intro + counting

LECTURE 1

SYLLABUS NOTES

see syllabus for important information!

Assessments:

- per-lecture concept checks
- (almost) weekly homeworks
- midterm and final
- section participation

TODOS FOR WEEK 1

- ☐ Read the syllabus!! ☐ Watch syllabus vid
- ☐ Any accommodation requests
- ☐ Concept check 1 (due on Fri 12pm)
- ☐ Concept check 2 (due next Mon 12pm)
- ☐ Start HW1! (due next Wed 11:59pm)
- ☐ Attend/participate in section (Thurs)

COUNTING RULES + TECHNIQUES

SUM RULE

If you are choosing one thing between n options in one group and m in another group with no overlap, the total number of options is: n+m *(i.e., |A U B| = |A|+|B| if A and B don't overlap)*

Example: We are choosing between going to Delfino's (6 options) **or** Supreme (4 options) for lunch. There are _____ options in total

Used when: we have some disjoint cases, or some sets that don't overlap

PRODUCT RULE

If you have a sequential process, where step 1 has n1 options, step 2 has n2 options,...,step k has nk options, and you choose one from each step, the total possibilities is n1*n2*...*nk

Example: We are ordering coffee with 3 options for base, 2 options for preperation, 4 options for the syrup. There are _____ options in total.

Used when: we have some sequential process. Write down steps to create the outcomes, count the options in each step, and multiply it together

example: We have 5 books to split to 3 people (A, B, C). Every book goes to exactly one person, but each person could end up with no books (or all of them, or something in between).

-----APPLICATIONS/GENERALIZATIONS/EXTENSIONS OF THE PRODUCT RULE-----

K-SEQUENCES

n^k length k sequences from an alphabet of size n, with repeats allowed

e.g.,

N FACTORIAL

n! = (n)(n-1)...(1) ways to rearrange n distinct objects

e.g.,

K-PERMUTATIONS (ORDER MATTERS)

The number of k-element sequences of distinct symbols from a universe of n symbols is: P(n,k)

e.g., How many length 3 sequences are there consisting of distinct elements of $\{1,2,3,4,5\}$?

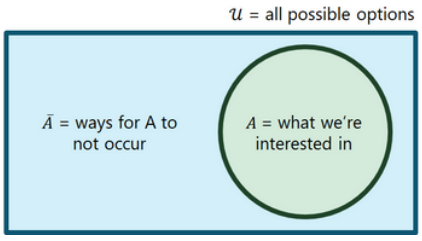
K-COMBINATIONS (ORDER DOESN'T MATTER)

The number of k-element subsets from a set of n symbols is: C(n,k)

e.g., How many subsets of 3 numbers are there consisting of distinct elements of $\{1,2,3,4,5\}$?

----------ANOTHER COUNTING TECHNIQUE----------

COMPLEMENTARY COUNTING



total options – options for A to not occur = options for A to occur

e.g.,