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 section 4.3
- If you have not encountered infinite series in a previous math class (i.e. an expression like $\sum_{k=1}^{\infty} 2^{-k}$) or would like a review infinite series, read the following sections from the Whitman College Calculus text: `https://www.whitman.edu/mathematics/calculus_online/`
  - Section 11.1: Sequence
  - Section 11.2: Series

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

- Lecture 9: Expectation, Indicator Random Variables, Linearity (from 41:00 to end)
- Lecture 10: Expectation Continued (from 13:00 to 30:00, from 39:00 to end)
- If you have not encountered infinite series in a previous math class (i.e. an expression like $\sum_{k=1}^{\infty} 2^{-k}$) or would like a review infinite series, read the following sections from the Whitman College Calculus text: `https://www.whitman.edu/mathematics/calculus_online/`
  - Section 11.1: Sequence
  - Section 11.2: Series

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

- Explain what is meant by saying that an infinite series convergrs.
- Prove that the geometric series converges.
- Prove that the harmonic series diverges.
- State the definition of the Geometric and Negative Binomial distributions, both in terms of the pmfs and an associated story.
- Compute the expected value of the geometric and negative binomial distributions.
- Solve "coupon-collector"-style problems by expressing relevant quantities as geometric random variables.

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

1) Use properties of exponents, along with the formula for the geometric series, to show that if x is a real number with $|x| < 1$, then

$$\sum_{k=0}^{\infty} x^{2k} = \frac{1}{1-x^2}$$

2) True or false? There exists a constant C (that does not depend on n) so that

$$p(n) = \frac{C}{n} \qquad \text{for } n = 1, 2, 3, \ldots,$$

is a valid probability distribution.

3) Suppose you roll a fair 6-sided die repeatedly until you roll a 1. On average, how many times will you need to roll the die? What is the probability that you will need to roll the die more times than this number?

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.*