

Quiz #11, Due: 11/23  
Math 181 (Discrete Structures), Fall 2022

Problem 1 is worth 4 points (2 pts each part), and Problem 2 is worth 6 points (2 pts each part), for a total of 10 points. Remember to *show your work* and *explain your answers* on all problems!

1. In a standard deck of Western playing cards, cards have two qualities:

- a *suit*: Spades, Hearts, Diamonds, or Clubs
- a *rank*: 2–10, Jack, Queen, King, or Ace

There are 4 suits and 13 ranks, for a total of  $4 \times 13 = 52$  cards. A *poker hand* consists of 5 of these 52 cards. We saw in class that there are  $C(52, 5) = 52!/(5! \cdot 47!) = 2,598,960$  different poker hands.

- (a) A poker hand is called *four of a kind* if it consists of all four cards of one rank, plus any other card. How many four of a kind hands are there?
  - (b) A poker hand is called a *full house* if it consists of three of the cards of one rank, and two of the cards of another rank. How many full house hands are there?
2. (a) How many rearrangements of the word LOLLYPOP are there?
- (b) How many rearrangements of LOLLYPOP start with a Y or end with a P (or both)?  
**Hint:** remember the Principle of Inclusion-Exclusion,  $\#(X \cup Y) = \#X + \#Y - \#(X \cap Y)$
- (c) How many rearrangements of LOLLYPOP have the two O's adjacent?  
**Hint:** to make the O's adjacent, you can treat them as a single character "OO"