

ECS 20: Discrete Mathematics for Computer Science

Winter 2021

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Week 2, January 11

A bit about logistics

- ▶ Midterm 1 on Friday (covers Sets and Relations)
- ▶ Check Canvas homepage frequently for update on discussion notes and videos.
- ▶ Ask questions on Piazza (self-signup is needed)

Outline

- ▶ Sets Recap
- ▶ Homework 1 Review
- ▶ Computer Representations of Sets ¹
- ▶ Relations (if we have time)

¹KH Rosen (2012) Discrete Mathematics and Its Applications, 7th edition

Computer Representation of Sets

There are a variety of ways to represent sets in computers.

One intuition is to store the elements of the set in an unordered fashion. However, in this way, the operations of union, intersection, difference etc. of two or more sets would be time-consuming, because a large amount of searching and comparing of elements is involved.

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Can we do better?

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Assume that the universal set U is finite and $n(U) = n$. First, specify an arbitrary ordering of the elements of U , for instance a_1, a_2, \dots, a_n . Represent a subset A of U with the bit string of length n , where the i -th bit in this string is 1 if a_i belongs to A and is 0 otherwise.

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Example. Let $U = \{1, 2, 3, 4, 5, 6\}$,

1. How to represent the set of all odd numbers, say O ?
2. What's the complement of O ?
3. Given that $B = \{1, 2, 3, 6\}$, how to represent is $O \cup B$?