Discrete Structures

Heather M. Michaud
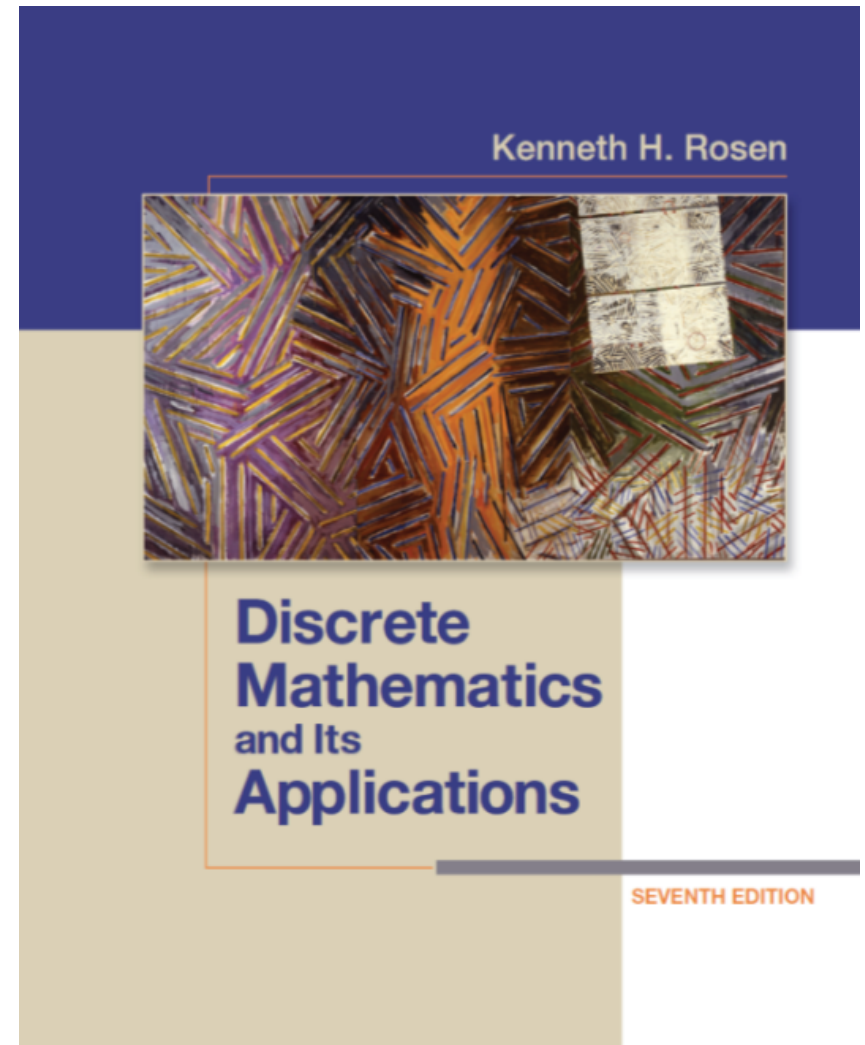
Textbook

Kenneth H. Rosen

Discrete Mathematics and Its Applications,

7th edition, McGraw-Hill

Also available as PDF

Course Requirements

Participation	10%	
Homework	25%	
Exam #1	20%	tentatively Thursday, Oct. 6th
Exam #2	20%	tentatively Thursday, Nov. 3rd
Exam #3 (Final)	25%	Tuesday, Dec. 13th, 7:45AM - 10AM
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

- Monday 4-5PM, Tuesday 2-3PM

- By appointment

  - Email me with a time that works for you

Course Site & Contact

- Course site

  - https://web.cs.kent.edu/~hmichaud/discrete-f16

  - 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 it 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

Continous
- 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
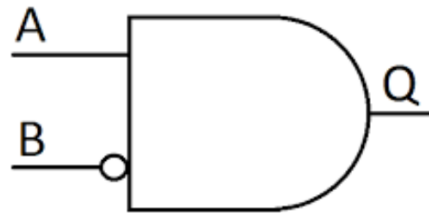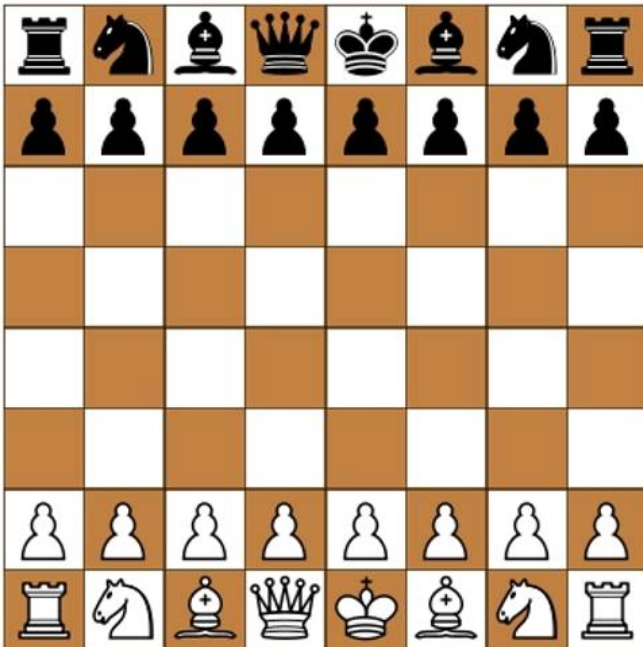
Topic 2. Counting

- 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
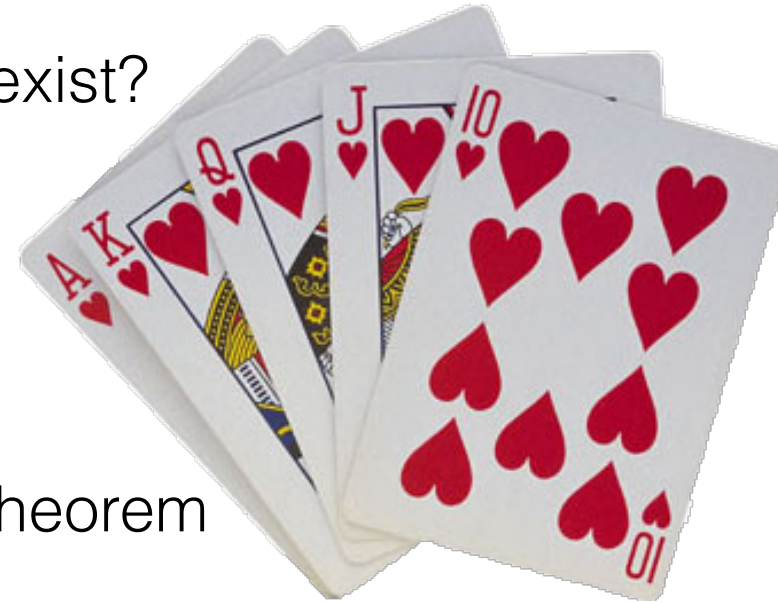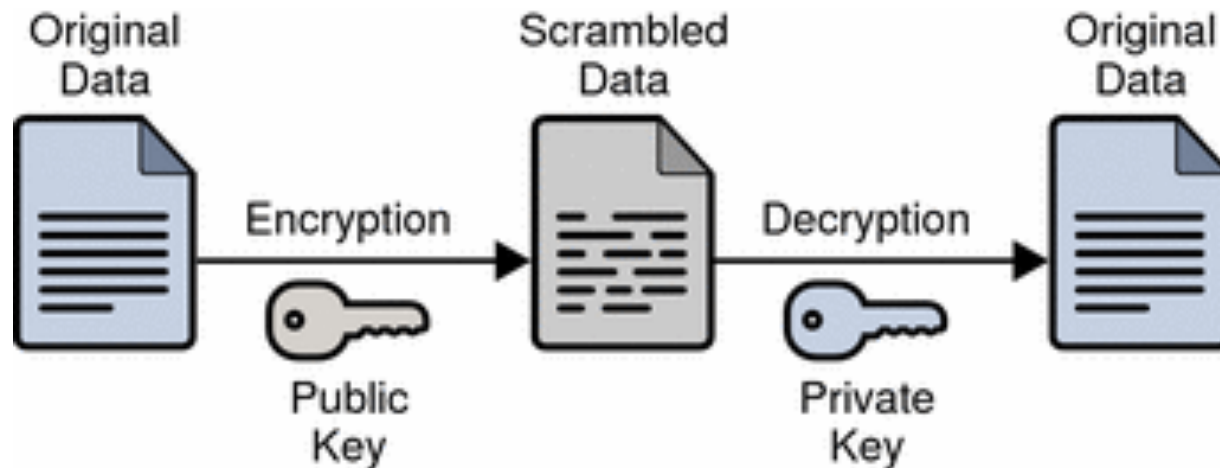
Topic 3. Graph Theory

- What's the best path?
- Relations, graphs, trees
- Degree sequence, isomorphism, Eulerian graphs
- Computer networks, circuit design, data structures
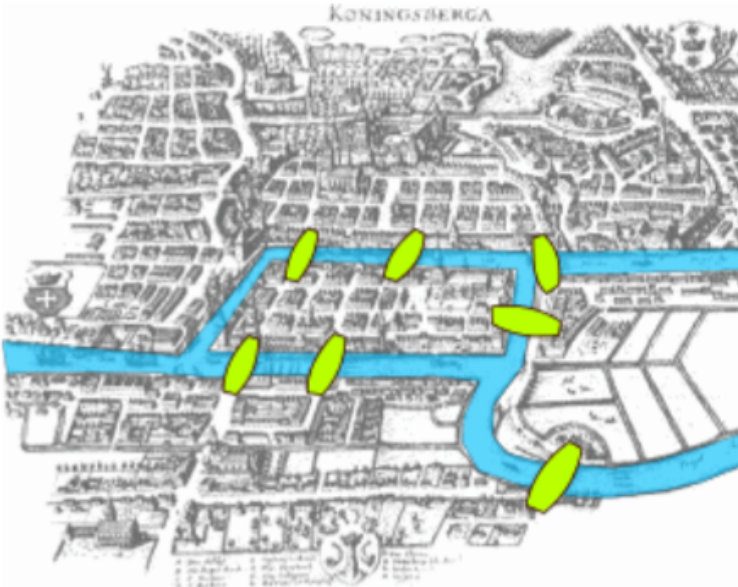
Topic 4. Number Theory

- 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?