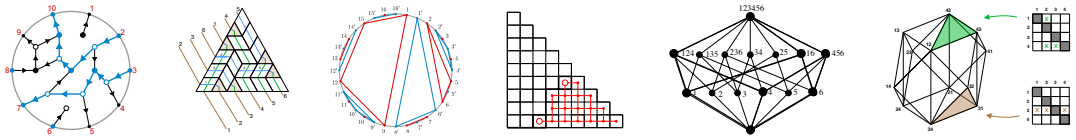

# enumerative combinatorics

san francisco state university . universidad de los andes federico ardila m.

**The course.** We will study some of the fundamental combinatorial structures that appear in most fields of mathematics. We will address the questions: Does an object with certain properties exist? If so, what structure does such an object have? How many such objects are there?
Enumerative combinatorics is about counting. We will study the main unifying principles, tools, and techniques behind counting. However, enumerative combinatorics is not only about counting. We will learn a basic fact: to count objects, we usually need to understand them first. Accordingly, the underlying discrete structure of mathematical objects will be one of our main concerns.

**Topics.** Objects: sets, permutations, partitions, compositions, trees, posets, polytopes, etc.
Methods: Bijections, generating functions, Möbius inversion, algebraic and topological methods.

**Instructor.** Federico Ardila `federico@sfsu.edu` TH 927 1.415.338.7720 Skype: `sfsu.colombia`

**Logistics.** This class is part of the SFSU-Colombia Combinatorics Initiative, a teaching and research collaboration between SFSU and Los Andes, with participants from UC Berkeley and other sites. The course will be offered jointly at both locations; most lectures will take place at SFSU, and videos will be broadcast at Los Andes and freely available online. Students will have the opportunity to discuss the course material and assignments in an internet forum.
Homework. During the first half of the course there will be biweekly assignments. These will range from fairly routine exercises to challenging problems. Working in groups is highly encouraged.
Project. In the second half, students will write a final project in pairs. International groups are encouraged. The project is a chance to go much deeper into a topic of your choice. It could be an expository paper summarizing an aspect of enumerative combinatorics, the beginning of an original research project, or (why not?) the solution to an open problem in the field. This may be a good opportunity to find a thesis topic. I will suggest numerous possible projects.
Language. The class will be taught in English. (Ustedes entenderán...) You may write your assignments in English (even if your English isn't great but you want to practice) or in Spanish.

**Textbook.** I will provide lecture notes. The books, which are not required, are:
• Richard Stanley. *Enumerative Combinatorics, Vol. 1* (2nd edition) and *Vol. 2*.

**Course website.** `http://math.sfsu.edu/federico/ec.html`
You are expected to visit this website often, and participate actively on the online discussion forum. There you will find the homework, suggested projects, lecture notes, and videos.

**Meetings.** sf: Tue, Thu 2:10 – 3:25. col: Mié, Vie 11:30–12:50. web: anytime.

**Prerequisites.** You must be prepared to devote at least 10 hours a week on this class. The formal prerequisites are Math 301 and 335 (SFSU) or Estructural (Los Andes) or equivalent.

**Grading and tentative due dates.**
• 40% main homework (due Sep. 6, Sep 20, Oct. 4, Oct. 18)
• 10% light homework (in Nov. and Dec.)
• 10% project proposal (due Nov. 1)
• 40% final project (due Dec. 14)
Extra credit:
• 10% in the final grade for active participation in online forum.
• 10% in the project grade for teams of a col and an sf student.