Projects

1   Introduction

A substantial portion of your grade for this course (25%) will come from your project presentation. This component of the course is designed to be flexible to accommodate your varied interests and backgrounds. To allow time for me to cover the core course material, these projects will be done in **pairs**. There will thus be **eight** presentations, lasting **50 minutes** each, which will take place during the last three weeks of the quarter, i.e., between **15 May** and **1 June**.

I've included a list of possible project topics below. This is just to get the ball rolling; **you can choose a different topic**, as long as it's related to the course, of sufficient depth, and provided you can interest at least one of your classmates to work on the project with you. While the exact forms of the projects will vary, they will all involve a significant amount of independent work. The grading will be based entirely on the presentation - there is no need to write a paper or submit any supporting documentation.

2   Pairs

You will need to organize yourselves into pairs somehow, based on your different interests. One way this could be achieved is through the "Discussions" tab on Canvas. We can also use a small amount of class time to finalize the pairs.

3   Presentations

As mentioned above, you should, in pairs, prepare a 50-minute presentation for a class meeting during the last three weeks of the course. You could use Powerpoint, Beamer, or something similar, but do consider giving an old-fashioned whiteboard talk: these can be surprisingly effective. Your presentation should last about 45 minutes and allow 5 minutes for questions from me and the rest of the class. Keep in mind that most of your audience will be unfamiliar with your topic.

Preparing your presentation will likely take longer than you think, especially if you don't have much experience giving presentations. For instance, you will need to decide early on what format will be best for your particular project.

4   Grading

Accuracy 10 points
Clarity 5 points
Depth 10 points

Total **25 points**

5   Some Possible Topics

Numbers in parentheses indicate sections of the book. These specific sections seem, to me, the most appropriate for projects at this level. If you're *really* interested in the history of mathematics, you could base a project around Ramsey's original paper (1.7), or, if you're *really* interested in algebra, you could do a project on the vector space Ramsey theorem (2.4), or equations over abelian groups (5.4). However, the challenge is to convey *to your audience* the essence of the topic in just 50 minutes, and, for such specialized topics, this would be difficult. The same applies to really ambitious projects on current developments (e.g. the recent bound $R(k) < (4 - \epsilon)^k$).

For some of these topics (e.g. Euclidean Ramsey theory) there are more up to date references, which I can provide.

- Roth's theorem (2.5)
- Shelah's proof of the Hales-Jewett theorem (2.6)
- The Lovász local lemma (4.2)
- Canonical Ramsey theorems (5.5)
- Euclidean Ramsey theory (5.6)
- Graph Ramsey theory (5.7)
- Ergodic Ramsey theory (6.1)
- Ultrafilters (6.2)