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 2.7
- Video:
  - Lecture 6: Monty Hall, (start through 25:30), and
  - Lecture 7: Gambler's Ruin and Random Variables(start through 34:00)

Objectives

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

- Describe the Monty Hall problem and explain how conditioning is used to obtain the correct solution.
- Solve the Gambler's Ruin problem and other problems using *first-step analysis*.

Reflection Questions

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

1. Consider the Monty Hall problem where without loss of generality, you have chosen Door 1. Suppose that Monty actually prefers opening Door 2 more than Door 3, and if he has a choice between opening these two doors, he opens Door 2 with probability p, where $1/2 \leq p \leq 1$. All the other rules of the game remain the same.

   What is the probability of winning if we switch, given that Monty opens Door 2? Given that Monty opens Door 2, should we switch or stay?

2. Consider the branching process in Example 2.7.2. Suppose that after every second, Bobo will either die or split into two amoebas with equal probability, and in subsequent minutes all living amoebas will behave the same way, independently. (i.e. unlike Example 2.7.2, Bobo either dies or splits, but cannot stay the same). What is the probability that the amoeba population will eventually die out?

3. Suppose that a certain box A contains five balls and the other box B contains 10 balls. One of these two boxes is selected at random, and one ball from the selected box is transferred to the other. If this process is repeated indefinitely, what is the probability that box A will become empty before box B becomes empty?

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?