One goal for this course is for you to develop your skill in effectively communicating mathematics. With this in mind, you should clearly write up your solutions.

(1) In class we considered the following problem: Suppose a bag contains three white balls and two blue balls. Suppose you draw 2 balls from the bag. What is the probability that you draw one white ball and one blue ball? We solved this problem in two different ways.

(a) First Solution:

\[ P(\text{white and blue}) = P(\text{white followed by blue}) + P(\text{blue followed by white}). \]

\[ P(\text{white and blue}) = \left( \frac{3}{5} \right) \left( \frac{2}{4} \right) + \left( \frac{2}{5} \right) \left( \frac{3}{4} \right). \]

\[ P(\text{white and blue}) = \frac{12}{20} = \frac{3}{5}. \]

(b) Second Solution: Let’s label the balls: W1, W2, W3, B1, and B2. There are 3 ways to pick two white balls: W1 with W2, W2 with W3 and W1 with W3. There is 1 way to pick two blue balls: B1 with B2. There are 6 ways to pick one of each: W1 with B1, W1 with B2, W2 with B1, W2 with B2, W3 with B1, and W3 with B2. This gives us:

\[ P(\text{white and blue}) = \frac{6}{10} = \frac{3}{5}. \]

These two methods yield the same solution. Are they both correct? Can you relate one solution process to the other? Kimberly noted that we seemed to consider order in the first solution but not in the second. Can you resolve this question?

(2) (a) Clearly write our new definition of a probability function on a set.

(b) Take a look at the problems we solved in class on probabilities involving coin flips and dice rolls. Pick any problem for which we added probabilities to get a final answer. Based on the definition above, clearly explain why it was acceptable to add the probabilities.

(3) (a) How many ways are there to place 8 black rooks on a chess board, so that no rook shares a row or a column with any other rook?

(b) How many ways are there to do this if we have 4 black rooks and 4 white rooks.
(4) Suppose you pick four cards from a standard deck of 52.
   (a) What is the probability that you draw four aces?
   (b) What is the probability that you draw exactly two aces in a row?
   (c) What is the probability that you draw exactly two black cards and exactly two kings?

(5) More may be posted by 5pm on Wednesday, May 1.