Groups and Symmetry

Dave Bayer

Practice Questions for First Midterm

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1. What is the first chapter of *Symmetry* (Weyl) about? (50 words or less)

2. How many permutations are there of the five letters ABCDE? List them.

3. How many symmetries does a pentagon have? Label the corners of a pentagon clockwise by A, B, C, D, E. What permutations of ABCDE correspond to symmetries of the pentagon?

4. For each of the following subgroups of the group of symmetries of the triangle, draw a design that has the given symmetries but no others:

  a)   { **1** }

  b)   { **1** , ✗}

  c)   { **1** , ✗}

  d)   { **1** , ↷ , ↶ }

  e)   { **1** , ↷ , ↶ , ✗ , ✢ , ✗}

5. What subgroup is missing from the above list?

6. Simplify the following permutations, given in cycle notation:

  a)   (12)(12)

  b)   (1234)(1432)

  c)   (1234)(14)(32)

  d)   (12)(1234)

  e)   (25)(123)(456)(25)

  f)   (25)(1234)(56)(25)

  g)   (25)(123456)(25)

7. What permutation corresponds to a perfect shuffle of 12 cards? How many perfect shuffles of 12 cards does it take for the cards to return to their original positions?

8. Look over this practice test, pretend you are me, and make up an actual exam. Are your questions reasonable and fair? Are they easily graded? Take the exam that you made up. Exchange candidate exams with classmates, and compare solutions. Establish a study atmosphere where bragging rights for having made the best guess is a coveted prize. (This technique works surprisingly well in any subject.)