Learning Discrete Mathematics and Computer Science via Primary Historical Sources: Student projects for the classroom

HPM 2008 Workshop
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Web resources and opportunities for collaboration

- *Teaching with Original Historical Sources in Mathematics:*

  `http://www.math.nmsu.edu/~history`

  has numerous resources, and information on books using primary sources.

- *Teaching Discrete Mathematics via Primary Historical Sources:*

  `http://www.math.nmsu.edu/hist_projects/`

  has 19 classroom project modules based on primary historical sources available for courses in discrete mathematics, combinatorics, graph theory, algorithm design, logic, abstract algebra, foundations of mathematics, or the history of mathematics, completed through year 2007 with NSF pilot funding.

- *Learning Discrete Mathematics and Computer Science via Primary Historical Sources:*

  `http://www.cs.nmsu.edu/historical-projects/`

  is an enlarged collaboration developing many more projects in the above areas, beginning in year 2008 with NSF expansion grant funding.

  We seek testers to try our new (or old) projects with students, and also more collaborators for the development of new project ideas. Please contact us if you are interested.

Some of the projects already available at *Teaching Discrete Mathematics via Primary Historical Sources* are

1. "Are All Infinities Created Equal?" (Georg Cantor, 1845–1918)
2. "Turing Machines, Induction and Recursion," (Alan Turing, 1912–1954)
3. "Turing Machines and Binary Addition," (Alan Turing, 1912–1954)
4. "Binary Arithmetic: From Leibniz to von Neumann" (Gottfried Leibniz, 1646–1716)
5. "Arithmetic Backwards from von Neumann to the Chinese Abacus," (Claude Shannon, 1916–2001)

6. "Treatise on the Arithmetical Triangle," (Blaise Pascal, 1623–1662)
7. "Counting Triangulations of a Polygon," (Gabriel Lamé, 1795–1870)
8. "Two-Way Deterministic Finite Automata," (John Shepherdson)
9. "Church's Thesis," (Alonzo Church, 1903–1995)
10. "Euler Circuits and the Königsberg Bridge Problem," (Leonhard Euler, 1707–1783)
11. "Topological Connections from Graph Theory," (Oswald Veblen, 1880–1960)
12. "Hamiltonian Circuits and Icosian Game," (William Hamilton, 1805–1865)

Projects under development now at *Learning Discrete Mathematics and Computer Science via Primary Historical Sources* are

1. Summation of Numerical Powers (Archimedes, Nichomachus, Aryabhata, al-Karaji, al-Haytham, Fermat, Pascal)
2. Summation of Powers, Bernoulli Numbers, and the Euler-Maclaurin Summation Formula (Jakob Bernoulli, Euler)
3. Logic and Truth Tables (Aristotle, Chrysippus, Boole, Frege, Russell-Whitehead, Wittgenstein)
4. Boolean Algebra and Discrete Structures (Boole, Venn, MacColl, Peirce)
5. Euclid's GCD Algorithm : Recursion vs. Iteration (Euclid)
6. Induction and Recursive Thought (Dedekind, Turing, Church)
7. A History of Sorting: The Emergence of Quicksort (Sedgewick)
8. History of Coding and Huffman Codes (Shannon, Huffman)
9. Networks and Spanning Trees (Prüfer)
10. Program Correctness (Floyd, Hoare)
11. Arthur Cayley and Group Theory (Cayley)
12. Regular Languages and Finite Automata (McCulloch-Pitts, Kleene)
13. Gödel's Completeness Theorem (Gödel)
14. Peano Arithmetic (Peano)
15. Gödel's Incompleteness Theorems (Gödel)