What data structures do you know (try to use one word or CamelCase)?
What programming languages do you know (one work or CamelCase)?
Overly Ambitious Warm-Up
Terminology

https://cs.pomona.edu/classes/cs140/
Outline

Topics and Learning Objectives
• Lean how to specify a problem and an algorithm
• Learn how to conduct a proof

Exercises
• Friend Circles
Problem Specification

• **Problem**: Integer Multiplication
• **Input**: Two \( n \)-digit nonnegative integers, \( x \) and \( y \).
• **Output**: The product \( x \cdot y \)
• **Assumptions**: none

- Think of \( n \) as “large”
- If \( x \) and \( y \) are different lengths, you can consider prepending zeros
Algorithm Specification

- We will sometimes use plain English
- And sometimes we will use pseudocode (see next slides)

Multiplication Algorithm

1. Multiply \( x \) by the current least significant digit of \( y \)
   1. Multiply each digit of \( x \) and add carries as necessary
2. Repeat with all subsequent digits of \( y \), shifting the result left by one
3. Add all products
Number of Operations

Multiplication Algorithm

- We can do better than $n^2$
Proof Terminology

• Theorem: important technical statements

• Lemma: technical statement that assists with the proof of a theorem

• Corollary: statement that follows immediately from an already-proven result

• Proposition: stand-alone technical statements that are not particularly important in their own right