1 Notes to the Instructor

This project is designed for an introductory course in discrete or finite mathematics that covers elementary symbolic logic. Particular emphasis is placed on the logic of deduction as expressed today in an "if-then" statement. An examination of various rules of inference throughout history reveals a commonality of deductive thought, encapsulated today in the schemata of Ludwig Wittgenstein and truth tables of Emil Post. The instructor may wish to lead class discussion on certain excerpts from the original sources, and assign certain problems as out-of-class exercises. Be sure to draw comparisons from one historical source to another, and follow the progress to what today appears rather abruptly in most textbooks on discrete mathematics, namely the truth-table for an "if-then" statement.

The project offers excerpts from several sources, and not all sections need be covered in detail. The most important selections are those from the ancient Greek philosopher Chrysippus and the modern writers Russell and Whitehead. Chrysippus states verbally several rules of inferences that are common place in modern discrete mathematics textbooks, while the symbolic logic need to show their equivalence is essentially that of Russell-Whitehead. Of course, bridging the gap between verbal arguments and symbolic manipulation can be gleaned by studying the authors writing between these two ears. An abbreviated version of the project could begin with a study of Chrysippus's writings, a brief look at the symbolic work of Boole, a comparison of Frege's condition stroke with Philonian implication (Exercise 5.9), followed by a study of the symbolic logic of Russell-Whitehead. A look at the modern truth table of an implication from Post offers a unifying conclusion to the project.

Although there are numerous exercises, not all need to be assigned. Furthermore, as an in-class activity, the students could work through several exercises together with the instructor. Other exercises could be added at the conclusion of the project, such as comparing the truth tables or Frege's concept-script for:

1. $p \supset (q \supset r)$ and $(p \supset q) \supset r$;
2. $p \supset (q \supset r)$ and $(p.q) \supset r$.

Above p, q, r are elementary propositions, and using the notation of *Principia Mathematica* [**?**], $p.q$ denotes "p and q," $p \vee q$ denotes "p or q," and $p \supset q$ denotes "p implies q." Many modern textbooks write $p.q$ as $p \wedge q$ and $p \supset q$ as $p \rightarrow q$. The main goal of the project, however, is to gain an appreciation of symbolic logic by witnessing the various attempts and historical progress at reducing statements to a useful symbolic form. For further material on Boolean algebras, see the projects of Janet Barnett, and for more information about coding information with 0s and 1s for computer science, see Inna Pivkina's project "Discovery of Huffman Codes."