Math 218: Combinatorics

1. (Morris Exercise 5.2.6) Prove the generalization of the Binomial Theorem called the *Multinomial Theorem* (page 44).

2. (Morris Exercise 10.1.10 #10) Suppose A is a set of 10 natural numbers between 1 and 100 (inclusive). Show that two different subset of A have the same sum. (See example and hint on page 93).

3. Suppose there are 20 people in a room and some people shake hands at the beginning of class (imagine we are in pre-COVID days). Show there always must be at least two people who have shaken hands with the same number of people.

4. Write the integers in the set $\{1, 2, \ldots, 6\}$ in a circle in any order. Prove that no matter what order we write the numbers, the sum of at least one set of three consecutive numbers is at least 11.