Theory of Computation, CSCI 438 spring 2022
Context-free grammars, pages 101-107, Feb. 9

1. Give a context free grammar for the language on $\sum=\{a,b\}$ defined by
   $L=\{w \mid w=w^R$ for $w \in \Sigma^*$, that is, w is a palindrome$\}$

2. Give a context free grammar for the language on $\sum=\{a,b\}$ defined by
   $L=\{a^n b^n : n \geq 0\}$

3. Give a context free grammar for the language on $\sum=\{0,1\}$ defined by
   $L=$ {w | w starts and ends with the same symbol}

4. Give a context free grammar for the language on $\sum=\{0,1\}$ defined by
   $L=$ {w | w contains at least three 1's}

5. Define a context-free grammar for the following language
   $L=\{w \mid (n_a(w) - n_b(w)) \bmod 3 = 1\}$

6. Create a context-free grammar for the language
   $L = \{w\#x \mid w^R$ is a substring of x for $w,x \in \{0,1\}^*\}$
   (This is exercise 2.6c in the text.)

7. Give a context free grammar for the language on $\sum=\{a,b\}$ defined by
   $L=\{w \mid (n_a(w) > n_b(w)\}$.
   The set of strings over the alphabet {a,b} with more a's than b's
   $n_a(w)$ is the number of a's in the string w.
   $n_b(w)$ is the number of b's in the string w.