

Math 2168: Project

This project consists of a paper and an in-class presentation. In both parts you will present a mathematical topic from a historical point of view. For inspiration, I suggest you check out *The Mathematics Teacher*, found in Thompson Library, 3rd Floor, QA1M416.

Paper

The paper should be 4–6 pages (not counting diagrams, tables, or references), double spaced, use a 12pt font, and have 1 inch margins. At least three (non-internet) references must be referenced in the paper and listed at the end in a reasonable format.

Description (5 pts) Give an introduction to your project. Discuss the historical context, and what key mathematical ideas you will address.

Content (10 pts) Discuss relevant and appropriate mathematics pertaining to the topic of your paper. The material should be accessible to middle-school or high-school mathematics teachers.

Extension (5 pts) Present further questions (related to those in your paper) that one could pursue in a future project.

Presentation

History (5 pts) Your presentation should briefly discuss the relevant historical context of your project.

Content (10 pts) Discuss relevant and appropriate mathematics pertaining to the topic of your paper. Feel free to make a handout, though due to time limitations you may want to only focus on a few problems from your handout. Address the key points/ideas/issues discussed in your paper.

Delivery (5 pts) Your presentation should be 10–15 minutes long, with an introduction, body and conclusion, and you must use your time effectively. You should give an engaging presentation, in essence you should be teaching our class. If you use tools, you should use them well. I strongly encourage you to actively involve the class in some way.

Timeline

- Topic—due by the end of the second week, graded as a 5 point homework. I suggest you discuss this with me *before* you hand it in. Full credit will not be given for ideas that are too vague or untenable.
- Worksheet—due by the end of the fifth week, graded as a 10 point homework.
- Paper—due on the first day of the 12th week, graded out of 20 points.

- Presentation—you should be ready to present starting on the 12th week. This will be graded out of 20 points.

Topic List

Here are some ideas for topics—but you can choose your own too. Look to any of the projects listed at the end of the sketches in the book for ideas as well.

- | | | |
|---|---|---|
| 1. AI and matchbox computers | 16. Fermat and Pascal and coins (Tartaglia too) | 34. Perfect numbers |
| 2. Algorithms for computation | 17. Fermat's last theorem | 35. Phi and Fibonacci numbers |
| 3. Ancient Chinese mathematics | 18. Four color theorem | 36. π and approximations |
| 4. Archimedes | 19. Fourier analysis | 37. Poincare conjecture |
| 5. Archimedes and calculus | 20. Galois, Abel, and group theory | 38. Power series |
| 6. Concept of number, Greeks to quaternions | 21. Game theory | 39. Prime number theorem |
| 7. Continuum hypothesis and large cardinals | 22. Gauss (quadratic reciprocity) | 40. Probability and counting cards |
| 8. Cryptography, RSA etc. | 23. Gödel | 41. Propositional logic and Boolean algebras |
| 9. Development of idea of functions—beyond the vertical line test | 24. History of $\ln$ and e | 42. Ramanujan |
| 10. Einstein and special relativity | 25. How does spell check work? | 43. Random number generators |
| 11. Emmy Noether | 26. Hyperbolic geometry | 44. Set Theory |
| 12. Erdős and his mathematics | 27. Magic squares | 45. Symmetry and group theory |
| 13. Euler | 28. Mersenne primes, GMPS | 46. Techniques of integration |
| 14. Euler's formula $V - E + F$ | 29. Modular arithmetic and the “freshman's dream” | 47. Topology vs. geometry |
| 15. Fermat | 30. Newton vs. Leibniz and calculus | 48. Turing machines, Conway's game of life, Cellular automata |
| | 31. Origami | 49. Voting and paradox |
| | 32. P vs. NP | 50. Winning strategies |
| | 33. Paradox in probability | |