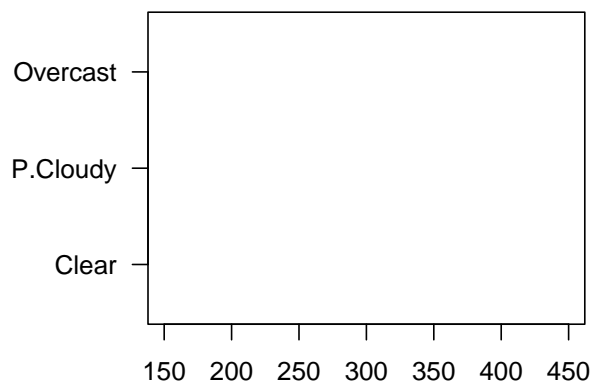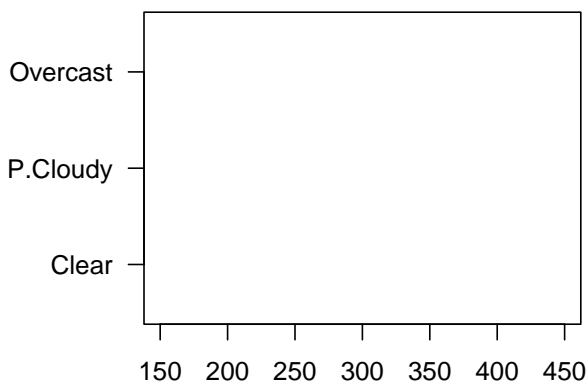# STA 209: ANOVA Worksheet

Name: _____

Show work for problems that involve calculations. Showing an understanding of the problem may earn you partial credit even if you are unable to determine the final value.

An environmental engineering team is studying whether sky conditions affect the electrical output of small residential solar panels. They categorize days into three groups (clear, partly cloudy, and overcast) based on hourly weather data from the local climate station. For each category, the team records the midday power output (in watts) from a sample of identical solar panels installed around the city. The median outputs for the clear, partly cloudy, and overcast days are 410 W, 330 W, and 190 W, respectively. The team wants to determine whether these observed differences in sunlight conditions correspond to statistically discernible differences in average solar panel output. For comparison, previous research suggests a typical solar panel produces somewhere between 350W and 460W in ideal conditions.

1. Briefly explain the main motivation for using ANOVA in this study.

2. What is the null hypothesis being tested?

3. Below are outlines of graphs for the team's data. Sketch boxplots for what the data could look like if:

- (Left) there's much more between group variation relative to within group variation
- (Right) there's much less between group variation relative to within group variation

Note: Exact numbers are not needed. I am looking for differences in patterns.

The team created an ANOVA table, but then their laptop exploded. One of the members recreated part of the table from memory. Here is what they wrote.

	Sum of Squares	df	Mean Square	F	p
Groups	517.0	?	?	?	0.0006
Residuals	3988.4	122	?		

4. Help the team find the missing values of their ANOVA table (MSG, MSE, F, df of groups)

5. For a reasonable significance level, should the team reject the ANOVA null hypothesis?

6. Using your answer to question 5, explain what the ANOVA results tell us about the solar panel output and weather conditions.