CSC 501 - Assignment #1
version 3.2

Due Wednesday 9/28/16 in Sakai

Problems

Given the grammar \( G = (\Gamma, \rightarrow, \gamma) \):

- \( \Gamma = T \cup N \) where
  \[
  T = \{0, \ldots, 9, \text{a, \ldots, z, true, false, skip, if, then, else, while, do, end, +, -, =, \leq, !, \&\&, ||, :=, ;, (, )}\}
  \]
  and
  \[
  N = \{A, B, C, D, L, V\}.
  \]

- The rule set \( \rightarrow \) is defined by the BNF style rewrite rules:
  
  \[
  \begin{align*}
  A & \rightarrow D | V | A + A | A - A | A \ast A | (A) \\
  B & \rightarrow \text{true} | \text{false} | A = A | A \leq A | B \& B | B||B | (B) \\
  C & \rightarrow \text{skip} | V := A | C ; C | \text{if} B \text{ then } C \text{ else } C \text{ end} | \text{while} B \text{ do } C \text{ end} \\
  D & \rightarrow L | - L \\
  L & \rightarrow 0 L | \ldots | 9 L | 0 | \ldots | 9 \\
  V & \rightarrow \text{a} V | \ldots | \text{z} V | \text{a} | \ldots | \text{z}
  \end{align*}
  \]

- \( \gamma = C \).

Do the following problems:

1. Derive at least three strings that belong to \( L(G) \). Show your derivations.

2. Formally prove that the string ‘while true do skip end’ is a member of \( L(G) \).

3. Is the string ‘if true then skip end’ a member of \( L(G) \)? Why? Why not?

4. Add a rule to the above grammar that would add the command ‘repeat-until’ to the language. Show that your grammar works by showing that you can derive a program that contains the ‘repeat-until’ command.