

Math 113 Review for the midterm

The midterm covers everything we have done in class or on homework so far: Polygons, straightedge and compass constructions, symmetries, symmetry groups of polygons, groups (subgroups, groups that are structurally the same, generators, relations, examples...), permutations, polyhedra, extra readings.

Here are some questions to help you review:

- (1) Definitions: Define each of the following terms, and be able to give an example where appropriate.
 - Polygon, congruent, similar, regular polygon, inscribed polygon, straight-edge and compass construction, perpendicular bisector.
 - Group, subgroup, element, identity, inverse, structurally the same, generate (also generator), relation, dihedral group (e.g. D_6 or D_8), symmetry, permutation, transposition, S_n , braid, Cayley's theorem.
 - Polyhedron, Dual polyhedron, Euler's formula.
- (2) Practice problems from your book: 10.4, 11.9, 11.10, 11.12, 11.14 (if you know what \mathbb{Z}_4 is), 11.15 (you can assume here that \mathbb{Z}_4 is the group of rotations of the square), 11.17, 12.3, 12.4, 12.6
- (3) All of the practice problems from the supplement on permutations.
- (4) Exercises from the book: 10.1, 10.10 (you are allowed to assume that you know how to make a perpendicular bisector), 11.1, 11.2, 11.3, 11.4, 11.5, 11.8, 11.9. Note: some of these were HW exercises.
- (5) More practice:
 - (a) In a few sentences, describe the program to classify finite simple groups. Why was it important or useful? Is the program complete? What are mathematicians still working on?
 - (b) What is the dual polyhedron to the square? How do you construct it?
 - (c) A polygon doesn't have to be regular to have a dual polyhedron. Describe what the dual polyhedron to a square-based pyramid would be. How many vertices, edges and faces?
 - (d) Does Euler's formula hold for the picture frame? For the cube with a hole inside? For non-regular polyhedra that still fit our definition of polyhedron from in class?
- (6) Don't forget to review the other questions that were on the homework!