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**Abstract Algebra B**
**Math 521B: Spring 2009**
Michael E. O'Sullivan

**Projects**

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## Expectations

- By April 7 please turn in a short (1-2 paragraph) proposal describing what you will study, with a rough plan. You may alter the plan, but I want to give feedback early.

- There is great latitude in choice of topic. Some suggestions are below. CAUTION: (1) Don't get bewildered by having too many choices. (2) Choose something with good references.

- You may work with another person. If you'd like to work with a larger group please discuss with me first. Each person must have a clear role in the group. I need to evaluate each person individually.

- There is a great deal of latitude in the "deliverable." You may turn in a survey, solutions to some exercises, detailed development of a narrow topic, computational work, or something else. CAUTION: There must be clear and substantial mathematical content.

- There must be an oral presentation of 10-20 minutes. These presentations will take place during the last week of classes and on the day of the final.

## Rubric

Up to 25 points may be awarded for each parameter. 100 pts is a full score, so 25 pts is only awarded for something exceptional.

- Audacity: Is the topic easy (10), average (15), challenging (20), very difficult (25).

- Quantity: The project replaces the final exam and is the capstone to the course. The amount of effort that you put into the project should be commensurate. A decent effort will bring you 15-20 pts.

- Quality: The deliverable should have good organization, clear definitions, concise explanations.

- Polish: Are materials turned in on time, clearly written, neatly presented, references given. Satisfying this criterion should be easy, for 20 pts.

- Oral presentation: This should be well organized and clear. Be prepared to answer questions. Your audience is your peers, so aim to inform them. Grade is mediocre (10), good (15), impressive (20), astounding (25).

## Possible topics

- Classification of finitely generated abelian groups (not necessarily finite).

- Classification of groups of small order $< 100$.

- Classification of finite simple groups: Understand some of the simple matrix groups.

- Symmetry of chemicals, crystallography

- Symmetry in physics

- Frieze groups and tilings of the plane

- platonic solids and archimedean solids

- Games with a combinatorial side (see D. Joyner's book).

- Applications of algebra in engineering or any other topic

- Rubic's cube

- Lattices

- Matrix rings

- finite fields

- power series rings $k[[x]]$

- computational/programming work in SAGE (or with other software).