**CSE 3341, Assignment #1**
**Due: Sept. 16**

1. (12 points). In our class discussion compilers and interpreters, we have been using the notations, $C^{L1}_{L2 \Rightarrow L3}$ for compilers and $I^{L1}_{L2}$ for interpreters. Answer the following questions:

   (a) Explain the precise meaning of each of these notations.

   (b) Why are there three languages listed in the notation for compilers and only two in the case of the notation for interpreters?

   (c) Can the JVM be characterized using either of these notations? If so, explain how; if not, explain why not.

2. (8 points). Consider the following grammar of expressions:

   $\langle exp \rangle$ ::= $\langle id \rangle$ | $\langle no \rangle$ | $\langle exp \rangle$+$\langle exp \rangle$ | $\langle exp \rangle$*$\langle exp \rangle$
   $\langle id \rangle$ ::= X | Y | Z

   $\langle no \rangle$ denotes unsigned integers as in the class notes/discussions.
   Rewrite this grammar such that the operations will be evaluated strictly left to right; i.e., X + Y * Z will be evaluated as if it was ( X + Y ) * Z; and X * Y + Z will be evaluated as if it was ( X * Y ) + Z. But do NOT introduce parentheses or other new terminal symbols into the language.
   **Use only pure BNF, i.e., the version of BNF that we have been using in class, for solving these problems.**