Pre-class preparation

Please read the following textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition) OR watched the indicated video from Blitzstein's Math 110 YouTube channel:

- Textbook: Section 7.1 (Just part 7.1.1 on Discrete Variables)
- Video: Lecture 18: MGFs continued (from 26:00 to end)

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.
- Construct two-way tables for a pair of discrete random variables.
- Determine whether two or more r.v are independent by analyzing their joint, conditional and marginal distributions.

Reflection Questions

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

1. The textbook's definition of the marginal PMF of X is reminiscent of a certain "Law" we encountered much earlier in the course. What is the name of this law, and what is the relationship between the law and the definition of the marginal PMF?
2. Suppose you know that the marginal distribution of X is $\text{Binom}(5, \frac{1}{2})$ and that the marginal distribution of Y is $\text{Binom}(10, \frac{1}{2})$. Find the joint distribution of X and Y, or explain why there is not enough information to do so.
3. Suppose $N \sim \text{Geom}(p)$ and $K \sim \text{Poisson}(\lambda)$ and that the joint PMF for (N, K) is
$$p(n, k) = \frac{(1-p)^n p \lambda^k}{k! e^\lambda}.$$
Explain how you can immediately tell that N and K are independent without any calculation.
4. (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?