

Discrete Structures

Heather M. Michaud

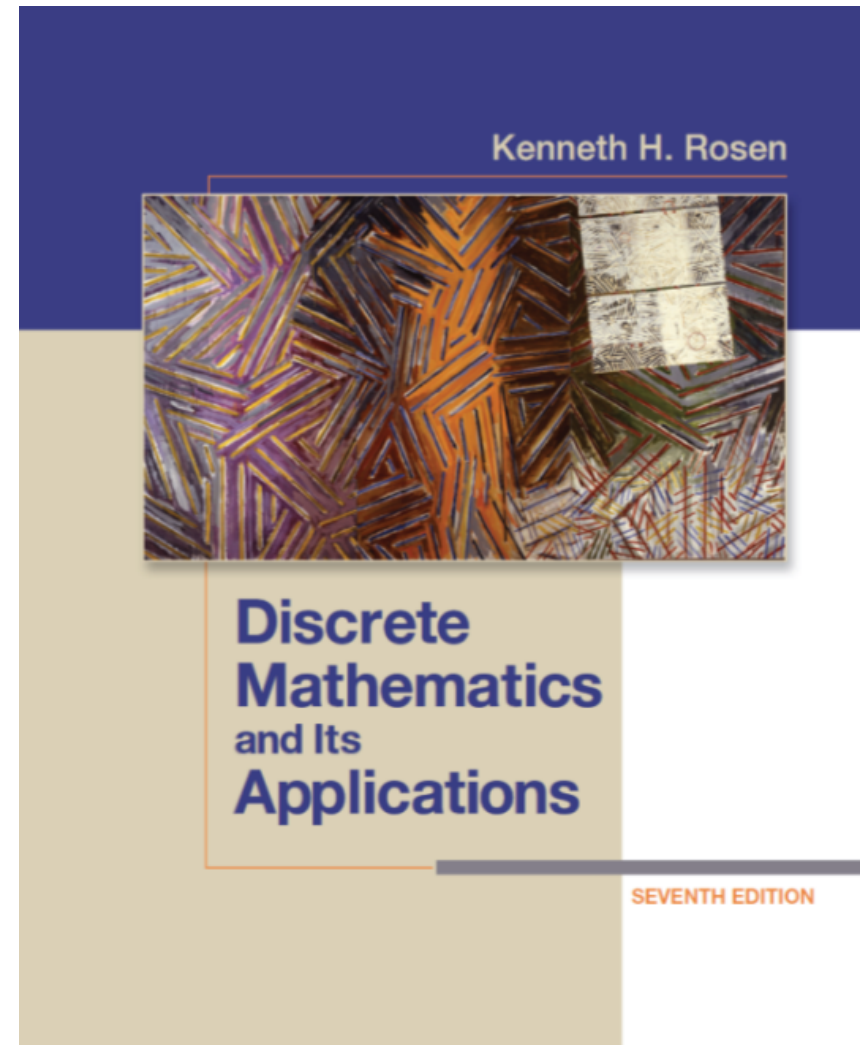
Textbook

Kenneth H. Rosen

Discrete Mathematics and
Its Applications,

7th edition, McGraw-Hill

Also available as PDF



Course Requirements

Participation	10%	
Homework	30%	
Exam #1	20%	tentatively Monday, Feb. 27th
Exam #2	20%	tentatively Monday, Apr. 3rd
Exam #3 (Final)	20%	Tuesday, May 9th, 10:15AM - 12:30PM
Extra Credit Problems	2-5%	TBD

Exams:

- 3 exams, including the final exam
- Closed book, closed notes

Homework:

- ~10 assignments
- Will be announced in class and posted on the course website
- Final HW grade: total # received points / # total possible points

Office Hours

- Room 352 Math and Science Building
- By appointment
- Email me with a few times that work for you

Course Site & Contact

- Course site
 - <https://web.cs.kent.edu/~hmichaud/discrete-s17>
 - topics and slides
 - homework
 - important dates
- Contact
 - hmichaud@kent.edu
 - put “Discrete Structures” somewhere in the subject

Tips

Homework... Do it!

- Do it by yourself.
- If you do it in groups... do it in small groups.
 - Try it on your own first.
 - Discuss approaches, not solutions.
 - Do not copy.
- Fully explain your answers. Show your work to receive full credit.

General

- Come to class
- Check the course website for upcoming deadlines
- Do the odd numbered problems at the end of each section
 - The solutions are in the end of the book
- Ask questions

Discrete Mathematics

What is Discrete Mathematics?

Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous.

Discrete

- given any two numbers, there isn't an infinite set in between them
- finite set, countable

Examples

- number of students
- number of languages you speak

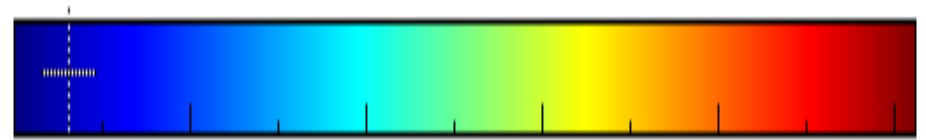


Continuous

- given any two numbers, can always find numbers in between
- infinite set, measurable

Examples

- height of a person
- speed of a car

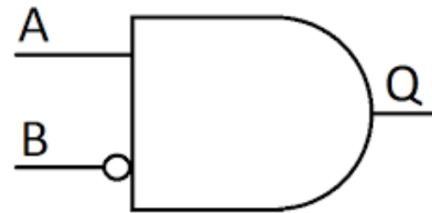
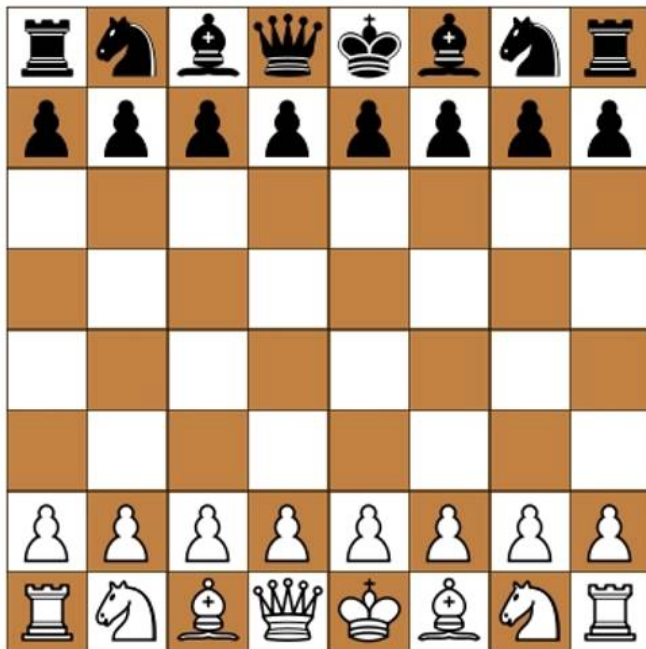


Topics in Discrete Math

- **Logic** - used in programming, artificial intelligence, circuit design, puzzles
- **Counting** - used in probability, games, analysis of algorithms
- **Graph theory** - used for computer and wireless networks, data structures, path finding
- **Number theory** - cryptography

Topic 1. Logic & Proofs

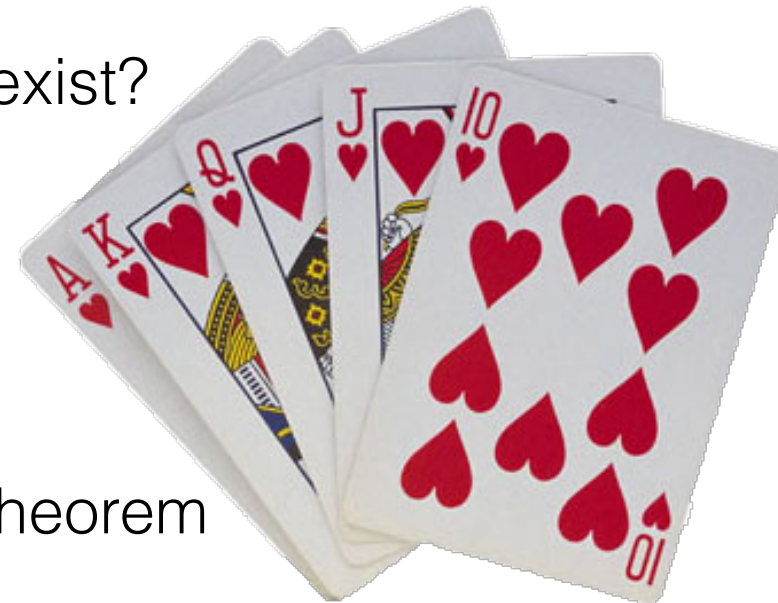
- Logic: propositional logic, first order logic
- Proof: induction, contradiction
- Used in artificial intelligence, programming, circuits, algorithms, and puzzles



5	3			7			
6			1	9	5		
	9	8					6
8				6			3
4			8		3		1
7				2			6
	6					2	8
			4	1	9		5
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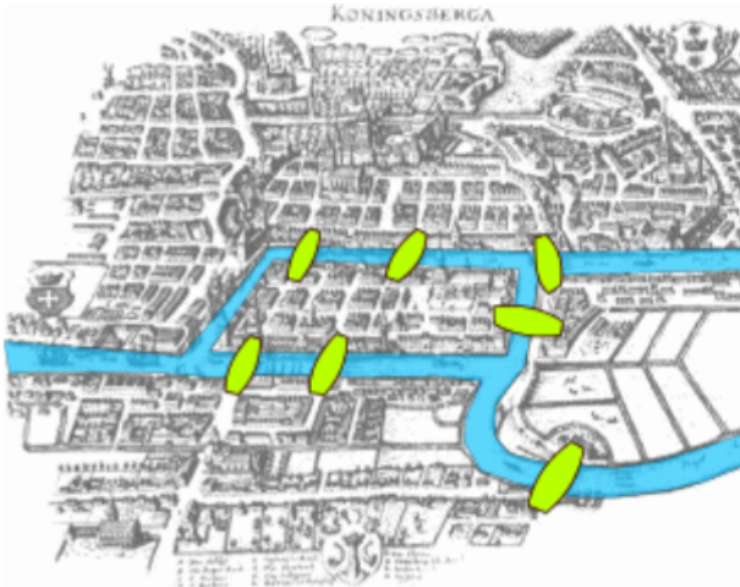
Topic 2. Counting

- How many combinations/permutations exist?
- How many steps are needed to sort n numbers?
- Sets
- Combinations, Permutations, Binomial theorem
- Functions
- Pigeonhole principle
- Recursions, generating functions
- Used in probability, algorithms, analysis of algorithms, data structures



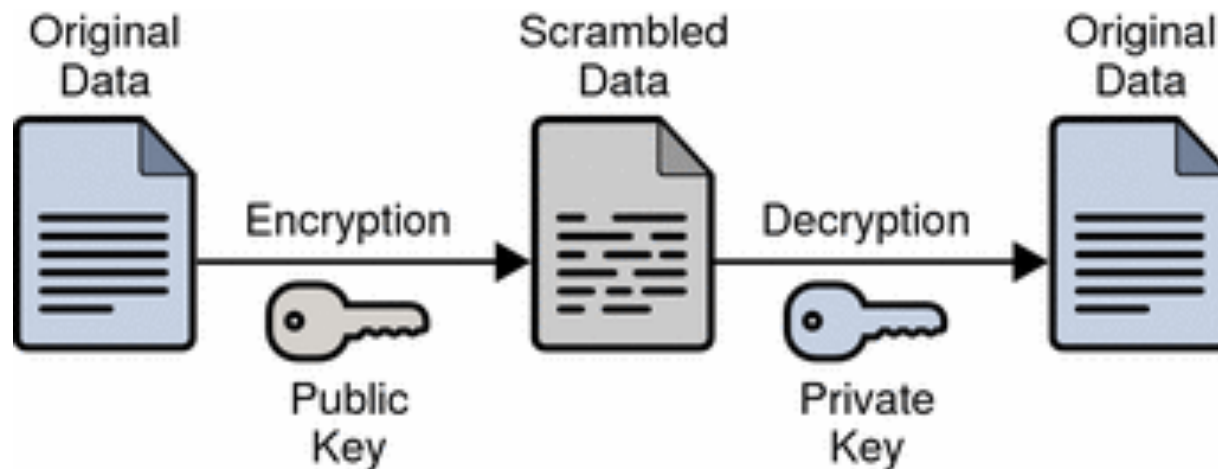
Topic 3. Graph Theory

- What's the best path?
- Relations, graphs, trees
- Degree sequence, isomorphism, Eulerian graphs
- Computer networks, circuit design, data structures



Topic 4. Number Theory

- Number sequence
- Euclidean algorithm
- Prime number
- Modular arithmetic
- Cryptography, coding theory, data structures



Why Discrete Math?

- Design **efficient** computer systems and programs.
 - How fast will the program run?
 - Can it be faster?
 - How do you know it will work?