**see syllabus for important information!**

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

Syllabus notes

## 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., \( |A \cup B| = |A| + |B| \) 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 \( n_1 \) options, step 2 has \( n_2 \) options, …, step \( k \) has \( n_k \) options, and you choose one from each step, the total possibilities is \( n_1 \times n_2 \times \ldots \times n_k \)

Example: We are ordering coffee with 3 options for base, 2 options for preparation, 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).
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
\begin{align*}
\text{total options} - \text{options for A to not occur} &= \text{options for A to occur} \\
\end{align*}
e.g.,