MATH 220 List of Possible Topics
Spring 2016

1. Pick's Theorem and the Farey Series

2. Transcendental Numbers

3. Bernoulli Numbers

4. Fractal patterns

5. The Golden Ratio

6. Fibonacci Numbers

7. Pascal's Triangle and its Applications

8. Error-correcting codes, especially linear or matrix codes

9. The Pigeonhole Principle

10. The Tower of Hanoi

11. Euler Characteristic

12. The Five Color Problem (All planar graphs can be colored using at most Five colors so that no two countries with a common borderline have the same color. Actually four colors are enough but that is beyond this course.)

13. The Königsberg Bridge Problem (or Eulerian Circuits).

14. Sphere packing problem (Kepler's conjecture).

15. Latin Squares (note: latin squares were first used in agricultural experiments)

16. Infinity (Hilbert's discussion of the "Grand Hotel" is a good starting point for this topic)

17. Ciphers or cryptography (secret codes)

18. Game theory and the prisoner's dilemma

19. Platonic solids

20. Crystal structures and symmetry

21. Tilings (e.g., the chess problem of the knights)

22. Knots and Braids

23. Little Fermat's theorem and RSA codes

24. Democratic elections and Arrow theorem

25. Finite Automata (including the Game of Life)

26. Göedel Incompleteness Theorem
    Feel free to choose another topic as long as you check with me first to be sure the topic is suitable For example:

27. A major theorem (e.g. Fermat's Last Theorem)

28. A problem that remains unsolved but has led to substantial mathematical activity (e.g. the Riemann Hypothesis)

29. An important mathematical concept (e.g. the axiom of choice)).

30. Proofs of impossibility (e.g. equations of 5th order, classical Greek problems)