6. In a recent small survey of airline passengers, 27 said they had flown American in the last year, 20 had flown Jet Blue, and 29 had flown Continental. Of those, 13 reported they had flown on American and Jet Blue, 10 had flown on Jet Blue and Continental, and 11 had flown on American and Continental. 6 passengers had flown on all three airlines.

How many passengers were surveyed? (Assume the results above make up the entire survey.)

7. Recall, by 10-bit strings, we mean strings of binary digits, of length 10.

a. How many 10-bit strings are there total?

b. How many 10-bit strings have weight 5?

c. How many subsets of the set {1,2,3,4,5,6,7,8,9,10} contain exactly 5 elements?

8. What is the coefficient of x^{10} in the expansion of $(x+3)^{15} + x^3(x+5)^{21}$?

9. How many 10-letter words contain exactly 3 vowels? (For example, an 8-letter word with 5 vowels is "aaioobtt"; don't consider "y" a vowel for this exercise.)

What if repeated letters were not allowed?

10. For each of the following, find the number of shortest lattice paths from $(4,4)$ to $(10,10)$ which:

a. pass through the point $(6,5)$.

b. avoid (do not pass through) the point $(9,9)$.

c. either pass through $(6,5)$ or $(9,9)$ (or both).

11. You live in Grid-Town on the corner of 2nd and 4th, and work in a building on the corner of 17th and 20th. How many routes are there which take you from home to work and then back home, but by a different route?

12. How many 11-bit strings start with 101 or end with 10 or both?

13. How many 15-bit strings of weight 5 start with 101 or end with 10 or both?

14. We are making 5-letter words from the set of letters $a, b, c, d, e, f \ldots$, in such a way that we have exactly the first 5 letters available so that we use all letters.

a. How many 5-letter words can we make from the letters without repeats that do not contain the sub-word "bad" in consecutive letters?

a. How many words don't contain the subword "bad" in not-necessarily-consecutive letters (but in order)?

15. Explain using lattice paths why $\sum_{k=0}^{n} \binom{n}{k} = 2^n$.

16. Suppose you have 16 one-dollar bills to give out as prizes to your top 6 discrete math students. How many ways can you do this if:

a. Each of the 6 students gets at least 1 dollar?