WHY THIS COURSE

This is a math course - math for computer science:

• Logic and formal reasoning. (How to think like a computer)
• Integers, sets, strings, graphs. (The basics of representing data)
• Finite state machines, Turing machines. (Abstract models of computation)
• Functions, Big-O, counting. (Tools for analyzing programs and code)

This is a prep course for upper-division computer science courses.
Computer science majors will learn this material sooner or later... why not now?
Several kinds of numbers:

**Natural numbers**/\( \mathbb{N} \): 1, 2, 3, 4, 5, ... (a.k.a. whole numbers)

**Integers**/\( \mathbb{Z} \): ...-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, ... (aka integers)

**Rational numbers**/\( \mathbb{Q} \): \( \frac{1}{2}, \frac{3}{4}, \frac{5}{6}, -\frac{3}{4}, \frac{8}{7}, -\frac{100}{101}, \) etc. (aka fractions)

**Real numbers**/\( \mathbb{R} \): 2, -11, \( \frac{7}{3} \), \( \sqrt{2} \), \( 7^\pi \), \( 3.\overline{3} \), \( \pi, e \), etc. (aka decimal numbers)

**Complex numbers**/\( \mathbb{C} \): \( \frac{3}{2}, 9, \pi, \sqrt{-1}, 10 + i, \sqrt{-\frac{3}{2}} \), etc. (real numbers + i)

Are there more integers than natural numbers? NO

Are there more rational numbers than integers? NO

Are there more real numbers than rational numbers? YES

Are there more complex numbers than real numbers? NO

input/output pairs: C# functions

Are there more problems than computer programs? YES
DIVISIBILITY & PRIMALITY

Let \( n, d \) be integers. Then \( d \) divides \( n \), written \( d \mid n \), provided that there exists an integer \( i \) such that \( n = di \).

Example: If \( 2 \mid n \), then \( n \) is even.

An integer \( n \) is prime provided \( n \geq 2 \) and the only positive integers that divide \( n \) are 1 and \( n \).

Example: 5 is prime since \( 2 \nmid 5 \), \( 3 \nmid 5 \), \( 4 \nmid 5 \).

An integer \( n \) is composite provided \( n \geq 2 \) and \( n \) is not prime.

Example: 9 is composite since \( 3 \nmid 9 \), \( 3 > 0 \), and \( 3 \neq 1 \), \( 3 \neq 9 \).