All students should read from the beginning of Chapter 4 to §4.2 of the textbook in preparation **for this assignment** and the next lecture.

Distribute the following questions across the members of your group. You will share your solutions (and most importantly the *method* of your solutions) during the next lecture period. Divide up the questions so that **each** question has at least two solutions from different group members.

1. (a) Page 138, question 1 ('What is a sentence diagram?' you may ask...)

   (b) We likely discussed `show_chl-nested-re-structures.pdf` in lecture today, and we now know that regular languages cannot express "arbitrarily deep nesting of recursive structures", such as matching parenthesis. Show the simplist **context free grammar** you can think of that demonstrates CFG's ability to represent these languages. **Hint:** you'll need three rules, two non-terminals, one λ and an alphabet Σ with just two terminals (make them "matching", like $\Sigma = \{ (,) \}$ or $\{ [,] \} \ldots$).

2. Page 138, question 2 (Hint: look up various uses of the word "buffalo" both capitalized and not. The sentence is written without punctuation hints, feel free to add some.)

3. Page 138, question 4

   For questions 4—6, use the following grammar:

$$
\begin{array}{lcl}
S & \rightarrow & A\ M\ \$ \\
A & \rightarrow & B\ C \\
 & | & C\ M \\
B & \rightarrow & b\ g\ h \\
C & \rightarrow & s\ t \\
 & | & \lambda \\
M & \rightarrow & m \\
 & | & n \\
 & | & p
\end{array}
$$

4. (a) Show a left-most derivation of the source string `b g h s t p`

   (b) Show the resulting parse tree for the source string `b g h n`

5. (a) Show a left-most derivation of the source string `b g h n`

   (b) Show a right-most derivation of the source string `b g h s t p`

   (c) Show the resulting parse tree for the source string `n p`

6. (a) Show a right-most derivation of the source string `b g h n`

   (b) Show the resulting parse tree for the source string `b g h s t p`