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 2.1, 2.2, 2.5

   (b) **Videos to Watch** (All videos from Blitzstein's Math 110 YouTube channel, unless otherwise noted)
- Lecture 4: Conditional Probability

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

- State the set-theoretic definition of conditional probability and explain what the conditional probability of an event means in 'everyday language'
- Express particular experiments as probability models using conditional probability
- State the set-theoretic definition of independence, and explain in 'every-day language' how to determine whether two events are independent
- Solve an array of probability problems by expressing results as intersections of independence events and then factoring probabilities as products.
- Discuss the relationship between independence and conditional independence. Provide examples of events which are independent, but not conditionally independent, and vice verse.

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

   1) Suppose a coin is flipped 3 times and the sequence of H/T recorded. Let A be the event that the first flip is heads, and let B be the event that exactly 2 heads are flipped. Show that $P(A|B) \neq P(B|A)$ by computing both $P(A|B)$ and $P(B|A)$ directly. *You can assume all sequences of H/T are equally likely.*

   2) Is it possible for an event to be independent of itself? If so, when is this the case?

   3) A weather forecaster claims that the event "it rains tomorrow" is conditionally independent of the event "it rained yesterday," given the event "it rained today." Explain what this means in everyday language. Discuss why this **does not** mean that the event "it will be sunny tomorrow" is independent of the event "it was sunny yesterday."

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.*