Time and Location: Wednesday, December 12, 3:30 pm, in our usual classroom. Plan on three hours for the exam.

My intention for the final exam is that you are given an opportunity to demonstrate your understanding of the main ideas and techniques of the course. This course has emphasized problem-solving methods much more so than theorems. So for the exam, you should expect problems that test your ability to apply these methods. Of course a timed exam is very different than a homework set that you have a week or more to complete, so I’m planning on 4–5 questions that test your understanding of the objects we’ve studied, and your ability to apply the methods to straightforward problems similar to those we’ve done in class or in homework. There is no need to memorize the list of known generating functions (from §2.1), I will provide it if necessary.

I’ve provided a list of objects and methods below. This isn’t meant to be exhaustive, although I’ve tried to be fairly complete. If you notice something missing that was an important element of the class, please let me know and I’ll add it to the list.

Objects:
- binomial and multinomial coefficients
- set partitions and Stirling numbers of the second kind
- number partitions and partition numbers \( p(n) \) and its various restrictions
- formal series and generating functions
- permutations

Methods:
- Basic counting of sets using the multiplication rule, sum rule, difference rule, and binomial or multinomial coefficients
- Giving a combinatorial argument for an identity involving binomial coefficients
- Giving a bijective proof that two sets have the same size (e.g. partition identities)
- Counting a union of overlapping sets using the general inclusion-exclusion principle (also counting the number of objects with exactly \( p \) properties)
- Solving recurrences using generating functions
- Evaluating sums using generating functions
- Computing the composition of exponential generating functions using the composition formula (and its corollary, the exponential formula)
- Proving partition identities by showing equality of generating functions or by using the Jacobi Triple Product formula
- Counting the number of inequivalent colorings of a set using the Burnside-Frobenius Lemma and the Pólya-Redfield Theorem