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: 4.4

- Video:

  - Lecture 10: Expectation Continued (from 30:00 to 39:00)
  - The video lecture's coverage of the Fundamental Bridge is very light. So read/skim section 4.4 in the textbook as well

Objectives

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

- Translate set-theoretic operations on events in a sample space to multiplication and addition operations on the corresponding indicator random variables.

- Explain how a counting variable can be decomposed into a sum of indicator variables.

- Apply the fundamental bridge in order to solve a wide variety of probability problems.

Reflection Questions

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

1. Consider a sequence of n Bernoulli(p) trials, which are not necessarily assumed to be independent. For $1 \leq i \leq n$, let A_i be the event that the i-th trial is a success. Define a random variable X as

$$X = \mathbf{1}_{A_1} + \mathbf{1}_{A_2} + \cdots + \mathbf{1}_{A_n},$$

where $\mathbf{1}_{A_i}$ is the indicator variable for the event A_i (the book uses the notation I_{A_i}, but I've never liked that for some reason!). In this set-up, what does the variable X represent? What is its expected value?

2. In your own words, explain why the "fundamental bridge" described in section 4.4 can be helpful in solving probability problems.

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?