Mathematics I

Course Description

Many practical concepts in IT and technology are based on the findings of discrete mathematics. For an in-depth understanding of, for example, data structures, the construction of communication networks, or of solutions to algorithmic problems, a basic understanding of their mathematical background is necessary. This course therefore introduces discrete mathematical terms and concepts, with specific areas of number theory also taught.

Contents

1. Mathematical Basics
   1. Basic Concepts
   2. Proof Techniques
   3. Finite Sums
2. Sets
   1. Properties and Calculation Rules for Sets
   2. Equivalence Relations
3. Propositional Logic
   1. Statements and Logical Connections
   2. Truth Tables
   3. Computational Rules of Propositional Logic
   4. Simplification of Expressions in Propositional Logic
4. Number Systems
   1. Decimal System
   2. Binary System
   3. Hexadecimal System
5. Mappings
   1. Mappings and Graphs
   2. Special Properties of Mappings
6. Basic Algebraic Structures
   1. Groups
   2. Rings
   3. Residual Class Rings
7. Prime Numbers
   1. Definition and Properties of Prime Numbers
   2. Prime Number Test
8. Modular Arithmetic
   1. The Euclidean Algorithm
   2. Fundamental Theorem of Arithmetic
9. Applications in Cryptography
   1. The Shift Cryptosystem
   2. Symmetric vs Asymmetric Cryptosystems
   3. The RSA Cryptosystem