

**MATHEMATICS 3170**  
**FALL 2015**  
**INTRODUCTION TO COMBINATORICS**

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WHAT YOU NEED TO KNOW

- (1) This course is about *enumeration* (counting things) and *graph theory* (math of networks).
- (2) I expect you to be strong on the Math 2001 background, particularly *methods of proof*, including induction, combinatorial proof, and the pigeonhole principle.
- (3) Assessment will be via in-class quizzes, homeworks and final exam.
- (4) There will be daily homework tasks (ungraded), which are essential (online schedule).
- (5) In-class time will be spent on lecture and sometimes groupwork.

GRADING

- In-class quizzes (best 5 of 7): 35%
- Homeworks (best 5 of 7): 35%
- Final exam: 40%

Each week (except the first) will alternate between a homework problem *or* an in-class quiz. The homework problems will be longer proofs, graded in detail for the quality of the exposition and logical reasoning (rubric detailed below). The quizzes will involve short and medium answer problems that test mastery of course content. The final exam will test both.

WORKING AT HOME

Online schedule:

<http://math.colorado.edu/~kstange/3170-Fall12015.html>

**You will be assigned home learning tasks between each lecture.** These tasks are not for a grade, but *if you are not doing them, you will not succeed*. They prepare you for the assessed work.

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*Date:* Last revised: August 21, 2015.

The Boulder Faculty Assembly at the university has made a motion (BFA-X-M-9-0105) which specifies that “**An undergraduate student should expect to spend approximately 3 hours per week outside of class for each credit hour earned.**” I will try to respect this workload.

FINAL EXAM

**Final Exam:** Thursday, December 17th, 4:30 – 7 pm.

MATERIALS

**Textbook.** *A Walk Through Combinatorics*, 3rd Edition, Miklós Bóna.

**Clicker or Calculator is not required.**

DOING MATH: INTERACTING AND FINDING HELP

**Virtual Office Hours:** You may email math and course questions to [kstange@math.colorado.edu](mailto:kstange@math.colorado.edu).

Questions of interest to your classmates will be anonymized and answered by the instructor on D2L, for the benefit of all students, unless you request otherwise.

**Instructor’s Office Hours:**

- **Regular Office Hours:** TBA, 2 hrs per week.
- **Floating Office Hour:** For students who cannot make the regular office hours, I will announce an extra office hour fitting the schedule of those that ask; this hour may change each week and will be posted online and open to all.
- **Private Office Hour:** You can always make a private appointment. This is only for private matters.

**Discussion Boards.** Are available on D2L, where you can write in LaTeX (math symbols; click ‘Advanced’ and investigate the editors). I **strongly** recommend discussion of any questions you may have.

**Study Groups.** Please take a moment now, while reading this syllabus, to get the names and contact info of the people nearest you in the class. It will be to your advantage to locate those in your dorm and hold study sessions.

Name	Contact Info
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## CHEATING

**If you fail to follow the rules below, you are in violation of the Honor Code of the University of Colorado. Failure to comply may result in a course grade of zero.**

- (1) **No aids during tests.** During tests, you may not use any resources besides your brain and your pencil. No phones, no books, no internet, no nothing.
- (2) **Original work.** When handing in written work, the exposition must be entirely your own. You may not hand in work copied from any source, in part or in whole.
- (3) **Cite resources.** If you used *any* resources while creating your written work, such as hints from classmates, collaboration with others, books or internet sources, you must cite them exactly (names, urls, how they helped). If you used no resources whatsoever, state this.

## MISSED OR LATE WORK

Missing the final exam is a major problem and will be addressed via university policies.

Missing homeworks and quizzes is at your discretion, but I appreciate notification, and there will be no make-ups. Two of each will be dropped, which is plenty to allow for unexpected illnesses etc. If you are missing more than that, you are in jeopardy of not being able to adequately prepare the material, and should consult me immediately.

## SPECIAL REQUESTS

I am happy to accommodate disabilities or religious observances, or a request that I address you with a different name or pronoun than my roster indicates. Please contact me as soon as possible.

It's possible you suffer from math anxiety. Although fear of math is like fear of chocolate, even mathematicians can suffer from it! Please come talk to me.

## UNIVERSITY POLICIES

Please see the course website for University Policies concerning such matters as religious holidays, the Honour Code, harassment, etc.

## MATHEMATICAL THINKING AND COMMUNICATING SKILLS

Besides the content, a principle goal of the course is to increase your mathematical communication and reasoning skills.

The basic skills are:

- (1) Reading
- (2) Writing
- (3) Reasoning
- (4) Synthesis

Each breaks into a variety of more specific skills. These lists may grow as needed.

**0.1. Reading.** This is the art of reading mathematics **for understanding**.

- (1) Create an example and counterexample when reading a definition.
- (2) Create an example satisfying a statement.
- (3) Create a counterexample to a statement (if one exists).
- (4) Test the loosening or tightening of a hypothesis in a statement.
- (5) Identify a misunderstanding or trace an argument by use of examples.
- (6) Identify and verify the required hypotheses for a logical step.
- (7) Locate logical errors.
- (8) Pinpoint misunderstanding.

**0.2. Writing.** This is the art of writing mathematics **for an audience**.

- (1) Complete and simple sentences, appropriately sized.
- (2) Do not include extraneous information.
- (3) Keep structure in line with logical steps.
- (4) State assumptions.
- (5) Introduce variables appropriately.
- (6) Guide the reader.
- (7) Choose notation to maximize clarity.
- (8) Identify the use of hypotheses.
- (9) Keep structure organized on the page and legible.
- (10) Precision over vagueness.
- (11) Honesty about logical gaps or imprecision.
- (12) Value simplicity.
- (13) Observe the established culture/etiquette.
- (14) Do multiple drafts as needed.

**0.3. Logical Reasoning.** This is the art of correct and logical reasoning from hypothesis to conclusion. It includes the ability to diagnose problems in the logical arguments of others.

- (1) Justify logical steps.
- (2) Choose appropriately sized logical steps.
- (3) Identify logical holes in an/your argument precisely.
- (4) Identify hidden assumptions.

- (5) Choose the fastest or clearest route.
- (6) Do not include extraneous reasoning.
- (7) Avoid arithmetic errors.
- (8) Correct use of contrapositive or contradiction.
- (9) Do not forget cases.

0.4. **Synthesis.** This is the art of combining, extending and adapting previous experience to novel problems.

- (1) Combine two methods in sequence.
- (2) Work with a novel definition in terms of known definitions.
- (3) Invent a new method by analogy to an old one.
- (4) Adjust a method to a new context.
- (5) Draw conclusions from the combination of known statements.
- (6) Choose appropriate concepts for a given context.
- (7) Recognize a known mathematical structure in a new context.