

Project topics, Math 4GR3

Listed below are some possible project topics. Form a small group of 2 or 3 people in the class and chose a topic. The project entails a 15 minute presentation in class (latex slides please) and a report. The presentations will be slotted during class time in the weeks of March 28 and April 4. Let me know when you have formed a group and picked a project; no later than March 11.

1. The question of how easy it is to determine the isomorphism type of a given finite abelian group is answered by what is know as Smith Normal Form. Explain what this is and how and why it works.
2. What is the “word” problem for groups and why is it undecidable?
3. Give an overview of the classification of finite simple groups (without proof!).
4. Prove that certain groups of Lie type are simple, for instance $PSL_2(p)$.
5. Choose some reasonably small number (32, 48, ...) and completely describe the isomorphism types of all groups of that size.
6. Two possible projects regarding straight edge and compass geometric constructions: discuss the classical Greek problems of doubling a cube, squaring a circle or trisecting an angle. Also, explain geometrically why there is no solution in radicals for a general quintic equation.
7. Have you played the game Spot It? Cards have objects on them and any two cards in the game have a unique common object. How do they do this? This is related to finite fields and projective geometry.
8. What is an elliptic curve? Where is the group and what does this have to do with cryptography?
9. Alternatively, you may choose any project topic you like but please get it approved be me first.