

MATH 4985/5653 Special Topics in Mathematics

Problem Solving : Counting and Combinatorics

Spring 2017

Credits: 3

Instructor: Dr. Kwang Shin

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Online Office hours: TR: 3-4:30pm.

Or you can visit my office at Boyd 311 during TR (10:45 am –12:30 pm) and TR (1:45 pm – 3:00 pm) or by appointment.

Textbook: We will not have any official textbook. I will send out the material we need or give you online links.

References: How to solve it: A new aspect of mathematical methods by George Polya and John Conway. The art of Problem Solving, Vol. 1 and 2 by Sandor Lehoczky and Richard Rusczyk.

Course Description: This is the first problem solving course in the area of counting and combinatorics. It is to expose students to middle and high school mathematics contest problems and to help them discover efficient problem solving strategies in counting. After they learn the basic results and tools in a particular topic in number theory, they are invited to solve typical problems, where hints will be provided by the instructor as needs be. Students will gradually be introduced to various classical problems.

Plans: Choose a set of problems with appropriate difficulty and with common themes in counting and combinatorics from Math Counts, AMC 8, AMC 10/12, AIME, and IMO problems. Students will try the problems individually, then discuss them online, where they present and exchange their ideas. After general results are introduced, students apply them to different set of problems within the same topic. By the end, student should be able to combine several concepts to build new tools that help solve more difficult problems.

Course Objectives: Expose students to the mathematical concepts required for solving math contest problems by studying and discussing a wide range of competition problems in counting and combinatorics.

1. Provide problem solving strategies such as using formulas, drawing sketches, writing equations, using tables, charts, organized lists and tree diagrams, working backwards, simplifying the problem, finding patterns and using elimination.
2. Communicate key ideas in coaching students for math competitions.

3. Organize and create new tools to solve problems.
4. Learn and master techniques to solve contest problems in AMC8, AMC 10/12, and Math Counts. Attempt to solve contest problems from IMO (International Mathematical Olympiad).

Topics:

1. Fundamentals of counting
2. Counting and probability
3. Pigeonhole principle
4. Sequences and series
5. Proofs by Induction
6. Number theory

Learning Outcomes: The students are expected to

1. gain and improve their skills in problem solving,
2. reduce and simplify complex system
3. acquire practical knowledge of a wide range of mathematical techniques,
4. learn to communicate mathematical ideas both orally and in writing,
5. be able to coach middle and high school students for math competitions.
6. be able to solve Math contest problems from AMC 8, AMC 10/12, and Math Counts.

Grading: Grades will be based on accuracy and simplicity of their solution, taking into account speed. Homework and assignments 65%, Tests 35%.

A=90%, B=80%, C=70%, D=55%

Homework: Homework will have different time limits. It will vary from one to 4 days. Partial credit will be considered for incomplete work. **However, late submission will receive reduced point.**

One or less than one day late including weekend days: 30% off

Three or Less than three days late: 50% off

More than three days late: no credit.

Tests: We will have 3 tests (5% each, Feb 8, Mar 15, Apr 21) and one final (20%).

ACADEMIC SUPPORT

Accessibility Services: Students with a documented disability may work with UWG Accessibility Services to receive essential services specific to their disability. All entitlements to accommodations are

based on documentation and USG Board of Regents standards. If a student needs course adaptations or accommodations because of a disability or chronic illness, or if he/she needs to make special arrangements in case the building must be evacuated, the student should notify his/her instructor in writing and provide a copy of his/her Student Accommodations Report (SAR), which is available only from Accessibility Services. Faculty cannot offer accommodations without timely receipt of the SAR; further, no retroactive accommodations will be given. For more information, please contact Accessibility Services.

University Writing Center: The [University Writing Center](#) assists students with all areas of the writing process. For more information, contact them: 678-839-6513 or writing@westga.edu

HONOR CODE

At the University of West Georgia, we believe that academic and personal integrity are based upon honesty, trust, fairness, respect, and responsibility. Students at West Georgia assume responsibility for upholding the honor code. West Georgia students pledge to refrain from engaging in acts that do not maintain academic and personal integrity. These include, but are not limited to, plagiarism, cheating, fabrication, aid of academic dishonesty, lying, bribery or threats, and stealing.

The University of West Georgia maintains and monitors a confidential Academic Dishonesty Tracking System. This database collects and reports patterns of repeated student violations across all the Colleges, the Ingram Library, and the School of Nursing. Each incidence of academic dishonesty is subject to review and consideration by the instructor, and is subject to a range of academic penalties including, but not limited to, failing the assignment and/or failing the course. Student conduct sanctions range from verbal warning to suspension or expulsion depending on the magnitude of the offense and/or number of offenses. The incident becomes part of the student's conduct record at UWG.

Additionally, the student is responsible for safeguarding his/her computer account. The student's account and network connection are for his/her individual use. A computer account is to be used only by the person to whom it has been issued. The student is responsible for all actions originating through his/her account or network connection. Students must not impersonate others or misrepresent or conceal their identities in electronic messages and actions. For more information on the University of West Georgia Honor Code, please see the Student Handbook.

UWG EMAIL POLICY

University of West Georgia students are provided a MyUWG e-mail account. The University considers this account to be an official means of communication between the University and the student. The purpose of the official use of the student e-mail account is to provide an effective means of communicating important university related information to UWG students in a timely manner. It is the student's responsibility to check his or her email.

CREDIT HOUR POLICY

The University of West Georgia grants one semester hour of credit for work equivalent to a minimum of one hour (50 minutes) of in-class or other direct faculty instruction AND two hours of student work outside of class per week for approximately fifteen weeks. For each course, the course syllabus will document the amount of in-class (or other direct faculty instruction) and out-of-class work required to earn the credit hour(s) assigned to the course. Out-of-class work will include all forms of credit-bearing activ-

ity, including but not limited to assignments, readings, observations, and musical practice. Where available, the university grants academic credit for students who verify via competency-based testing, that they have accomplished the learning outcomes associated with a course that would normally meet the requirements outlined above (e.g. AP credit, CLEP, and departmental exams).