Final Project

(Final Exam)
CMPSC 122

A++ Interpreter

This assignment is an individual programming project (*final exam*).

Details of the structure and content of the programming project of CMPSC 122 class are described in the file "The Structure of a Programming Project" (see Angel)

Due Date: No later than **December 12, 2016, 3:50 PM**. The project must be submitted as a docx file (Drop Box on Angel).

A++ is a programming language created for the final project in the CMPSC 122 class. The general structure of an **A++** statement is described below.

<A++ statement> ::= <Label> <Statement body>

<Label> ::= <C++ unsigned positive>

<Statement body> ::= <**var** statement> | <**assignment** statement> |
<**if** statement> | <**print** statement> | <**stop** statement>

<A++ number> ::= <C++ integer constant>

<A++ identifier> ::= <C++ identifier>

<A++ variable> ::= <A++ number> | < A++ identifier>

<A++ Expression> ::= <A++ variable> | <**A++ Expression** > <Operator> <A++ variable>

<Operator> ::= <C++ binary arithmetic operators: +, -, *, /, and %>

There are only four kinds of statements in A++ language: *variable declaration*, *assignment*, is statement, and *print* statements with the following syntax:

1. **var** (declaration) statement

   <Label> **var** <A++ identifier>;

   <Label> **var** <A++ identifier> = <A++ number>;

   where:

   var is a reserved word.

2. **Assignment** statement

   <Label> <A++ identifier> = <A++ Expression>;

3. **If** statement

   <Label> **if (** <A++ Expression> **) goto** <Label>

   where:
   if *and* **goto** are reserved words;

4. **print** statement

   <Label> **print** <A++ Expression> **;**

   where:
   print is a reserved word.

5. **stop** statement

   <Label> **stop;**

Syntax rules of A++ language:

- All statements end with a semicolon.
- There are no statements with equal labels. The labels in an A++ program are in increasing order.
- All variables must be declared before being used.
- Every statement is written on one line.
- The priorities of the operators are the same as in C++.

Semantics rules of A++ language:

- All variables must be declared in a **var** statement before to be used in other statements.
- The operator "**=**" in assignment statement is a C++ assignment operator.
- If the value of the expression in an **if** statement is *not zero* **(≠ 0**) the next executed statement will be the statement which label is written after the **goto** reserved word. Otherwise (the value = **0**), the next executed statement will be the statement immediately following the **if** statement.
- Print statement *prints ou*t the value of the expression following the **print** reserved word starting at the first position on the next *new line*.
- **stop** statement stops the program execution.

Write a class called **App** that exports member functions needed to:

- Enter an **A++** program from a *text file* or from the *keyboard*.
- Executes a correct A++ program.
- Generate syntax errors, *if any*. Document all possible syntax errors.

Example of an **A++** *program:*

```
10  var alpha = 10;
15  print alpha;
20  var x15 = 15;
30  var c = 7;
40  if (alpha - x15) goto 85;
60  print alpha + x15 % c;
65  stop;
80  var result;
85  result = alpha*x15 / c;
90  print result;
99  stop;
```

Program execution:

```
10
11
```

6. Project Evaluation

1. Style & Documentation	15 p
2. C++ Program Text	70 p
3. Program Tests	15 p
Total: 100 p	

7. Important Notes:

- Do not forget to ask question about the project in class.
- Programming style, documentation and testing are important components of the project. Show the results from all program executions together with the input data (A++ programs).
- No late projects will be accepted.
- Start your projects early to eliminate last minute problems.