Combinatorics Review: Practice Problems

January 2023

1. A total of 36 students plan to take at least one of *Discrete Mathematics*, *Algebra* and *Calculus* during the coming semester:

   - *Discrete Mathematics*: 23
   - *Algebra*: 19
   - *Calculus*: 18
   - *Discrete Mathematics* & *Algebra*: 7
   - *Discrete Mathematics* & *Calculus*: 9
   - *Algebra* & *Calculus*: 11

   (a) How many students plan to take *all three* courses?

   (b) How many students plan to take *exactly one* of the courses?

2. Each entry of a string is an element of the set $S = \{0, 1, 2\}$. How many such strings of length 6 are there that begin with 022 *or* end with 01?

3. How many subsets does a set of n elements have?

4. How many shuffles are there of a deck of cards, such that ace of hearts is *not* directly on top of king of hearts, ***and*** ace of spades is *not* directly on top of king of spades? A standard deck contains 52 cards.

5. A total of six freshmen, five sophomores and four juniors have volunteered to serve on a four-person committee. How many such committees are possible if at least one freshman, one sophomore and one junior must serve on the committee?

6. You go to a doughnut store to by a box of eight doughnuts. The store has five varieties available. How many ways are there for to fill your box?