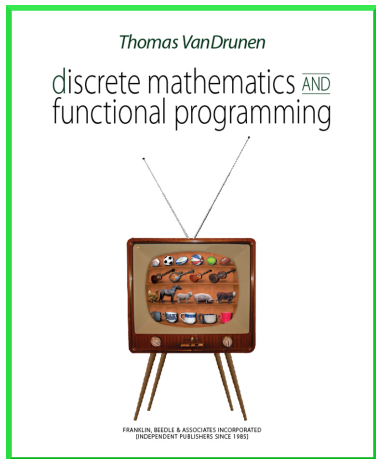


Welcome

CSCI 243
Wheaton College
Thomas VanDrunen
Fall 2024



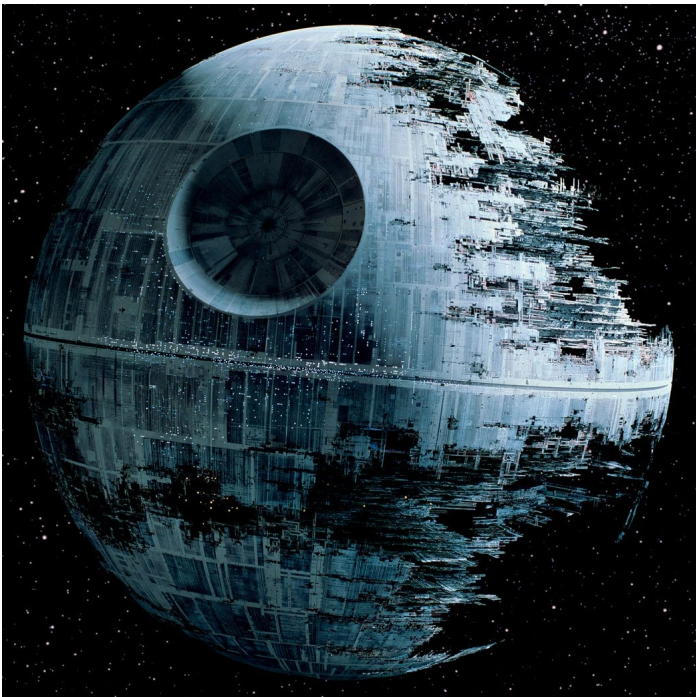
Please keep phones and other devices silenced and put away—not seen or heard (or used) any time during class.



*Discrete Mathematics and
Functional Programming.*
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*Discrete Mathematics and
Functional Programming with Python.*
Under contract with Taylor & Francis.
Expected 2026.



What is this course about?

Proof-based **discrete mathematics**
and
programming in the **functional style**

... with three audiences in mind:

- ▶ Computer science majors
- ▶ Math majors
- ▶ Everyone else

Goals and themes

At the end of this course you should be able to

- ▶ Manipulate symbolic logical forms
- ▶ Write mathematical proofs, especially for results from basic set theory
- ▶ Write programs in the functional style using the Python programming language

Throughout this course, we will see these recurring themes:

- ▶ Formal definitions
- ▶ Recursive thinking
- ▶ Analysis and synthesis

Course outline

Ch 1. Set. (Aug 28–Sept 9)

Ch 2. Sequence. (Sept 11 – Sept 18)

Test 1. Sept 23

Ch 3. Proposition. (Sept 25–Oct 4)

Ch 4. Proof. (Oct 7–Oct 14)

Test 2. Oct 18

Ch 5. Relation. (Oct 25–Nov 4)

Ch 6. Function. (Nov 6–Nov 18)

Test 3. Nov 22

Ch 7. Self reference (Nov 25–Dec 11)

Final exam. Wed, Dec 18, 1:30

5 is a natural number (*or* the collection of natural numbers contains 5).

$$5 \in \mathbb{N}$$

All integers are rational numbers.

$$\mathbb{Z} \subseteq \mathbb{Q}$$

Merging the algebraic numbers and the transcendental numbers makes the real numbers.

$$\mathbb{R} = \mathbb{A} \cup \mathbb{T}$$

Negative integers are both negative and integers.

$$\mathbb{Z}^- = \mathbb{R}^- \cap \mathbb{Z}$$

Transcendental numbers are those real numbers that are not algebraic numbers.

$$\mathbb{T} = \mathbb{R} - \mathbb{A}$$

Nothing is both transcendental and algebraic, *or* the collection of things both transcendental and algebraic is empty.

$$\mathbb{T} \cap \mathbb{A} = \emptyset$$

Adding 0 to the collection of natural numbers makes the collection of whole numbers.

$$\mathbb{W} = \{0\} \cup \mathbb{N}$$

Since all rational numbers are algebraic numbers and all algebraic numbers are real numbers, it follows that all rational numbers are real numbers.

$$\begin{aligned} \mathbb{Q} &\subseteq \mathbb{A} \\ \mathbb{A} &\subseteq \mathbb{R} \\ \therefore \mathbb{Q} &\subseteq \mathbb{R} \end{aligned}$$

For next time:

Read Sections 1.(1 & 2)

Take quiz on Canvas (covering the reading)

*Meet in the CSCI lab (MEY 154) on Friday (This Friday, Aug 30, only)
(Make sure you know your username and password for the Wheaton network.)*