I. **Sections to Read** (All content from Blitzstein and Hwang's *Introduction to Probability* unless otherwise noted)

- Read sections 2.5, 2.6

II. **Videos to Watch** (All videos from Blitzstein's Math 110 YouTube channel, unless otherwise noted)

- Lecture 5: Conditioning Continued, Law of Total Probability

III. **Objectives**

- 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.
- Explain why Bayes' Rule is coherent.

IV. **Quiz Questions** (Submit answers on Gradescope)

1) In everyday language, when we say that one event is independent of another, it means that knowledge of the first gives no knowledge about the second. Write down a set-theoretic equation that expresses this interpretation, and then derive this equation from the definition of independence.
2) Is it possible for an event to be independent of itself? If so, when is this the case?
3) A weather forecaster claims (with good reason) that tomorrow's weather is conditionally independent of yesterday's weather, given the weather today. Explain what this means in every-day language, to someone who doesn't necessarily know any probability. In particular, be sure to explain why this **does not** mean that tomorrow's weather is independent of yesterday's.
4) Briefly explain what is meant by the statement *Bayes' Rule is coherent.* Why is it important that Bayes' rule is coherent?