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.

- Sections 4.7, 4.8 and 4.11

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

- Lecture 11: Poisson Distribution
- Read section 4.11 (R coding isn't discussed in the lecture video)

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

- State the definition of a Poisson random variable both in terms of its pmf and a story model.
- Show that the expected value for a Poisson variable with parameter λ is λ.
- Describe the shape of the Poisson distribution for both small and large values of the parameter λ.
- Summarize and provide examples of the "Poisson paradigm."
- Explain how to obtain a binomial variable by conditioning on values of a Poisson variable, and conversely, explain how to obtain a Poisson variable by taking limits of binomial variables.

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

1) In the video / reading, we used the fact that the *Taylor Series* for e^x is

$$e^x = \sum_{k=0}^{\infty} \frac{x^k}{k!}.$$

To help me prepare for class, let me know the following:

i. In a previous class, have you seen this equation before?
ii. In a previous class, have you seen Taylor Series before?

2) In the 'Poisson paradigm,' we say that $X = \sum_{j=1}^{n} I_{A_j}$ is approximately Poisson distributed with rate $\lambda = \sum_{j=1}^{n} P(A_j)$, provided the events A_j are at most **weakly dependent**. However, it would not be appropriate to say X is approximately Poisson when the A_j are **highly dependent**. Explain why a collection of disjoint events would be considered **highly dependent**, and then demonstrate that the Poisson paradigm indeed fails when the A_j are all disjoint.

3) Suppose $X \sim \text{Bin}(n, p)$. In your own words, explain what is meant by the statement: "the distribution of X is *approximately* $\text{Pois}(\lambda)$ with $\lambda = np$."

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.*