

## Geometry Honors

5 credits - Level: Honors

Grades: 9-10

Prerequisite: Minimum grade of A with no more than one B in all four marking periods in 8<sup>th</sup> grade Algebra I or minimum grade of 80 in Algebra I Honors (or a minimum of 90 in Algebra I Level I)

Geometry Honors serves the most able and motivated members of the student body. The course assumes that the student has a strong knowledge of the curriculum of Algebra I, as well as of mathematics concepts in general. Students will be taught the language and logic of this ancient and fascinating mathematical discipline.

### PROFICIENCIES

#### POINTS, LINES, PLANES AND ANGLES

- use the undefined terms point, line and plane
- draw representations of points, lines and planes
- add segments and rays
- define and use geometric terms
- state and use segment addition and angle addition postulates
- use postulates and theorems relating to points, lines and planes

#### DEDUCTIVE REASONING

- state the hypothesis and conclusion of an if-then statement
- state the converse of an if-then statement
- use a counterexample to disprove an if-then statement
- use properties from algebra and properties of congruence in proofs
- use the Midpoint Theorem and the Angle Bisector theorem
- apply definitions of complementary and supplementary angles
- state and use the theorem about vertical angles
- apply the definition and theorems about perpendicular lines
- state and apply the theorems about angles supplementary to, or complementary to, congruent angles
- plan and write a proof in two-column form

#### PARALLEL LINES AND PLANES

- differentiate between intersecting, parallel and skew lines
- identify the angles formed when two lines are cut by a transversal
- state and apply the postulates and theorems about parallel lines
- classify triangles according to sides and to angles
- state and apply the theorem and corollaries about the sum of the measures of the angles of a triangle
- state and apply the theorem about the measure of an exterior angle of a triangle
- identify and name convex polygons and regular polygons
- find the measures of interior angles and exterior angles of convex polygons
- use inductive reasoning

#### CONGRUENT TRIANGLES

- identify corresponding parts of congruent figures
- prove whether or not two triangles are congruent by using the SSS, SAS, ASA postulates and AAS and HL theorems
- apply the theorems and corollaries about isosceles triangles
- prove two triangles are congruent by first proving two other triangles congruent
- apply the definitions of the median and the altitude of a triangle and the perpendicular bisector of a segment
- state and apply the theorem about a point on the perpendicular bisector of a segment, and the converse
- state and apply the theorem about a point on the bisector of an angle, and the converse

## **QUADRILATERALS**

- apply the definition, theorems and properties of a parallelogram
- prove that certain quadrilaterals are parallelograms
- apply theorems about parallel lines
- apply the midpoint theorems for triangles
- apply the definitions and identify the special properties of a rectangle, a rhombus and a square
- identify when a parallelogram is a rectangle, rhombus or square
- apply the definitions and identify the properties of a trapezoid and an isosceles trapezoid

## **INEQUALITIES IN GEOMETRY**

- apply properties of inequality to positive numbers, lengths or segments, and the measures of angles
- state and use Exterior Angle Inequality Theorem
- state the contrapositive and inverse of an if-then statement
- define the relationship between logically equivalent statements
- write indirect proofs in paragraph form
- state and apply the inequality theorems and corollaries for one triangle
- state and apply the inequality theorems for two triangles

## **SIMILAR POLYGONS**

- simplify a ratio
- find an unknown term in a proportion
- state and apply the properties of similar polygons
- use the AA similarity postulate and the SAS and SSS similarity theorems to prove triangles are similar
- apply the triangle proportionality theorem and its corollary
- state and apply the triangle angle-bisector theorem
- state and apply the inequality theorems for two triangles

## **RIGHT TRIANGLES**

- find the geometric mean between two numbers
- state and apply the relationships that exist when the altitude is drawn to the hypotenuse of a right triangle
- state and apply the Pythagorean theorem, the converse, and related theorem about obtuse and acute angles
- find the lengths of two sides of a 45-45-90 or a 30-60-90 triangle when the length of the third side is known
- define the sine, cosine and tangent ratios for an acute angle
- solve right triangle problems

## **CIRCLES**

- define a circle, a sphere and terms related to them
- apply theorems that relate tangents and radii
- identify inscribed polygons and circles and circumscribed polygons and circles
- define and apply properties of arcs and central angles
- apply theorems about the chords of a circle
- solve problems and prove statements involving inscribed angles and angles formed by chords, secants and tangents
- solve problems involving lengths of chords, secant segments and tangent segments

## **AREAS OF PLANE FIGURES**

- find the area of a rectangle, parallelogram, triangle, rhombus, trapezoid or regular polygon using the correct formulas
- use formula for the circumference and area of a circle
- use the formula for arc length and area of a sector of a circle
- find the ratio of the areas of two triangles
- apply the relationships between scale factors, perimeters and areas of similar figures
- use areas to solve problems involving geometric probability

## **AREAS AND VOLUMES OF SOLIDS**

- identify the parts of prisms
- find the lateral area, total area and volume of a right prism
- identify the parts of pyramid
- find the lateral area, total area and volume of a pyramid
- find the lateral area, total area and volume of a right cylinder and right cone
- find the area and volume of a sphere
- state and apply the properties of similar solids

## **COORDINATE GEOMETRY**

- state and apply the distance formula and the general equation of a circle
- state and apply the slope formula
- use slope to determine whether two lines are parallel, perpendicular or neither
- understand the basic properties of vectors
- state and apply the midpoint formula
- identify the slope and y-intercept of the line specified by a given equation
- construct the equation of a line
- write an equation of a line when given either one point and the slope, or two points on the line

## **TRANSFORMATIONS**

- identify and use the terms: image, pre-image, mapping, one-to-one mapping, transformation, isometry, congruence mapping
- describe the image of a figure by reflection, translation, rotation, dilation and glide reflection
- describe the image of a figure by composites of mapping
- use the terms identity and inverse in relation to mappings
- describe the symmetry of figures and solids