

Homework 2

CS250 Discrete Structures I, Winter 2020

David Lu

Due: April 12, 2020

Your solutions must be typed (preferably typeset in \LaTeX) and submitted as a PDF on D2L.
Solutions generally require clear explanations in complete sentences and must be in your own writing.

Assignment For Week 2

- Read chapter 0.3 in the textbook on set theory. <http://discrete.openmathbooks.org/dmoi3.html>
- Take a look at some of the TrevTutor videos on set theory. (The first 7 videos from this play list are relevant: <https://www.youtube.com/playlist?list=PLDDGPdw7e6Ag1EIznZ-m-qXu4XX3A0cIz>)
- Complete the following exercises.

Set Theory Chapter 0.3

Discrete math courses often begin with one of two topics: logic and set theory. At PSU, you can think of CS250 as the set theory and stuff you can do with set theory class and CS251 as the logic and stuff to do with logic class. Both of these topics are foundational to broader investigations in mathematics and are central problem solving tools for computer scientists.

For this week, we'll take a look at the basics of set theory. Set theory lays out the groundwork for a lot of further topics we'll look at this term and beyond. For instance, counting, functions, graphs, data structures, and Turing Machines are all described in terms of the language of set theory.

OEIS – the online encyclopedia of integer sequences wiki – has a page with many of the \LaTeX commands you'll use for typesetting set theory notation. https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols

Exercises Set theory and material implication

I'll try to keep most of the homework exercises from the textbook for consistency. I recommend working through problems beyond what's assigned for the homework to more thoroughly evaluate your own understanding of the material. If you have time, do all the exercises. Many of them have solutions and check yourself hints in the online version of the textbook.

Problem 1 Write up solutions to the following exercises from chapter 0.3 (page 35–38 in the pdf version)

Exercises: 1, 2, 5, 8, 10, 19, 22, 25, 26, 30.

Problem 2 Understanding the ‘if... then...’ conditional, also called *material implication*

1. Card Puzzle I have a set of cards. Each card has a number on one side and a letter on the other.

Here is a rule:

If a card has a 'D' on one side, then it has a '3' on the other side.

Which cards you have to turn over given the following cards to determine whether the rule holds or not?

D F 3 7

2. Bar Puzzle You are a bouncer in a bar and you must enforce the following rule:

If a bar patron is drinking beer she or he must be 21 or over.

Of the four people at the bar drinking beverages, whose IDs or drinks do you need to check?

- A person drinking beer.
- A person drinking coke.
- A person who you know is over 21.
- A person who is you know is under 21.