MATH 220 List of Possible Topics **Section 904**

31. Pick's Theorem and the Farey Series
32. Transcendental Numbers
33. Bernoulli Numbers
34. Fractal patterns
35. Fibonacci Numbers and Golden Ratio
36. Pascal's Triangle and Fibonacci Numbers
37. Error-correcting codes, especially linear or matrix codes
38. Two Principles of Counting (The Pigeonhole Principle and The Inclusion-Exclusion Principle)
39. The Tower of Hanoi
40. Euler Characteristic
41. Exploring Graph Theory: The Five Color Problem. (Remark: 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.)
42. Exploring Graph Theory: The Königsberg Bridge Problem. .
43. Sphere packing problem (Kepler's conjecture).
44. Latin Squares (note: Latin squares were first used in agricultural experiments)
45. Infinity (Hilbert's discussion of the "Grand Hotel" is a good starting point for this topic)
46. Ciphers or cryptography (secret codes)
47. Game theory and the Prisoner's Dilemma
48. Platonic solids
49. Crystal structures and symmetry
50. Tilings (e.g., the chess problem of the knights)
51. Knots and Braids
52. Little Fermat's theorem and RSA codes
53. Democratic elections and Arrow theorem
54. Finite Automata (including the Game of Life)
55. Göedel Incompleteness Theorem
56. Fermat's Last Theorem
57. The Riemann Hypothesis)
58. The axiom of choice.
59. Proofs of Impossibility (Classical Greek problems)
60. The P versus NP problem