Algebra for Educators
E Term 2017
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MME529 Homework 2
Revised Due Date: Tuesday May 23rd, 2017

Please recall the basic rules for homework assignments submitted in this course. (E.g., manifestly legible, one side of each page, written in full sentences.)

Reading: Please carefully read Chapters 1 and 2 in Gallian's text: "Introduction to Groups" and "Groups". After this, read lightly[1] Chapters 27 & 28: "Symmetry Groups" and "Frieze Groups and Crystallographic Groups". Try to follow the main ideas and become familiar with the examples, but don't worry about technicalities.

1. #15 on p36
2. #18 on p53
3. #10 on p459
4. The dihedral group D_n consists of the $2n$ symmetries of a regular n-gon. An *involution* g in a group G is an element which is equal to its inverse: it solves the equation $gg = 1$ (or $g^2 = 1$). Find a formula for the number of involutions in the group D_n as a function of n. Justify your answer.
5. One of the fundamental defining properties of a group is the *associative law*: for all a, b and c in the group, $a(bc) = (ab)c$. For example, real numbers under addition satisfy $a + (b + c) = (a + b) + c$ and the group of non-zero real numbers under multiplication satisfy $a \cdot (b \cdot c) = (a \cdot b) \cdot c$. Describe in a paragraph or two the first time (or the most common situation) in which you dealt with students for whom this property was not obvious.
6. Read Chapters 27 and 28 for inspiration. Then submit a short lesson plan appropriate for your class that deals with spatial symmetry. You may focus on Frieze groups, Escher tilings, symmetries in 3-spaces, etc. But show me what a practical lesson plan would look like that addresses these issues.

"If you don't learn from your mistakes, there's no sense making them."
- Herbert V. Prochnow

[1] Unfortunately, there will be terms used that are unfamiliar to you. (For example, the term *isomorphism* refers to a structure-preserving one-to-one and onto function from one group to another which essentially acts as a 'proof' that they are the same thing.) But you should skip over these.