

# A LOGICAL APPROACH TO DISCRETE MATH

**David Gries**  
**Fred B. Schneider**

Theorem:

$$(\forall x | : P \Rightarrow Q) \equiv \{x | P\} \subseteq \{x | Q\}$$

Proof:

$$\begin{aligned} & \{x | P\} \subseteq \{x | Q\} \\ = & \text{(Def. of Subset } \subseteq, \text{ with } v \text{ not} \\ & \text{occurring free in } P \text{ or } Q) \\ & (\forall v | v \in \{x | P\} : v \in \{x | Q\}) \\ = & (v \in \{x | R\} \equiv R[x := v], \text{ twice}) \\ & (\forall v | P[x := v] : Q[x := v]) \\ = & \text{(Trading; Dummy renaming)} \\ & (\forall x | : P[x := v][v := x] \Rightarrow \\ & \quad Q[x := v][v := x]) \\ = & (R[x := v][v := x] \equiv R \text{ if } v \\ & \quad \text{does not occur free in } R, \text{ twice}) \\ & (\forall x | : P \Rightarrow Q) \end{aligned}$$



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# A Logical Approach To Discrete Math

**DP Hallahan**



## **A Logical Approach To Discrete Math:**

A Logical Approach to Discrete Math David Gries, Fred B. Schneider, 1993-10-22 Here the authors strive to change the way logic and discrete math are taught in computer science and mathematics while many books treat logic simply as another topic of study this one is unique in its willingness to go one step further The book treats logic as a basic tool which may be applied in essentially every other area

A Logical Approach to Discrete Math David Gries, Fred B. Schneider, 2013-03-14 This text attempts to change the way we teach logic to beginning students Instead of teaching logic as a subject in isolation we regard it as a basic tool and show how to use it We strive to give students a skill in the propositional and predicate calculi and then to exercise that skill thoroughly in applications that arise in computer science and discrete mathematics We are not logicians but programming methodologists and this text reflects that perspective We are among the first generation of scientists who are more interested in using logic than in studying it With this text we hope to empower further generations of computer scientists and mathematicians to become serious users of logic Logic is the glue Logic is the glue that binds together methods of reasoning in all domains The traditional proof methods for example proof by assumption contradiction mutual implication and induction have their basis in formal logic Thus whether proofs are to be presented formally or informally a study of logic can provide understanding

A Logical Approach to Discrete Math David Gries, Fred B. Schneider, 2014-01-15

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**Mathematical Logic** George Tourlakis, 2008-09-02 A comprehensive and user friendly guide to the use of logic in mathematical reasoning Mathematical Logic presents a comprehensive introduction to formal methods of logic and their use as a reliable tool for deductive reasoning With its user friendly approach this book successfully equips readers with the key concepts and methods for formulating valid mathematical arguments that can be used to uncover truths across diverse areas of study such as mathematics computer science and philosophy The book develops the logical tools for writing proofs by guiding readers through both the established Hilbert style of proof writing as well as the equational style that is emerging in computer science and engineering applications Chapters have been organized into the two topical areas of Boolean logic and predicate logic Techniques situated outside formal logic are applied to illustrate and demonstrate significant facts regarding the power and limitations of logic such as Logic can certify truths and only truths Logic can certify all absolute truths completeness theorems of Post and Gödel Logic cannot certify all conditional truths such as those that are specific to the Peano arithmetic Therefore logic has some serious limitations as shown through Gödel's incompleteness theorem Numerous examples and

problem sets are provided throughout the text further facilitating readers understanding of the capabilities of logic to discover mathematical truths In addition an extensive appendix introduces Tarski semantics and proceeds with detailed proofs of completeness and first incompleteness theorems while also providing a self contained introduction to the theory of computability With its thorough scope of coverage and accessible style Mathematical Logic is an ideal book for courses in mathematics computer science and philosophy at the upper undergraduate and graduate levels It is also a valuable reference for researchers and practitioners who wish to learn how to use logic in their everyday work      *Conference Record* ,1994

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