While people are coming in, please turn to a neighbor and introduce yourself. Get to know a little about them... potential major, hometown, class year, what's in their playlist, etc.

COSC 290 Discrete Structures

Lecture 1: Basic Math and Sets

Prof. Michael Hay
Wednesday, Aug. 30, 2017

Colgate University

Plan for today

1. Booleans, Numbers, Arithmetic

2. Formal reasoning

3. Sets

Booleans, Numbers, Arithmetic

Booleans, Numbers, Arithmetic

- Booleans = {*True*, *False*}
- Integers $\mathbb{Z}$
- Reals $\mathbb{R}$, non-negative reals $\mathbb{R}^{\geq 0}$
- Rationals $\mathbb{Q}$
- Absolute value $|x|$, floor $\lfloor x \rfloor$, ceiling $\lceil x \rceil$
- Logarithms and exponentials
- Modulus: if $x \bmod 2 = 0$, then x is...?
- Summations $\sum_{i=1}^{n} x_i$ and products $\prod_{i=1}^{n} x_i$

Pset, problem 1

DLN 2.12. Using floor, ceiling, and standard arithmetic, give an expression for a real number x rounded to the nearest integer.

DLN 2.13. Using floor, ceiling, and standard arithmetic, give an expression for a real number x rounded to the nearest 0.1.

DLN 2.61. What is the smallest positive integer n such that $n \bmod 2 = 0$, $n \bmod 3 = 0$, and $n \bmod 5 = 0$?

What is this question asking? Can you rephrase without "mod?"

Summations

Quick review of notation:

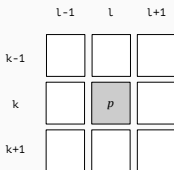$$\sum_{i=1}^{n} x_i := x_1 + x_2 + \cdots + x_n$$

Example:

$$\sum_{i=-2}^{3} i^2 = (-2)^2 + (-1)^2 + (0)^2 + 1^2 + 2^2 + 3^2$$

$$= 4 + 1 + 0 + 1 + 4 + 9$$

$$= 19$$

New problem

Suppose we want to apply a blur filter to an image. This blur filter replaces pixel p with the average of all pixels with ± 1 rows and columns of p. In this figure, pixel p is in row k and column ℓ.

Let $pix(x, y)$ be a function that takes in a row x and column y and returns the *current* pixel value at x, y. Write an expression that uses summations for the *desired* value for pixel k, ℓ.

Challenge

Generalize to $\pm w$ rows.

Formal reasoning

Modeling a short proof

(On the whiteboard) Problem 3 from the Pset.

Polling questions

Rules of the game.

- *(before class, you prepare yourself by reading the textbook and completing any problem sets)*
- I ask a question.
- You first answer it by yourself... no talking!
- Then discuss in groups of 3-4 students.
- Answer the question a second time.
- I will ask someone to answer and we will discuss.

Why?

Logistics

No lab this week.

Come to the Department "Tea" to eat lunch! This Thursday, 11:20ish.

I will post a problem set for Friday later today.

Sets

Sets

Note: we didn't get to sets today.