

I. **Pre-class material** Either read the indicated textbook sections OR watch the indicated video.

- (a) **Sections to Read** (All content from Blitzstein and Hwang's *Introduction to Probability* unless otherwise noted). A digital copy of the textbook is available for free via the authors' website.
- Read sections 2.7 (just part 2.7.2), 2.10
- (b) **Videos to Watch** (All videos from Blitzstein's Math 110 YouTube channel, unless otherwise noted)
- Lecture 7: Gambler's Ruin and Random Variables (from start to 33:00)
 - Read Section 2.10 (the video doesn't include coding discussion)

II. **Objectives** (By the end of the day's class, students should be able to do the following:)

- Solve Gambler's Ruin and other similar problems using 'first-step analysis'
- Estimate conditional probabilities using simulation
- Use simulation to model Gambler's Ruin and the Monty Hall problem

III. **Reflection Questions** (Submit answers on Gradescope <https://www.gradescope.com/courses/425901>)

- 1) Consider a new version of the Monty Hall game: Instead of 3 doors where one contains a car and 2 contain goats, there are 100 doors where one contains a car and 99 contain goats. After the player picks a door, Monty opens 98 other doors that contain goats, and asks the player if they would like to switch to the remaining door.

Write an algorithm in R that can estimate the probability that a player wins the car if they choose not to switch doors. *Your response should include your algorithm's code, as well as your estimate of the probability based on running the simulation. See Section 2.10 for a similar example.*

- 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?

IV. **Additional Feedback** Are there any topics you would like further clarification about? Do you have any additional questions based on the readings / videos? *If not, you may leave this section blank.*