

Math4All: Exploring Geometry

Course Description:

Dive into the exciting world of competition and olympiad geometry with this engaging and comprehensive course designed for students interested in learning geometric concepts applicable to the AMC, AIME, and even USAMO. This intermediate course offers a unique blend of foundational concepts and challenging topics to cater to students with varying levels of proficiency in geometry. In fact, this is not a standard geometry class, but rather one that will take a deep dive in much of the modern geometry developed by Steiner and Gergonne in the 18th century, in Coxeter's *Geometry Revisited*, and in Evan Chen's *E.G.M.O.*

Throughout the course, students will:

- Develop a strong foundation in geometric principles.
- Enhance their problem-solving skills by tackling a wide range of hard geometry problems, emphasizing critical thinking, creativity, and efficient approaches.
- Learn essential geometric theorems to build a toolbox of techniques for solving advanced competition problems.

Topics that may be covered include special triangle points, pedal triangles, power of a point with respect to a circle and other conics, reflections, inversion, affine and vector geometry, the nine-point-circle, polar involution, and possibly even projective and incidence geometry.

Additional topics may be covered upon student request (though try to request things a couple weeks in advance so I can prepare a lesson).

A great "textbook" for this course would be *Geometry Revisited* by Coxeter, pdfs of it are readily available online. I highly recommend everyone who takes this course to look at this book.

A highly tentative schedule for this class is as such:

Class 1: Triangle Special Points Review

Class 2: Pedal Triangles

Class 3: Nine-Point Circle and its Properties

Class 4: Nagel and Gergonne

Class 5: PoP on any Conic + Radical Axis

Class 6: Clines, Reflections, Inversions

Class 7: Ptolemy's Inequality

Class 8: Pole and Polar Involution

Class 9: Affine Geometry Intro

Class 10: Ceva and Menelaus (without Bary-Bash)

Class 11: Vectors

Class 12: Incidence Geometry and Projective

Note that some weeks might have multiple classes.