

Counting Principles

Course Syllabus

Instructor: Andrew Spieker

Course Time/Place: Every Sunday from 1:30 to 3:00 in Room 4-257

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Course Description: Why take a course in Counting Principles? Well, the best way to see why is by example; here is a list of just a few of the types of questions we'll be able to answer in this course:

- How many ways can you arrange four boxes labeled 1 through 4 such that none of them are in their original position?
- How many cards do you need to select out of a deck before you're guaranteed to have chosen at least one spades and one clubs?
- How many ways can you distribute 5 pears, 7 bananas, and 4 apples to three children so that each child has at least two pieces of fruit?
- How many ways can you arrange 3 red books and 8 blue books so that no two red books are adjacent?

What's really nice is that these questions could be comprehended by pretty much anyone. The solutions to these problems though, are not done by physically **counting out** the number of solutions, but rather they are based off of counting **principles** which make the answers very easy to find.

Below is a tentative schedule; we may speed up or slow down as necessary. It's not important to get through all of the material. Changes will be announced in class.

Week 1 An Introduction to Counting, Some Basic Principles

Week 2 Permutations, Combinations

Week 3 Graph Theory and Elementary Topology

Week 4 The Pigeonhole Principle

Week 5 Permutations and Combinations of Multisets

Week 6 The Inclusion-Exclusion Principle

Week 7 Derangements, and then JEOPARDY WEEK!!

Week 8 Elementary Group Theory and Abstract Algebra

Attendance: You will find that this course is cumulative in nature. Please try your best to show up for every class, and on time. The group that you work in will rely on everybody being here regularly. Also, if you know you're going to miss a class, please let me know in advance.

Problem Sets: Each week, I will assign a problem set. No, they will not be collected and graded, but you will see the benefit in doing them. The classes

will run a lot smoother when you've spent some time outside of class working on the material. The problem sets should take between twenty and forty minutes; spaced out over seven days, you'll find that that's not that much. They are structured into the "generic problems" session that everybody will be assigned, and the "group-specific" problems, which we will find out more about in just a second.

Group Work: On the first day of class, we will divide the into three groups, and each group will come up with a team name. This is why the problem sets are important to do, because each week one member of your group will come up and explain the solution to their "group specific" problem. The better your answer is, the more points your group will earn towards a prize (to be determined) at the end of semester! Group-specific problems may vary in difficulty from group to group and from week to week, but the difficulty will even out altogether.