HONR - The Mathematics of Games and Puzzles
Dr. Justin Wyss-Gallifent
Basic Course Syllabus

Description: In this course we will investigate the mathematics behind several well-known games and puzzles. We will play, suggest and test hypotheses and then develop the mathematics necessary to draw proper conclusions. We will also see how the mathematics can be useful in seemingly different situations and discuss how many of these games and puzzles have significant real-world applications.

Topics: Topics include but are not limited to the following. We may augment this list depending upon the class’ interests.

1. Sliding block puzzles - Group theory and symmetry groups.
2. Tic tac toe - Permutations and combinations, probability.
3. Nim - Game theory, combinatorics.
4. Towers of Hanoi - Binary numbers, alternate bases, graph theory.
5. Rubik’s cube - Group theory, generators and relations.
7. Tessellations and tilings - Study of polygons, periodicity.
8. Origami and paperwork - Solving cubic equations, orientable versus nonorientable surfaces, geometry.

Material: There are no books, everything will be in handouts created for this course from various texts, websites, etc. You may find it helpful to have a calculator handy sometimes.

Assignments: Each class will involve a guided groupwork analyzing a puzzle or game. This will be collected on that same day. In addition there will be a homework each class due the following class.

Project: The final project will consist of each student developing a game or puzzle on his or her own and writing a short paper explaining the mathematics behind it.

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