

## **Project**

For the in class project, pick one of the three options below to complete. The project is due April 5th at Midnight. This project will allow us to apply the concepts from class to help motivate why they might be helpful when pursuing future careers, hobbies, or mathematics. Have fun with your project and be as creative as you wish!

### **Option 1:**

One of the primary goals of this course is to develop a deeper understanding of the concepts learned in middle and high school math. In order to do so, I would like for you to create a lesson plan for a topic covered at the middle or high school level. Your lesson plan should explain the concept of your choice using ideas from group theory (even if you would not use the formal language of group theory explicitly when teaching your concept). In addition to your lesson plan, submit a write up explaining which concepts from group theory were used in your lesson. This example lesson plan cannot be on one of the topics we discussed in detail in class (such as tessellations). In your write up, be sure to prove any claims made in your lesson. As many of you are math education majors, you may have specific formatting given in previous classes. Feel free to use these types of formatting as long as you include all of the necessary concepts. The goal of this option is to give practice planning lessons before you teach in a classroom.

### **Option 2:**

Group theory has many applications outside of pure mathematics. Pick an application of groups we did not discuss in class, and describe the group structure behind this application using the appropriate terminology. Explain the application in detail and provide examples. In addition, prove any claims made in your project or provide citations of proofs. (Some applications such as

crystallography groups have very complicated proofs. If you have any questions about what level of rigor is appropriate, please ask me over email or during my office hours).

**Option 3:**

Abstract algebra has a long and interesting history. It has been used to solve many difficult problems throughout history and is still an active field of research today. Pick a historical or current problem or theorem in math that is related to abstract algebra. Explain your problem/theorem in appropriate terms. If the problem has been solved, explain the proof and what steps were taken in the process of solving the problem. If the problem is currently unsolved, write about some of the attempts made to solve the problem, current research into the problem, and how the problem came about. If you chose a theorem, be sure to provide a proof or a sketch of a proof of your theorem. Your explanation should use the appropriate terminology from class and should define any concepts not discussed in class.