Directions: You may work to solve these problems in groups, but all written work must be your own. **Show your work**; See "Guidelines and advice" on the course webpage for more information.

1. Poker hands.

   (a) A *full house* is a poker hand in which 3 cards have the same rank and the other 2 also have the same rank (e.g. 3 of hearts, 3 of spades, 3 of clubs, 7 of diamonds, 7 of clubs). How many poker hands are full houses? What are the odds of being dealt a full house from a freshly shuffled deck?

   Hint: Resist the temptation to look up the answer online. It is not allowed *and* it defeats the purpose of the question.

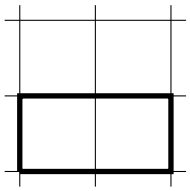
   (b) A *near flush* is a poker hand in which 4 cards belong to a single suit and the remaining card belongs to a different suit. How many poker hands are near flushes? What are the odds of being dealt a near flush from a freshly shuffled deck?

2. How many ways are there to arrange the letters of the word 'SUSPICIOUS':

   (a) with no additional restrictions?

   (b) if no two S's are consecutive?

3. How many rectangles are created when n horizontal lines intersect n vertical lines? (Note: a square is a rectangle, so squares are included.) For example, when $n = 3$, there are 9 rectangles, one of which is highlighted below:



4. Binomial theorem.

   (a) Find the coefficient of $x^6y^2z^3$ in $(2x - y + 3z)^{11}$.

   (b) Compute $\sum_{k=0}^{n} 2^k \binom{n}{k}$.

   (c) Compute $\sum_{k=0}^{n} \frac{1}{k!(n-k)!}$. Hint: recall the formula for $\binom{n}{k}$. Relate the given sum to one involving binomial coefficients.