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

$$T = \{0, \ldots, 9, \mathbf{a}, \ldots, \mathbf{z}, \mathbf{true}, \mathbf{false}, \mathbf{skip}, \mathbf{if}, \mathbf{then}, \mathbf{else}, \mathbf{while}, \mathbf{do}, \mathbf{end}, +, -, *, =, \leq, !, \&\&, ||, :=, ;, (,)\}$$

  and

$$N = \{A, B, C, D, L, V\}.$$

- The rule set $\rightarrow$ is defined by the BNF style rewrite rules:

$$
\begin{array}{rcl}
A & \rightarrow & D \,|\, V \,|\, A + A \,|\, A - A \,|\, A * A \,|\, (A) \\
B & \rightarrow & \mathbf{true} \,|\, \mathbf{false} \,|\, A = A \,|\, A \leq A \,|\, !B \,|\, B\&\&B \,|\, B||B \,|\, (B) \\
C & \rightarrow & \mathbf{skip} \,|\, V := A \,|\, C\,;C \,|\, \mathbf{if}\ B\ \mathbf{then}\ C\ \mathbf{else}\ C\ \mathbf{end} \,|\, \mathbf{while}\ B\ \mathbf{do}\ C\ \mathbf{end} \\
D & \rightarrow & L \,|\, -L \\
L & \rightarrow & \mathbf{0}\,L \,|\, \ldots \,|\, \mathbf{9}\,L \,|\, \mathbf{0} \,|\, \ldots \,|\, \mathbf{9} \\
V & \rightarrow & \mathbf{a}\,V \,|\, \ldots \,|\, \mathbf{z}\,V \,|\, \mathbf{a} \,|\, \ldots \mathbf{z}
\end{array}
$$

- $\gamma = C$.

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.