Pre-class preparation

Please read the following textbook sections from Blitzstein and Hwang's *Introduction to Probability* (second edition) OR watched the indicated video from Blitzstein's Math 110 YouTube channel:

- Textbook: 4.3
- Video:
  - 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 $\sum_{i=1}^{\infty} 2^{-i}$ or would like a refresher, read Sections 11.1 (sequences) and 11.2 (series) from the Whitman College Calculus text: `https://www.whitman.edu/mathematics/calculus_online/`

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 converges.
- 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.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 7:45AM:

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 $p(n) = \frac{C}{n}$ for $n = 1, 2, 3, \ldots$ is a valid probability distribution. Briefly explain why.

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?

4. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?