

# NFC ACADEMY



## COURSE OVERVIEW

Geometry Honors is a full year, high school math course for the student who has successfully completed the prerequisite course, Algebra I. The course focuses on the skills and methods of linear, coordinate, and plane geometry. In it, students will gain solid experience with geometric calculations and coordinate plane graphing, methods of formal proof, and techniques of construction.

## OBJECTIVES

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- **INTRODUCTION:** Student will solve problems using set theory and operations, identify characteristics of postulates and relate geometric theorems on points, lines, and planes
- **LOGIC:** Student will use inductive reasoning to draw reasonable conclusions, or deductive reasoning to prove basic theorems, and write conditional statements, converses, inverses and contrapositives.
- **ANGLES AND PARALLELS:** Student will identify types of angles, categorize a shape as a polygon or non-polygon, identify different kinds of polygons, and find angle measures of polygons
- **CONGRUENT TRIANGLES AND QUADRILATERALS:** Student will identify corresponding parts of congruent triangles, prove congruent parts using different theorems and postulates, and solve for angle measures of congruent polygons.

- **SIMILAR POLYGONS:** Student will use facts about similarity to calculate side and angle measures in similar polygons, and use sine, cosine, and tangent values to solve for missing values in triangles.
- **CIRCLES:** Student will identify different parts of a circle, and angles and arcs created by different lines interacting with circles, and calculate their measures.
- **AREA AND VOLUME:** Student will calculate the area, surface area, and volume of varying polygons by breaking them down into smaller and recognizable shapes.
- **COORDINATE GEOMETRY:** Student will graph linear equations and inequalities, use the distance and mid-point formulas to find lengths of segments and perimeters of geometric shapes, and find the equation of a line in various ways.
- **TRANSFORMATIONS:** Student will understand rotations, reflections, dilations and translations in terms of angles, circles, perpendicular lines, and line segments, and find the result of combining multiple transformations.
- **GEOMETRIC APPLICATION:** Student will use the functions sine, cosine, and tangent, and the inverse trigonometric functions ( $\sin^{-1}$ ,  $\cos^{-1}$ , and  $\tan^{-1}$ ) to calculate unknown side lengths in right triangles, calculate densities, and use ratios to calculate unit scales.
- **PROBABILITY:** Student will determine the number of combinations, or permutations, in choosing elements from a set, explain the concept of conditional probability as found in everyday situations, and analyze decisions and strategies using probability concepts.

## **CURRICULUM CONTENT & SKILL FOCUS**

### **UNIT 1: INTRODUCTION**

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- Identify finite and infinite sets
- Find the intersections and unions of sets (set operations), and solve word problems using set theory and set operations

- List properties and characteristics of the undefined term 'point', 'line', and 'plane'
- Identify and name examples of segments, rays, and collinear items when prompted
- Identify characteristics of postulates, and review properties of algebra
- Recall and relate geometric theorems on points, lines, and planes

## **UNIT 2: LOGIC**

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- Define and identify types of logical statements
- Use a truth table to analyze conjunctions and disjunctions, and to judge conditional statements
- Identify the converse, inverse, and contrapositive of conditional statements
- Identify statements as inductive or not inductive, and the major and minor premises of a syllogism
- Use inductive reasoning to draw reasonable conclusions, or deductive reasoning to prove basic theorems
- Identify the essential parts of a two-column proof, and match statements with reasons
- Prove some simple statements using the indirect method, or contradiction
- Write a conditional statement, the converse, inverse, and contrapositive version of conditional statements

## **UNIT 3: ANGLES AND PARALLELS**

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- Name an angle and its parts, use a protractor to measure angles, and find the sum of angle measures
- Define and identify acute, right, obtuse angles, adjacent angles, complementary and supplementary angles, vertical angles, exterior and interior angles.
- Copy a figure, and bisect figures by using mathematical construction techniques
- Name the angles formed by a transversal, and calculate their angle measures

- Complete proofs by applying properties and theorems of parallels and transversals
- Construct a line that is perpendicular to another line at a given point, and one that is tangent to a circle at a given point
- Identify triangles as acute, obtuse, equiangular, scalene, isosceles, or equilateral
- Categorize a shape as a polygon or non-polygon, identify different kinds of polygons, and find angle measures of polygons

## **UNIT 4: CONGRUENT TRIANGLES AND QUADRILATERALS**

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- Define congruent triangles, and identify corresponding parts of congruent triangles
- Prove that triangles are congruent using side and angle postulates, the Hypotenuse-Leg Theorem, and the ASA Theorem
- Prove that line segments, and angles are congruent using triangle congruence theorems on non-overlapping triangles, and properties of isosceles triangles
- Construct 30-60-90 right triangles, triangles given three sides, triangles given two sides and the included angle, 45-45-90 right triangles, and a median and an altitude of a triangle
- Use angle measures to prove when one side of a triangle is longer than another side, and use side lengths to prove when one angle of a triangle is larger than another angle
- Determine when one side of a triangle is greater than or less than another side, and when sides of two different triangles are equal
- Prove statements involving the rectangle, trapezoids, parallelograms, or the rhombus

## **UNIT 5: SIMILAR POLYGONS**

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- Solve proportions in one variable, including in the context of word problems, and in two variables
- Identify the means and extremes of a proportion, and the geometric mean of two numbers

- Identify similar triangles, and state key properties of similarity
- Use facts about similarity to calculate side measures of similar polygons
- Find the side measures of right triangles by applying special properties of 30-60-90 right triangles, and 45-45-90 right triangles
- Apply the Pythagorean theorem when solving for parts of rectangular solids
- State the sine ratio, cosine ratio, or tangent ratio of a given angle
- Use a table of sine values, cosine values, or tangent values to solve for a missing value

## **UNIT 7: CIRCLES**

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- Identify and define the parts of a circle, and calculate measures of parts of a circle
- Practice finding the measures of major and minor arcs, and segments and angles.
- Prove theorems that relate to tangents, arcs, and chords of a circle.
- Use properties of inscribed angles and intercepted arcs to solve problems and complete proofs
- Identify and define inscribed angles and intercepted arcs, and angles formed by intersecting secants
- Solve for angle and arc measures when secant lines intersect inside, or outside, a circle
- Find the lengths of chords, secants, and tangents
- Construct a circle given three points, circumscribed by a triangle, and circumscribing a triangle

## **UNIT 8: AREA AND VOLUME**

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- Recognize that polygons can be broken into non-overlapping triangles
- Find the area of a rhombus, triangle, trapezoid, parallelogram, rectangle, circle, or any other regular polygon.
- Find area and linear measures such as side length of regular polygons that are similar
- Find the circumference of a circle when given the radius, and find the radius of a circle when given the circumference

- Find the arc length of a sector, the area of a sector, or a segment of a circle
- Find the area of unusual shapes using the areas of sectors and segments
- Find the surface area and volume of a prism, pyramid, cylinder, cone, sphere, kite

## **UNIT 9: COORDINATE GEOMETRY**

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- Find points, lines, and planes of symmetry
- Review and practice graphing linear equations and inequalities
- Review and practice using the distance formula to find the distance between two points, and finding the midpoint of line segments, and find the lengths and perimeters of geometric shapes
- Find equation for a circle in the coordinate plane
- Calculate slope of a line, and determine if lines are parallel, perpendicular, or neither (skew)
- Find properties and measures of shapes using the coordinate plane
- Find the equation of a line, in standard form, given two points, and given a point on the line and the slope
- Prove theorems about plane figures using coordinate geometry

## **UNIT 10: TRANSFORMATIONS**

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- Define isometry and the three types of rigid motion
- If  $A$  is not on the line  $n$ , then  $n$  is the perpendicular bisector of  $AA'$
- If  $A$  is on the line  $n$  then  $A = A'$
- Find the image of a shape after a rigid motion, translation, rotation, reflection, or dilation
- Tell the difference between a contraction and an expansion
- Find the result of combining multiple transformations
- Identify the inverse of a transformation
- Understand rotations, reflections, and translations in terms of angles, circles, perpendicular lines, and line segments.

## **UNIT 11: GEOMETRIC APPLICATION**

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- Use the functions sine, cosine, and tangent, and the inverse trigonometric functions ( $\sin^{-1}$ ,  $\cos^{-1}$ , and  $\tan^{-1}$ ) to calculate unknown side lengths in right triangles.
- Find missing angle and side measures of a triangle using the law of sines, and law of cosines.
- Prove the SAS Triangle Area formula, and use it to find the area of non-right triangles
- Solve real-world problems involving three-dimensional figures.
- Determine population density using the formula
- Use density to calculate mass or volume using
- Use ratios and proportions to be able to calculate unit scales of certain objects.

## **UNIT 12: PROBABILITY**

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- Find the probability of mutually exclusive, or independent events.
- Determine the number of combinations, or permutations, in choosing elements from a set.
- Find the number of permutations, or combinations, of  $n$  items taken  $r$  at a time, when some of the items are indistinguishable.
- Explain the concept of conditional probability as found in everyday situations.
- Interpret two-way frequency tables.
- Analyze decisions and strategies using probability concepts.

## **PERFORMANCE TASKS**

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Each unit of study has Performance Tasks which are a part of the regular assignments for honor's courses. Students are expected to complete all sections of each Performance Tasks successfully.

## **REQUIRED RESOURCES**

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Some assignments in this course require the use of resources that must be supplied by the user. These outside resources are listed below by assignment.

<b>GEOMETRY</b>		
<b>Unit</b>	<b>Assignment Title</b>	<b>Supply List</b>
All	All Assignments	Scratch Paper/Notebook Paper Pencil Notebooks Ruler Compass Protractor

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## **GRADING INFORMATION**

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### **GRADING COMPONENTS**

Lessons	40%
Quizzes	30%
Tests	30%

### **GRADING SCALE**

100-90	A
89-80	B
79-70	C
69-60	D
Below 60	F