

1. General Information

Instructor: Dr. Jeong-Hyun Kang

Course Website: <https://sites.google.com/a/westga.edu/math-5653/> (This is NOT CourseDen but through my UWG website.)

Alternatively, you can find a link to the course web from my UWG webpage <https://www.westga.edu/~jkang/> that can be found by Google search or in a natural way: UWG Math department homepage → Faculty and Staff list (under About Us) → Jeong-Hyun Kang; you can find a link to my UWG website.

E-mail Address: jkang@westga.edu (*Best way to contact me!*)

Office: Boyd 328

Office Hours: Tue 10:30-11 & 2-3:30; Thur 10:45-11 & 2-3:30; Fri 10:45--11 & 1-2

Online office hours: Tue 2-3:30; Thur 2-3:30. You can expect almost immediate response from me during these online office hours. I will let you know in advance if I am temporarily unavailable during those hours.

Textbook: We will not have any official textbook. The necessary material will be uploaded on the Course Website.

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. The students will learn the basic results and tools in combinatorics and number theory, then are invited to solve typical problems. The hints will be provided by the instructor as needs be. Students will gradually be introduced to various classical 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.

- 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.
- Communicate key ideas in coaching students for math competitions.
- Organize and create new tools to solve problems.
- 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. Fundamentals of counting and combinatorics. Pigeonhole principle. Proofs vs. Non-proofs. Mathematical induction. Number theory. Complex Numbers.

Learning outcomes: The students are expected to

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

2. Class Structure

Twice a week, at night on Tue, & Thur., a lecture note will be uploaded on the course website. Every lecture note will include basic concepts of the material of the day, theorems, exercises, problems, and problem solving techniques at aim. Among these, you are expected to submit most of the solutions of exercises and problems (and, sometimes, proofs of theorems) by a certain time.

Online Lecture / Exercises: Considering it's a problem solving online course, the lecture will be comprised mainly in the format of "Exercises". Though these exercises are meant to be easy or not-so-difficult, I understand the same exercise could be *easy* for one person and could be a really *hard* problem for another; something may be beyond the knowledge of the reader *early* in the semester, while *later* it may turn out to be a piece of cake.

To ensure you follow the lecture in a timely manner, you should submit these exercises, as many as possible, by **9pm of the next new-lecture-note-date** that shall be Tue. or Thur. The due dates will be specified upon each assignment. **No late submission will be accepted** by all means as the solutions will be posted along with the new lecture note.

(Real) Problems / Homework: The questions labeled by "problem" will be of two types:

(i) "*Problem*" indicates fair homework questions for this course, yet require more effort than "Exercise";

(ii) "*Problem ♣*(with clubsuit)" is an open question or one that requires extra knowledge, therefore counts with much more weight than regular problems.

The regular "**Problem**" **will be due, typically in a couple of weeks. Late submission will be accepted with reduced rate as follows:** 100% of your score if submitted by the due date; 90% if one week late; 70% if two weeks late; 50% if submitted by the end of the semester.

The **due date for the challenging "Problem ♣(with clubsuit)" will be announced as lecture goes.**

Problem Solving Technique (PST✓(check mark)): The problem solving techniques, indicated by PST✓, are appearing throughout the lecture. Although all lectures in this course are based on basic knowledge from middle and high school, and are, therefore, accessible to a wide range of ages and mathematical backgrounds, to do the exercises, you need to develop problem solving techniques (PTS's), and will also need to learn how to *fit together various mathematical parts* in order to move forward in the solutions.

In fact, **reading PST's stated after your Exercise or Problem could work as big hints for you to work on the questions!**

Discussion: When exercises or problems are posted, you think it over each question by yourself for a couple of hours. I will make an email thread for each question so that the class can discuss each other. I will consider giving extra credits, at my discretion, to those who will make the discussion lively and meaningful contributions to it.

Muddying your hands. Do not expect each session to be a collection of clearly spelled out recipes leading to instantaneous solutions..... Nope! *"The best way to learn is to learn from your own mistakes,"* said one. And so, it will be you, each student, who has to commit to mastering the new math theories and techniques by

- "Muddying you hands" in your problems,
- Going back and reviewing necessary PST's and theory, and
- Persistently moving forward in the semester

3. Grading Policy

Submission of Exercises and Problems/Homework:

- Submit an electronic file through an email. It can be typed (preferable) or handwriting and scanned. Either way, your solution should be clearly legible.
- **Your arguments of the solutions and proofs are expected to be logical presented at math graduate level.** Scribbled ideas or a final answer without showing procedure won't earn any credit.

Posting your grades: Your scores will posted in "your 5653 folder".

Grading scale:

- Exercises 100 points; The Exercises total may be scaled to 100 points if necessary at the end of the semester.
- Problems 100 points; The Problems total may be scaled to 100 points if necessary at the end of the semester.
- Problem ♣ and Discussion participation: Extra credit points at my discretion.
- 200 points total: $\geq 80\%$ (i.e. 160 pts) A; $\geq 65\%$ (130 pts) B; $\geq 50\%$ (100 pts) C; $\geq 40\%$ (80 pts) D; below 40% F

4. 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

5. University Policies

Please carefully review the following information at

<https://www.westga.edu/UWGSyllabusPolicies/> or

<https://www.westga.edu/administration/vpaa/common-language-course-syllabi.php>.

It contains important material pertaining to your rights and responsibilities in this class. Because these statements are updated as federal, state, university, and accreditation standards change, you should review the information each semester.

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 activity, 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).