

CSE 312: Foundations of Computing II

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**Date:** 6/24/30

**Lecture Topics:** 1.2 More Counting, 1.3 No More Counting Please

[Tags: CC1.2 Q5, Stars and Bars]

1. A hypothetical Meme Awards Committee is picking the "best living meme" of 2019. How many ways can they give 10 indistinguishable (wink wink) nominations to Keanu Reeves, Will Smith and Ninja, assuming they each get at least one nomination? Hint: It's a variation of Stars & Bars in that it "forces a star between each bar". Because of the condition that "they each get at least one nomination", consider giving each one nomination first before distributing the remaining 7 nominations.

[Tags: Sum Rule, Product Rule, Binomial Coefficients]

2. Suppose you have five quarters left and you want to take exactly two classes per quarter. You want to take CSE1, CSE2, ..., CSE10, but CSE1 and CSE2 must both be taken before CSE3, which must be taken before CSE4. CSE1 and CSE2 can be taken in any order, or together. The other classes can be taken any quarter, in any order, and have no prerequisites. How many different schedules can be formed (assume the two classes in a quarter are unordered)?

[Tags: PSet1 Q7, Combinatorial Proofs]

3. **Give combinatorial proofs of the following identities:**
  - a. Prove that  $\binom{n}{2} = \sum_{k=1}^{n-1} k$ .
  - b. Prove that  $2^n - 1 = \sum_{i=0}^{n-1} 2^i$ . (**Hint:** Imagine a tournament bracket)

[Tags: Complementary Counting, Inclusion-Exclusion, Multinomial Coefficients]

4. Find the number of ways to rearrange the word "INGREDIENT", such that no two identical letters are adjacent to each other (there are two E's, two N's, and two I's). For example, "INGREEDINT" is invalid because the two E's are adjacent. Repeat the question for the letters "AAAAABBB".

For more examples and solutions (S01 and S02), see

<https://courses.cs.washington.edu/courses/cse312/18sp/>.