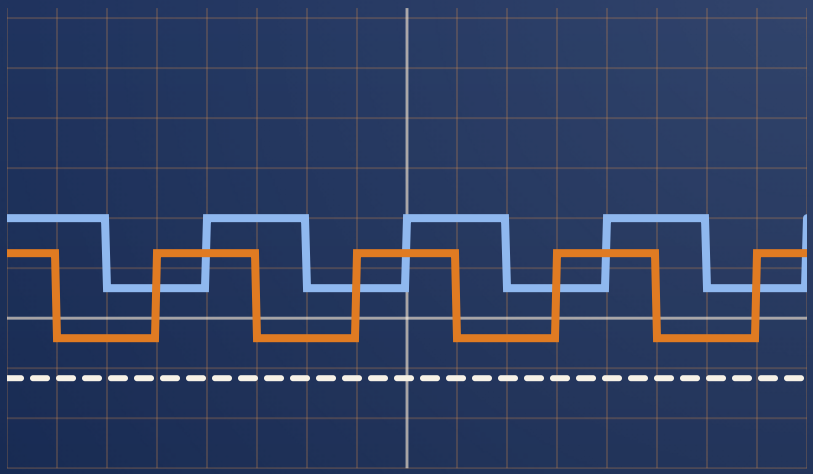
KECUDO

2026 EDITION · COLLEGE MATH SERIES



DISCRETE MATHEMATICS

Class G1

Logic & Proofs

How to reason without mistakes

PREMIUM EDITION · KECUDO · G1

13 CHAPTERS · 120 SELF-ASSESSMENT QUESTIONS

INTERACTIVE EDITION + PRINT PDF

Contents

Part I · Foundations 4

1. Propositions 5
2. Truth Tables 7
3. Logical Equivalences 9
4. Predicates & Quantifiers 11

Part I Review · 10 questions 13

Part II · Core 15

5. Rules of Inference 16
6. Direct Proof 18
7. Contrapositive & Contradiction 20
8. Proof by Cases 22
9. Mathematical Induction 24

Part II Review · 10 questions 27

Part III · Advanced 29

10. Strong Induction 30
11. Recursive Definitions 32
12. Common Proof Mistakes 35
13. Logic in Computer Science 37

Part III Review · 10 questions 39

Final Exam · 25 questions 41

Your Results 46

FOUNDATION

Chapter 1

Propositions

A **proposition** is a statement that is either true or false, like "The shop opens at 9" or "2 + 2 = 5". Questions and commands are not propositions.

Connective	Symbol	Read as	True when
negation	¬p	not p	p is false
conjunction	p ∧ q	p and q	both true
disjunction	p ∨ q	p or q	at least one true
conditional	p → q	if p then q	except p true, q false
biconditional	p ↔ q	p if and only if q	same truth value

WORKED EXAMPLE **Kecudo's late-fee rule**

1. p: "the bike is returned late"; q: "a fee is charged".
2. The rule is p → q. It is broken only if a bike is late and no fee is charged.

✓ **A conditional is false in exactly one case**

READING CONDITIONALS

p → q can be read "p only if q", "q if p", "p is sufficient for q", or "q is necessary for p".

FOUNDATION

Chapter 2

Truth Tables

A truth table lists every combination of truth values. With n variables there are 2^n rows.

p	q	p → q	¬q → ¬p	q → p
T	T	T	T	T
T	F	F	F	T
F	T	T	T	F
F	F	T	T	T

CONTRAPOSITIVE VS CONVERSE

p → q always has the same truth values as its **contrapositive** ¬q → ¬p, but not as its **converse** q → p.

WORKED EXAMPLE **Tautology and contradiction**

1. p ∨ ¬p is always true: a **tautology**.
2. p ∧ ¬p is always false: a **contradiction**.

✓ Some statements are true or false by form alone

CHECK YOUR UNDERSTANDING

Chapter 1: Propositions

5 questions · your answer locks when you choose it

1. Which is a proposition?

- **A** "7 is prime."
- **B** "Close the door."
- **C** "x + 1"
- **D** "Is it raining?"

2. p ∧ q is true when:

- **A** neither is true
- **B** either is true
- **C** p is false
- **D** both p and q are true

3. p → q is false when:

- **A** q is true
- **B** both are false
- **C** p is false
- **D** p is true and q is false

4. "q is necessary for p" means:

- **A** p → q
- **B** p ↔ q
- **C** p ∧ q
- **D** q → p

5. If p is false, p → q is:

- **A** false
- **B** q
- **C** true
- **D** unknown

FINAL EXAM

25 Questions on the Whole Book

Parts A–E · 5 questions each

Part A · Basics

1. A proposition is:

A a statement that is true or false
B a question
C a command
D a variable

2. $p \to q$ is equivalent to:

A $q \to p$
B $\neg p \to \neg q$
C $p \wedge q$
D $\neg q \to \neg p$

3. $\neg \forall x\, P(x) \equiv$

A $P(x)$
B $\exists x\, \neg P(x)$
C $\exists x\, P(x)$
D $\forall x\, \neg P(x)$

4. Induction has:

A only cases
B only a contradiction
C a base case and an inductive step
D no assumptions

5. A tautology is:

A sometimes true
B a question
C always false
D always true



KECUDO

Thank you for learning with Kecudo.

NEXT IN THE SERIES

Class G2 · Sets, Functions, Relations & Number Theory