

MATH 300 List of Possible Topics

1. Transcendental Numbers
2. Bernoulli Numbers
3. Fractal patterns
4. Fibonacci Numbers and Golden Ratio
5. Pascal's Triangle and Fibonacci Numbers
6. Error-correcting codes, especially linear or matrix codes
7. Two Principles of Counting (The Pigeonhole Principle and The Inclusion-Exclusion Principle)
8. The Tower of Hanoi
9. Euler Characteristic
10. 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.)
11. Exploring Graph Theory: The Königsberg Bridge Problem. .
12. Sphere packing problem (Kepler's conjecture).
13. Latin Squares (note: Latin squares were first used in agricultural experiments)
14. Infinity (Hilbert's discussion of the "Grand Hotel" is a good starting point for this topic)
15. Ciphers or cryptography (secret codes)
16. Game theory and the Prisoner's Dilemma
17. Platonic solids
18. Crystal structures and symmetry
19. Math in nature
20. Tilings (e.g., the chess problem of the knights)
21. Knots and Braids
22. Groups
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
27. Fermat's Last Theorem
28. The Riemann Hypothesis
29. Unsolved problems in mathematics
30. The axiom of choice.
31. Proofs of Impossibility (Classical Greek problems)
32. The P versus NP problem