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

- 7.4 and 7.5

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

- Lecture 20: Multinomial and Cauchy (from 8:00 to 30:00)
- Lecture 21: Covariance and Correlation (from 33:00 to end)

III. **Objectives**

- Define the multinomial distribution via a story model and calculate the corresponding joint PMF.
- Compute the marginal and conditional distributions for the multinomial distribution, as well as the covariance of coordinates of the multinomial vector.

IV. **Quiz Questions** (Submit answers on Gradescope `https://www.gradescope.com/courses/157877`)

1) Explain why the multinomial distribution $\text{Mult}_k(n, \mathbf{p})$ reduces to the binomial distribution $\text{Bin}(n, p)$ in the case when $k = 2$ and $\mathbf{p} = (p, 1-p)$. What is the corresponding distribution when $k = 1$?
2) In your own words, explain why it isn't surprising that the covariance of components in a Multinomial vector are negatively correlated.
3) Briefly describe the difference between the *likelihood function* introduced in part (d) of example 7.4.8 and the binomial PMF.