OM015: Honors Geometry

Course Description
The OHS Honors Geometry course will cover plane geometry with an emphasis on constructing logical arguments/proofs and solving computational, real-life problems.

Textbooks and Recommended Reading

Required:
Geometry,
by Ray C. Jurgensen, Richard G. Brown, and John W. Jurgensen.
Publisher: Houghton Mifflin McDougal Littell.

Recommended:
Geometry for Challenge and Enjoyment,
by Richard Rhoad, George Milauskas, and Robert Whipple.
Publisher: Houghton Mifflin McDougal Littell.

Introduction to Geometry,
by Richard Ruscyzk.
Publisher: AOPS Inc, 2007.

Additional material and handouts will be posted on the e-college webpage.

Course Topics
Honors Geometry requires that students master the following specific topics:

- Basic definitions and facts (points, lines, rays, segments, and angles; angles around one point, vertical angles; units for angles and perpendicular lines; using the Geometer's Sketchpad).
- Parallel lines and applications (the sum of the angles in a triangle and extensions to general polygons).
- Congruent triangles (SSS, SAS, ASA, and AAS Theorems; isosceles and equilateral triangles).
- Quadrilaterals and special quadrilaterals (parallelograms, rhombi, rectangles, squares, and trapezoids).
- Similar triangles and polygons (AA, SAS, SSS Similarity theorems and applications)
- Right triangles (the Pythagorean Theorem and special right triangles; introduction to trigonometry and applications to solving real-life problems).
- Special parts of a triangle (perpendicular bisectors, angle bisectors, medians, and altitudes; concurrency results; the Angle Bisector Theorem, Ceva’s Theorem, and Menelaus’s Theorem).
- Circles (tangents, arcs, chords, central and inscribed angles, angles made by two intersecting chords, power of a point; inscribed and circumscribed quadrilaterals; length of an arc).
- Area of plane figures (rectangles, triangles, parallelograms, rhombi, trapezoids, circles and circular sectors; funky areas (circular segments, lunes, etc.); Heron’s formula).
• Regular polygons.
• Geometric inequalities (relationships between angles and their opposing sides in a triangle; the triangle inequality; Hinge Theorem).
• Introduction to Analytic Geometry (the distance and midpoint formulas, equations of lines; applications).
• Special topics (Ptolemy’s Theorem, Stewart’s Theorem, Euler’s line, etc).

Learning Objectives

Upon completion of Honors Geometry, students will demonstrate proficiency in:
• Applying techniques related to the above topics to solve problems.
• Understanding the nature of rigorous logical thinking and applying this knowledge in writing correct and concise geometry proofs.
• Expressing mathematics clearly, in both written and oral communication.
• Working creatively toward solutions to novel problems.
• Synthesizing methods of dynamic geometry, computational geometry, and deductive geometry to gain maximal understanding of geometric concepts.