

OVERVIEW: GROUP THEORY

Here are some materials that were developed in Fall, 2000, for using the computer algebra system GAP to teach group theory. Although they were developed for a graduate course in abstract algebra, many of them deal with topics that also appear in undergraduate algebra courses, and thus are suitable for such courses, as well.

The course

The course is MT A511 Algebra I, a graduate course in abstract algebra that has as its prerequisite an undergraduate course in abstract algebra. It is the first course in a two-semester graduate sequence in abstract algebra. It is taken by students in the master's and Ph.D. programs and by some advanced undergraduates. Many, but by no means all, of these students had used GAP in their undergraduate course in abstract algebra.

The text for the course is *Abstract Algebra* (second edition), by David S. Dummit and Richard M. Foote (John Wiley, 1999). About half of the course was devoted to group theory (Part I of the book), and about half to rings and fields (Part II and a portion of Part IV).
[Check on this.]

Format and computer facilities

The course met three times each week, for 50-minute periods, in a regular classroom. Twice during the semester, the class met in a computer classroom, where students gained hands-on experience with GAP. When I wanted to demonstrate GAP in the regular classroom, I made transparencies of GAP printout and displayed them on the overhead projector. Although some instructors might prefer to use an internet connection in the classroom, this strategy prevented me from wasting class time in hooking a computer up to the network and videoprojector, or in typing in GAP code and correcting syntax errors.

What's here

GAP was used in this course in three ways:

- to explain and illustrate concepts in group theory;
- to enable students to test conjectures and find counterexamples;
- to enable students to apply theorems to specific groups in which it is unreasonable to carry out the computations by hand.

The corresponding materials fall into the following categories:

- handouts for the two class periods that the students spent in the computer classroom;

assignments and projects, on which the students were expected or permitted to use GAP (as well as one examination question that refers to GAP);

transparencies of GAP printout to illustrate important concepts in group theory when the class met in a regular classroom;

an evaluation form that was used to solicit student comments about the use of GAP in the course.

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