Pre-class preparation

Please watch the following video OR read the following textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition):

- Video: Joint, marginal, conditional PMFs
- Textbook: Section 7.1 (Just part 7.1.1 on Discrete Variables; we'll do part 7.1.2 in class)

Objectives

By the end of the day's class, students should be able to do the following:

- State the definition of the joint CDF of two or more random variables.
- Calculate the joint PMF given marginal and conditional PMFs of discrete random variables, and vice verse, both explicitly as functions and using contingency tables.
- Determine whether two or more r.v.'s are independent by analyzing their joint, conditional and marginal distributions.
- Calculate the joint PDF given marginal and conditional PDFs of continuous random variables, and vice versa.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 7:45AM:

1. Suppose you know that the marginal distribution of X is Binom$(5, \frac{1}{2})$ and that the marginal distribution of Y is Binom$(10, \frac{1}{2})$. Find the joint PMF of X and Y, or explain why there is not enough information to do so.
2. Suppose that we have to discrete random variables N and K, whose joint PMF is as follows:
$$f_{N,K}(n,k) = \frac{(1-p)^n p \lambda^k}{k! e^\lambda} \qquad n, k \in \mathbb{Z}^*$$
Explain how you can immediately tell that N and K are independent without any calculation. Then determine the marginal distributions of N and K.
3. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?