FINITE GROUP THEORY

TONY FENG

There are three main types of problems on group theory, plus the occasional miscellaneous question that resists classification.

1. GROUP ACTIONS

These questions are about group actions. They test your understanding of stabilizer groups, decomposition into orbits, etc. In particular, keep in mind the orbit-stabilizer theorem.

(1) 2010 Fall Morning 5
(2) 2011 Spring Morning 1
(3) 2013 Fall Afternoon 1

2. STRUCTURE THEOREMS FOR ABSTRACT GROUPS

These questions are about the structure theory of finite groups, especially normal and simple subgroups and the Sylow theorems.

(1) 2012 Fall Afternoon 10
(2) 2014 Spring Morning 3
(3) 2015 Spring Afternoon 2

3. FINITE LINEAR GROUPS

These problems test your understanding of finite linear groups. You should be able to calculate their sizes, find Sylow subgroups, and relate them to the theory of finite fields.

(1) 2011 Fall Morning 1
(2) 2012 Fall Morning 2
(3) 2013 Spring Morning 3

If you get stuck, you can find a discussion of techniques for solving these sorts of problems in Dan Litt's notes linked on the class webpage. However, I recommend attempting the problems before reading the notes.

4. TRICKY MISCELLANEOUS

(1) 2010 Fall Afternoon 1