Probability HW 1

Sample spaces

1. Draw a probability tree for the sets {python, R, SQL} and {Windows, Linux}. (Say you are working on what IT support resources will be required for each combination.) Assume “indifference” among items, and assign probabilities to each branch and leaf.
2. Consider these two events:
   a. Visited Paris
   b. Have not been to France.

   Are they E*xhaustive? Mutually exclusive?* Draw the tree to show your sample space.
3. Assume you are catering a large event and have to decide on course combinations. Your main course combinations are either vegan or non-vegan, and your deserts are either cheese cake or (presumably vegan) lemon sherbert. Draw the tree of possible menu combinations, and assign probabilities, assuming “indifference.”
   a. Why is indifference a questionable assumption for planning the numbers of each combination to order.
   b. What might be an alternative?
   c. What would the tree look like if vegans don’t eat cheesecake?

Permutations.

1. How many ways are there to select 4 cards from a 52 card deck? What if the deck has only 13 cards? How do the counts change if we don’t care what the order of the cards selected is?
2. Find *n* that makes this expression true: ${}_{n+1}P_3 =_n P_4$

Binomial coefficients

1. Compute the $\binom{n}{k}$ for $n = 0 \ldots 10, 0 \leq k \leq n$ to create “Pascal’s Triangle.” Plot the values of $\binom{n}{k}$ for each value of *n.* (The look something like distributions.)
2. Sasha has to compute the number of ways to pick subsets of all-but-one day of the year from a year of 365 days, but discovers that his computer fails to compute *365!* Find him a workable solution.
3. Complete the proof of $\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$ that we started in class. (Hint - use $n(n-1)! = n!$)