tree.
- The log file will contain information about the success or failure of each phase of the program's execution.