Key Terms of Chapter 1

proposition命题: a statement that is true or false

propositional variable命题变量: a variable that represents a proposition

truth value真值: true or false

¬*p* (negation of *p*)否定: the proposition with truth value opposite to the truth value of *p*

logical operators逻辑运算符: operators used to combine propositions

compound proposition复合命题: a proposition constructed by combining propositions using logical operators

truth table真值表: a table displaying all possible truth values of propositions

***p*∨*q* (disjunction of *p* and *q*)析取:** the proposition "*p* or *q*," which is true if and only if at least one of *p* and *q* is true

***p*∧*q* (conjunction of *p* and *q*)合取:** the proposition "*p* and *q*," which is true if and only if both *p* and *q* are true

***p*⊕*q* (exclusive or of *p* and *q*)异或:** the proposition "*p XOR q*," which is true when exactly one of *p* and *q* is true

***p*→*q* (*p* implies *q*)蕴含:** the proposition "if *p*, then *q*," which is false if and only if *p* is true and *q* is false

converse of *p* → *q*逆命题: the conditional statement $q \rightarrow p$

contrapositive of *p* →*q*逆反命题: the conditional statement $\neg q \rightarrow \neg p$

inverse of *p* →*q*反命题: the conditional statement $\neg p \rightarrow \neg q$

***p*↔ *q* (biconditional)双条件:** the proposition "*p* if and only if *q*," which is true if and only if *p* and *q* have the same truth value

bit位: either a 0 or a 1

Boolean variable布尔变量: a variable that has a value of 0 or 1

bit operation位运算: an operation on a bit or bits

bit string位串: a list of bits

bitwise operations按位运算: operations on bit strings that operate on each bit in one string and the corresponding bit in the other string

logic gate逻辑门: a logic element that performs a logical operation on one or more bits to produce an output bit

logic circuit逻辑电路: a switching circuit made up of logic gates that produces one or more output bits

tautology永真式/重言式: a compound proposition that is always true

contradiction矛盾式: a compound proposition that is always false

contingency偶真式: a compound proposition that is sometimes true and sometimes false

consistent compound propositions一致的复合命题: compound propositions for which there is an assignment of truth values to the variables that makes all these propositions true

satisfiable compound proposition可满足的复合命题: a compound proposition for which there is an assignment of truth values to its variables that makes it true
logically equivalent compound propositions逻辑等价复合命题: compound propositions that always have the same truth values
predicate谓词: part of a sentence that attributes a property to the subject
propositional function命题函数: a statement containing one or more variables that becomes a proposition when each of its variables is assigned a value or is bound by a quantifier
domain (or universe) of discourse论域: the values a variable in a propositional function may take
$\exists x\, P(x)$ (existential quantification of $P(x)$)存在量词: the proposition that is true if and only if there exists an x in the domain such that $P(x)$ is true
$\forall x P(x)$ (universal quantification of $P(x)$)全称量词: the proposition that is true if and only if $P(x)$ is true for every x in the domain
logically equivalent expressions逻辑等价表达式: expressions that have the same truth value no matter which propositional functions and domains are used
free variable自由变量: a variable not bound in a propositional function
bound variable绑定变量: a variable that is quantified
scope of a quantifier量词的作用范围: portion of a statement where the quan- tifier binds its variable
argument论证: a sequence of statements
argument form论证形式: a sequence of compound propositions involving propositional variables
premise前提: a statement, in an argument, or argument form, other than the final one
conclusion结论: the final statement in an argument or argument form
valid argument form有效的论证形式: a sequence of compound propositions involving propositional variables where the truth of all the premises implies the truth of the conclusion
valid argument有效的论证: an argument with a valid argument form
rule of inference推理规则: a valid argument form that can be used in the demonstration that arguments are valid
fallacy谬论: an invalid argument form often used incorrectly as a rule of inference (or sometimes, more generally, an incorrect argument)
circular reasoning or begging the question循环推理或乞求问题: reasoning where one or more steps are based on the truth of the statement being proved
theorem定理: a mathematical assertion that can be shown to be true
conjecture猜想: a mathematical assertion proposed to be true, but that has not been proved
proof证明: a demonstration that a theorem is true
axiom公理: a statement that is assumed to be true and that can be used as a basis for proving theorems
lemma引理: a theorem used to prove other theorems
corollary推论: a proposition that can be proved as a consequence of a theorem that has just been proved
vacuous proof空洞证明: a proof that $p \rightarrow q$ is true based on the fact that p is false

trivial proof平凡证明: a proof that $p \rightarrow q$ is true based on the fact that q is true
direct proof直接证明: a proof that $p \rightarrow q$ is true that proceeds by showing that q must be true when p is true
proof by contraposition对位证明: a proof that $p \rightarrow q$ is true that proceeds by showing that p must be false when q is false
proof by contradiction反证法,归谬法: a proof that p is true based on the truth of the conditional statement $\neg p \rightarrow q$, where q is a contradiction
exhaustive proof穷举证明: a proof that establishes a result by checking a list of all possible cases
proof by cases案例证明: a proof broken into separate cases, where these cases cover all possibilities
without loss of generality不失一般性: an assumption in a proof that makes it possible to prove a theorem by reducing the number of cases to consider in the proof
counterexample反例: an element x such that $P(x)$ is false
constructive existence proof构造性证明: a proof that an element with a specified property exists that explicitly finds such an element
nonconstructive existence proof非构造性证明: a proof that an element with a specified property exists that does not explicitly find such an element
rational number有理数: a number that can be expressed as the ratio of two integers p and q such that $q \neq 0$
uniqueness proof 唯一性证明: a proof that there is exactly one element satisfying a specified property