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.

- 8.3 and 8.5, along with Story 8.4.5

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

- Lecture 23: Beta Distribution (beginning to 25:00)
- Lecture 25: Order Statistics and Conditional Expectation (beginning to 24:00)

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

- State the PDF for the beta distribution with parameters a and b, and describe the shape of the distribution for various values of these parameters.
- Calculate the normalizing constant $\beta(a, b)$ in the beta distribution **without using calculus** via the 'billiard ball' story.
- Show that the Beta distribution is the conjugate prior of the binomial distribution.
- Describe the relation between the Beta and Gamma distributions.
- Compute the mean of a Beta distributed random variable.

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

1) For what values of a, b will the Beta(a, b) distribution be symmetric around $x = 0.5$?
2) In what ways is the Beta distribution a generalization of the uniform distribution on $(0, 1)$
3) In your own words, explain what it means to say that the Beta distribution is a conjugate prior to the Binomial distribution.

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.*