Math 6833 assignments

12. Another open-ended project: For the case of alternating groups, modify `genPairs.gap` to do some more refined investigation. For example, one reason a pair might not generate is that they have a common fixed element. Write routines that will take a pair and see if they have a common fixed element (section 40.2 of the reference manual may be useful). Does this explain most of the nongenerating pairs encountered, or are there other important phenomena? What is going on group-theoretically?

13. Another possible GAP project: Investigate the average order of an element of a finite simple group, by modifying genPairs.gap.

    1. Write a routine that actually computes the average order of all of the elements of a given group. Try it on various finite groups (see section 48 of the GAP reference for the built-in groups) until the computing capacity of your machine is exceeded.

    2. Write a routine to estimate the average order by random sampling. Try this on different groups. Try to make some guesses of how average order might work as the group gets large.

14. Do a bit of exploring in the Java API Specification (a link to it is on our links page):

    1. Examine the Scanner class (find it in the lower left-hand frame, and click on Scanner to open up the information in the large frame). Examine the list of its constructor functions, and some of its methods.

    2. Examine the Exception class. Notice the list of its subclasses, i. e. the classes that inherit from it. These are specific types of exceptions, that carry more information about what happened.

    3. Examine the MouseEvent class. When you do something with the mouse, it creates a MouseEvent class that a program can use to react. Among the MouseEvent methods are the getX() and getY() methods, which give the current x- and y-coordinates of the mouse (in the computer world, the origin is the upper left hand corner of a window, and the positive y-axis points downward).

    4. Examine another class or two. For example, Calendar is an interesting one, so is Window.