(E) Use the Force (1/2)

Yoda, the lovable green Jedi from the Star Wars franchise, speaks the same language as most of the other characters in the series (a language that seems a whole lot like English). However, his sentences don't sound completely normal to our ears because he inverts (swaps the order of) pairs of phrases before speaking. For example, if Yoda were to say "believe you I don't" we know a non-Yoda speaker saying the same thing would say "I don't believe you." We can mark Yoda's sentences to recover the original sequence with the following hierarchical annotation:

< [believe you] [I don't] >

The "[ ]" means preserve the relative order of the phrases inside the brackets (of which there must be exactly two) and the "< >" means invert the order. So in this case the annotation means "you" comes after "believe" and "don't" comes after "I", but "I don't" comes *before* "believe you". Here's another example:

< patience [< must you > have] >   becomes   you must have patience

This method of forming Yoda-isms is an example of an unlabeled inversion transduction grammar, a powerful formalism used in machine translation.

Answer these questions in the Answer Sheets.

E1. For each of these annotated Yoda-isms, write down the original sentence

a.   < go [you must] >

b.   < [strong [with [the force]]] < [this [one is]] < think I > > >
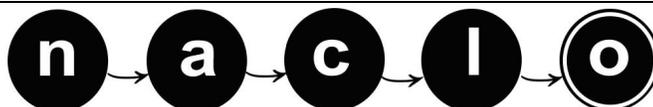
c.   < [< < home [milk < coming before >] > [< to forget > < up pick >] > tonight] < don't please > >

E2. For each of these Yoda-isms of the sentence "use the Force Luke" write the annotation that recovers the original. If no such annotation is possible write "NOT POSSIBLE". If more than one annotation that recovers the original sentence is possible, choose any legal annotation but write "MORE POSSIBLE" next to the answer.

a.   use Force Luke the

b.   Luke the Force use

c.   Luke Force the use

d.   the Luke use Force

e.   the Luke Force use

E3. If Yoda were not bound by the rules of this puzzle and could reorder the four words of the sentence "use the Force Luke" in any way he likes, how many ways could he do this?

E4. Since Yoda *is* bound by the rules of this puzzle, how many ways can he actually reorder "use the Force Luke"?

E5. For each of the following sentences, write down the number of unique permutations of the sentence and the number of unique Yoda-isms that can be formed from the sentence. Note the original sentence does count as one of the permutations.

a.   do or do not

   Permutations   Yoda-isms

b.   Luke I am your father

   Permutations   Yoda-isms

c.   a galaxy far far away

   Permutations   Yoda-isms