

# Worksheet 11

Math 392, Abstract Algebra

Monday, February 8, 2021

1. Find an object that's roughly a cube, or make a cube out of paper. Show it to your colleagues.

(Really! You can't do this problem properly without holding some kind of box in your hands and spinning it around.)

2. We saw in lecture that the group of rotations of a square has four elements: do nothing, turn it  $90^\circ$  to the left, or  $90^\circ$  to the right, or  $180^\circ$  all the way around. (There are also reflections, but let's ignore those for now.)

Now consider the group of rotations of a cube. How many elements does it have? Are you sure you haven't overcounted or undercounted?

3. Challenge: Show that this group is not Abelian by finding two rotations  $g$  and  $h$  such that  $gh \neq hg$ .