For this assignment you will write Haskell interpreter for a tiny programming language, let's call it TL (Tiny Language). The language contains just three types of statements:

```
let variableName = expression
if expression goto label
print expression1, expression2, ...
input variableName
```

Each statement may contain a preceding label. A label is an alphanumeric string ending with a colon (":").

A number of simplifying assumptions have been made about the syntax of the language.

- White space (blanks) are important and must be used to separate each token including around the arithmetic operators.
- There can be only one statement per line.
- The expressions are limited to constant numbers, constant strings, variable names, and binary expressions involving just one of the following operators: "+", "-", "*", "/", "<", ">", "<=", ">=", "==", or "!=", with their conventional meanings. Note again that the operators must be surrounded by spaces, which makes for easier parsing.
- The only types are strings and floating point numbers (Float in Haskell) and strings are only used in print statements. The result of Boolean operations is 0 if false and 1 if true. Furthermore any numeric expression can be used in an if-statement and as with the C language, 0 is false and everything else is true.
- Blank lines are ignored.

let variableName = expression computes the value of *expression* then binds that value to the name *variableName*.

if expression goto label computes the value of *expression*, if the value is 0 execution continues with the next statement. If the value is non-zero then execution continues with the statement labeled *label*. If no such statement exists, the program terminates with the message: "Illegal goto *label* at line *x*." where x is the actual line number of the illegal goto statement.

print expression1, expression2, ... evaluates each expression, then prints their values, all on one line, separated by spaces, terminating the line with a newline character.

input variableName attempts to read a number from the standard input. If successful that value is bound to the name *variableName*. If the read fails the program terminates with the message: "Failed input at line *x*." where x is the actual line number of the failed input statement.

If at any point an attempt is made to evaluate an expression that references a variable *variableName* for which there is no binding, the program terminates with

the message: "Undefined variable *variableName* at line *x*." where x is the actual line number of the failed expression.

Your program tli (tiny language interpreter) will take one command line argument, the name of the source file. It will compile the program into an internal form, then execute the compiled program. Each line containing a syntax error should generate an output message "Syntax error on line x." If an error is detected, syntax analysis should continue and error messages generated for all erroneous lines. If there are any errors, the program should not be run.

tli should make just one pass over the program source building an internal representation that is a list of statements and a symbol table that maps labels into line numbers. You may use this same symbol table to store variable bindings during execution of the program. Each statement should be represented by a value of an appropriately extended version of these data types

data Expr = Constant Int | Var String | Plus Expr Expr deriving (Show)

data Stmt = Let String Expr | Print Expr deriving (Show)

Here is a tiny language program that prints out a sequence of numbers.

```
        input start
        input end
        let x = start
repeat: print x
        let x = x + 1
        if x < end goto repeat
        print "done", x
```

Assuming the above program is stored in "prog1.txt", when executed the command "tli prog1.txt" and the user entering 1 and 5, tli should produce the output

```
1.0
2.0
3.0
4.0
done 5.0
```

You should turn in one file, tli.hs. To help you get started, I have provided the file nano.hs that parses and executes a nano-subset of the tiny language. You can find that file in Canvas. I will spend time in class explaining nano.hs.