Announcements

Quiz today!

Midterm 2 grades released + sol'ns posted

Mean: 62.0/85
Median: 63.5/85
Std. dev.: 12.1

Q1: 72%
Q2: 89%
Q3: 97%
Q4: 87%
Q5: 65%
Q6: 48%

Gradelines:

A/A-: 67-85
B+/B/B-: 52-66
C+/C/C-: 34-51
D+/D/D-: 20-33

out of 85

Gradeline calculator updated

Regrade requests open for 1 week

Recall: An <u>equivalence relation</u> on A is a rel'n on A which is reflexive, symmetric, and transitive

Some more examples: ($A=\mathbb{Z}$)

a) $a \sim b$ if $a \mid b$ No (not symmetric)

b) $a \sim b$ if $a \leq b$ No (not symmetric)

c) $a \sim b$ if $a = b$ Yes

d) $a \sim b$ if $a-b$ is a mult. of 10 Yes

e) $a \sim b$ if $a-b$ is a mult. of 17 Yes

f) $A = \{a,b,c\}$, $R = \{(a,a),(a,b),(b,a),(b,b),(c,c)\}$ Yes

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Every equivalence reln corresponds to a set partition (and vice-versa)

Def: A set partition of A is a set of subsets $A_1, A_2, \ldots$ s.t.

$A_i \cap A_j = \emptyset$ and $A_1 \cup A_2 \cup \cdots = A$

i.e. every elt. of A is in exactly one A_i

The A_i correspond. to the equiv. classes of an equiv. reln.

equiv reln $\longleftrightarrow$ equiv. classes $\overset{\sim}{=}$ set partition

Ex 4 (cont.): $A = \{\text{binary strings}\} = \{\emptyset, 0, 1, 00, 01, \ldots\}$

$a \sim b$ if a and b have the same length

The set partition corresp. to this equiv. reln is

$A = A_0 \cup A_1 \cup \cdots$ where $A_i = \{\text{strings of length } i\}$

Ex 15: Let $A = \{\text{binary strings of length } 12\}$.

Set partition

$$\left.\begin{aligned} A_{000} &= \{\text{strings starting w/ } 000\} \\ A_{001} &= \{\text{ '' \quad '' \quad w/ } 001\} \\ &\ \vdots \\ A_{111} &= \{\text{ '' \quad '' \quad w/ } 111\} \end{aligned}\right\} \text{ set partition into 8 sets}$$

Corresp. equiv. rel'n:

$a \sim b$ if and only if a and b have the same first 3 digits

Ex 13: Let $A = A_1 \cup A_2 \cup A_3$ be a set partition with

$A_1 = \{1,2,3\}$ $A_2 = \{4,5\}$ $A_3 = \{6\}$

Class activity: Find the corresp. equiv. rel'n.

If time:

Midterm 2 #6: Using a combinatorial argument, prove the following identity:

$$\binom{n+1}{2k+1} = \sum_{j=k}^{n-k} \binom{j}{k}\binom{n-j}{k}$$