Fair Lawn

Public Schools

Fair Lawn, NJ

Geometry Honors

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The purpose of Geometry Honors is to develop students' inductive and deductive reasoning skills as they learn the basics of geometry. Through the use of technology and various geometric tools students will discover the theorems and postulates. The development of critical thinking skills will help students make and test conjectures, resulting in a greater appreciation for the methods of problem solving.

Geometry Honors

Fair Lawn School District

Committee Credits

Geometry Honors Team

Kathleen Ometz
Bryan McCourt
Thomas Clark
Lauren Gimon, Supervisor

Geometry Honors

I. Course Synopsis

In Geometry Honors, the instructional time will focus on seven critical areas: (1) developing an understanding the basic terms of Geometry and the skill of writing a geometric proof; (2) transformations of geometric figures; (3) understand, apply and prove theorems about congruent triangles; (4) understand and apply theorems about similarity and right triangles; (5) understand and apply theorems about quadrilaterals; (6) understand and apply theorems about circles; (7) calculate area, surface area and volume of geometric figures; and (8) factoring, quadratic equations, linear equations, and simplifying radicals.

Throughout the course, mathematical concepts will be taught with an emphasis on enduring understandings, essential questions, real-world application, technology, and cross-curricular interaction.

II. Philosophy & Rationale

The purpose of Geometry Honors is to develop students' inductive and deductive reasoning skills as they learn plane Euclidean geometry. In Geometry Honors, students will develop their skill of creating and presenting proofs. The use of dynamic geometry software is essential to allow students to discover the theorems and postulates. Students will develop critical thinking skills through the process of making and testing conjectures, resulting in a greater appreciation for the methods of problem solving.

The Common Core State Standards for Geometry states that "During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs." Throughout the Geometry Course, the emphasis will be on the students understanding Geometry concepts at a higher level than when they were first introduced to the concepts in middle school.

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical

proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

CCSS.MATH.PRACTICE.MP1 - Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

CCSS.MATH.PRACTICE.MP2 - Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

CCSS.MATH.PRACTICE.MP3 - Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

CCSS.MATH.PRACTICE.MP4 - Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

CCSS.MATH.PRACTICE.MP5 - Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their

grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

CCSS.MATH.PRACTICE.MP6 - Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

CCSS.MATH.PRACTICE.MP7 - Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

CCSS.MATH.PRACTICE.MP8 - Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

III. Scope & Sequence

Unit 1: Tools of Geometry **(4 weeks)**

- Tools of geometry review
- Angle/segment addition postulates
- Complementary supplementary
- Vertical/adjacent/linear pair
- Pythagorean Theorem
- Bisectors and midpoints
- Constructions
- Proofs
- Conditional/converse
- Algebraic reasoning
- Basic geometric proofs
- Lines
- Transversals and parallel lines/angle relationships
- Proofs for theorems and converse
- Polygons
- Sum of interior angles
- Exterior Angles
- Diagonals

Unit 2: Transformations **(4 weeks)**

- Translations
- Reflections
- Over axis
- Over any line
- Rotations
- About the Origin
- About any given point
- Dilations
- Defining Similar Polygons
- Centered at origin
- Centered at any point
- Composition of Transformations

Unit 3: Triangles **(11 weeks)**

Basic properties/ definitions
Define equilateral, isosceles, scalene
Define and determine difference between acute, obtuse, and right triangles
Triangle inequalities and converse of the Pythagorean Theorem
Triangle third angle theorem
Remote interior angles theorem
Similarity
Similarity theorems and postulates
Triangle mid-segment
Congruence
Triangle congruence postulates and theorems
Proofs
Right triangles
Pythagorean theorem
Special Right Triangles
Trigonometry
Unit Circle
Word problems
Area
Vectors

Unit 4: Quadrilaterals **(4 weeks)**

Parallelograms
Relationships of Angles and Sides
Diagonal Properties
Trapezoids and Kites
Relationships of Angles and Sides
Diagonal Properties
Mid-segment of a Trapezoid
Area of Parallelograms, Trapezoids, and Kites
Coordinate Proofs

Unit 5: Circles **(4 weeks)**

- Radius/diameter
- Chord
- Tangent/secant lines
- Central angles
- Inscribed
- Arc
- Arc/angle relationships
- Segment relationships
- Area/circumference
- Sector area
- Arc length
- Area of a Segment
- Equation of a Circle
- Standard and General form
- Graphing

Unit 6: Measurement **(4 weeks)**

- Area of irregular shapes
- Area of Regular Polygons
- Volume of Three Dimensional Figures
- Surface area Three Dimensional Figures
- Geometric Probability

Unit 7: Introduction to Pre-Calculus **(3 weeks)**

- Factoring
- Simplifying Radicals
- Simplifying Rational expressions
- Linear and Quadratic Functions
- Solving all types of equations

IV. Unit Descriptions

Unit 1: Tools of Geometry **4 weeks**

Enduring Understanding

1. Geometry is a mathematical system built on accepted facts basic terms and definitions.
2. Special angle pairs can help identify geometric relationships.
3. You can use special geometric tools to make a figure that is congruent to an original figure without measuring.
4. You can use formulas to find the midpoint and length of any segment in the coordinate plane.
5. You can describe some mathematical relationships using a variety of if then statements.
6. Algebraic properties of equality are used in Geometry. They will help you solve problems and justify each step you took.
7. Logical reasoning from one step to another is essential in building a proof.
8. When a line intersects two or more lines the angles formed at the intersection points create special angle pairs.
9. You can use certain angle pairs to decide whether two lines are parallel.
10. The sum of the interior angle measures of a polygon depends on the number of sides the polygon has.
11. If you know the lengths of two sides of a right triangle you can find the length of the third side by using the Pythagorean Theorem.

Essential Question(s)

1. What are the building blocks of geometry?
2. How can you describe the attributes of a segment or an angle?
3. How can you make a conjecture and prove that it is true?
4. How do you prove that two lines are parallel?
5. How can you find the sum of the measures of polygon angles?

Learning Objectives

Students will be able to:

1. Understand the basic terms and postulates of geometry.
2. Identify special angle pairs and use their relationships to find angle measures.
3. Make basic constructions using a straight edge and a compass.
4. Find the midpoint of a segment and find the distance between two points on the coordinate plane.

5. Recognize conditional statements and their parts; and write converses of conditionals.
6. Connect reasoning in algebra and geometry.
7. Prove and apply theorems about angles.
8. Identify angles formed by two lines and a transversal.
9. Use properties of parallel lines to find angle measures.
10. Prove theorems about parallel lines.
11. Find the sum of the measures of interior and exterior angles of a polygon.

Common Core State Standards

- **G.C0.1** – Know the precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- **G.CO.12 –** Make formal geometric constructions with a variety of tools and methods (compass and straight edge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment, copying an angle, bisecting a segment, bisecting an angle, constructing perpendicular lines, including the perpendicular bisector of a line segment, and constructing a line parallel to a given line through a point not on the line.*
- **G.CO.9** – Prove theorems about lines and angles. *Theorems include: vertical angles are congruent, when a transversal crosses parallel lines alternate interior angles are congruent and corresponding angles are congruent, points on a perpendicular bisector of a line segment are exactly those equidistant from the segments endpoints.*
- **G.CO.13** – Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
- **G.CO.10** – Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
- **G.SRT.5** – Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- **G.CO.11** – Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other and its converse, rectangles are parallelograms with congruent diagonals.*
- **G.MG.1 –** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Do Now activities
    b. Classwork
    c. Homework
    d. Use of white boards
    e. Unit Test (extended time when needed)
    f. Review Game
    g. Project
    h. Graphic Organizer
    i. Calculator Use
    j. Assistive Technology
2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
    a. Students may be provided with note organizers / study guides to reinforce key topics.
    b. Extended time on assessments when needed.
    c. Preferred seating to be determined by student and teacher.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
    f. Establish a non-verbal cue to redirect student when not on task.
    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

New Jersey Core Curriculum Standards – Technology

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Career Readiness Practices

- CRP 6. Demonstrate creativity and innovation.
- CRP 7. Employ valid and reliable research strategies.
- CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.

NJCCS Standard 9.2 – Career Awareness, Exploration, and Preparation

- 9.2.12.C.1-- Review career goals and determine steps necessary for attainment.

NJCCS Standard 9.3 – Career and Technical Education

- 9.3.ST.2 -- Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST-ET.2 -- Display and communicate STEM information.
- 9.3.ST-ET.4 -- Apply the elements of the design process.

Unit 2: Transformations **4 Weeks**

Enduring Understanding

1. The distance between any two points, angle measures, and orientation of a geometric figure remain the same when the figure is translated in one direction.
2. When you reflect a figure across a line each point of the figure maps to another point the same distance from the line, but on the other side. The orientation of the figure reverses.
3. Rotations preserve distance, angle measures, and orientation of figures.
4. You can express all isometries as a composition of reflections.
5. You can use the scale factor to make a larger or smaller copy of a figure that is also similar to the original figure.
6. You can use compositions of rigid motions to understand congruence.

Essential Question(s)

1. How can you change a figures position without changing its size and shape?
2. How can you represent a transformation in the coordinate plane?

Learning Objectives

Students will be able to:

1. Identify isometries.
2. Find translation images of figures.
3. Find reflection images of figures.
4. Draw and identify rotation images of figures.
5. Identify congruence transformations.
6. Understand dilation images of figures.

Common Core State Standards

- **G.CO.2** – Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
- **G.CO.4** – Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
- **G.CO.5** – Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
- **G.CO.6** – Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motion.

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    c. Homework
    d. Use of white boards
    e. Unit Test (extended time when needed)
    f. Review Game
    g. Project
    h. Graphic Organizer
    i. Calculator Use
    j. Assistive Technology
2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.

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e. Student may complete assessments in alternate setting when requested.
f. Establish a non-verbal cue to redirect student when not on task.
g. Maintain strong teacher / parent communication.

4. Gifted and Talented Students.
   a. Provide enrichment activities to expand upon the curriculum.
   b. Use higher level questioning techniques in class and on assessments.

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- 9.3.ST-ET.4 -- Apply the elements of the design process.

Unit 3: Triangles **11 weeks**

Enduring Understanding

1. The sum of the angle measures of a triangle is always the same.
2. Any exterior angle of a triangle has a special relationship with the two remote interior angles of a triangle.
3. You can determine whether two figures are congruent by comparing their corresponding parts.

4. Two triangles can be proven to be congruent without having to show all corresponding parts are congruent.
5. If you know two triangles are congruent then you know every pair of their corresponding parts is also congruent.
6. The angles and sides of equilateral and isosceles triangles have special relationships.
7. There are two special relationships between a midsegment of a triangle and the third side of a triangle.
8. The angles and sides of triangle have special relationships that involve inequalities.
9. You can use ratios and proportions to decide whether two polygons are similar and to find unknown side lengths of similar figures.
10. You can show that two triangles are similar when you to know the relationships between only two or three pairs of corresponding parts.
11. You can use the converse of the Pythagorean Theorem to determine whether a triangle is a right triangle.
12. Certain right triangles have properties that allow you to use short cuts to determine side lengths without using Pythagorean Theorem.
13. If you know certain combinations of side lengths and angle measures of a right triangle you can use ratios to find the other side lengths and angle measures.
14. You can use the angles of elevation and depression as the acute angles of right triangles formed by a horizontal distance and a vertical height.
15. You can find the area of a parallelogram or a triangle when you know the length of its base and height.
16. Utilizing sine and cosine to find the magnitude and direction of a vector.

<u>Essential Question(s)</u>

1. What is the sum of the measures of the angles of a triangle?
2. How can you tell whether a triangle is isosceles or equilateral?
3. How do you identify corresponding parts of congruent triangles?
4. How do you show that two triangles are congruent?
5. How do you solve problems that involve measurements of triangles?
6. How do you use proportions to find side lengths in similar polygons?
7. How do you identify corresponding parts of similar triangles?
8. How do you show two triangles are similar?
9. How do trigonometric ratios relate to similar right triangles?
10. How do you find side length or angle measure in a right triangle?

Learning Objectives

Students will be able to:

1. Find measures of angles of triangles.
2. Recognize congruent figures and their corresponding parts.
3. Prove two triangles are congruent using SSS, SAS, ASA, AAS, and HL.
4. Use and apply properties of isosceles and equilateral triangles.
5. Identify congruent overlapping triangles.
6. Use properties of midsegments to solve problems.
7. Use inequalities involving angles and sides of triangles.
8. Identify and apply similar polygons.
9. Use AA~, SAS~, and SSS~ to prove triangles are similar.
10. Use Pythagorean Theorem and its converse.
11. Use the properties of 45-45-90 and 30-60-90 triangles.
12. Use the sine, cosine, and tangent ratios to determine side lengths and angle measures in right triangles.
13. Use angles of elevation and depression to solve problems.
14. Find the area of a triangle.
15. Finding the magnitude and direction of a vector.

Common Core State Standards

- **G.CO.10** – Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180 degrees; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*
- **G.SRT.5** – Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- **G.SRT.4** – Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally and its converse; the Pythagorean Theorem proved using triangle similarity.*
- **G.SRT.6** – Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- **G.SRT.7** – Explain and use the relationship between the sine and cosine of complementary angles.
- **G.SRT.8** – Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
- **G.MG.1** – Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

- **G.GPE.7 –** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
- **HSN.VM.A.1**

  (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\boldsymbol{v}$, $|\boldsymbol{v}|$, $||\boldsymbol{v}||$, v).
- **HSN.VM.A.2**

  (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

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   a. Provide enrichment activities to expand upon the curriculum.
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- 9.3.ST.2 -- Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST-ET.2 -- Display and communicate STEM information.
- 9.3.ST-ET.4 -- Apply the elements of the design process.

Unit 4: Quadrilaterals **4 weeks**

Enduring Understanding

1. Parallelograms have special properties regarding their sides, angles, and diagonals.
2. You can decide whether a quadrilateral is a parallelogram if its sides, angles, and diagonals have certain properties.
3. The special parallelograms, rhombus, rectangle, and square have basic properties about their sides, angles, and diagonals that help identify them.
4. The angles, sides, and diagonals of a trapezoids and kites have certain properties.
5. The midsegment of a trapezoid has a specific relationship to the bases.
6. You can classify figures in the coordinate plane using the formulas for slope, distance, and midpoint.

7. You can use variables to name the coordinates of a figure. This allows you to show that relationships are true for a general case.
8. You can find the area of quadrilaterals when you know certain dimensions.

Essential Question(s)

1. How can you classify quadrilaterals?
2. How can you use coordinate geometry to prove general relationships?
3. How do quadrilaterals relate to triangles?

Learning Objectives

Students will be able to:

1. Use relationships amongst sides, angles, and diagonals of parallelograms.
2. Determine whether a quadrilateral is a parallelogram.
3. Define and classify special types of parallelograms.
4. Verify and use the properties of trapezoids and kites.
5. Classify polygons in the coordinate plane.
6. Name coordinates of special figures using their properties.
7. Find the area of quadrilaterals.

Common Core State Standards

- **G.CO.11** – Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other and its converse, rectangles are parallelograms with congruent diagonals.*
- **G.SRT.5** – Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
- **G.GPE.7** – Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
- **G.MG.1 –** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Do Now activities
    b. Classwork
    c. Homework

d. Use of white boards
e. Unit Test (extended time when needed)
f. Review Game
g. Project
h. Graphic Organizer
i. Calculator Use
j. Assistive Technology

2. English Language Learners.
    a. Students may use a bilingual dictionary.
    b. Read written instructions.
    c. Students may be provided with note organizers / study guides to reinforce key topics.
    d. Provide modified assessments when necessary.
    e. Student may complete assessments in alternate setting when requested.
3. Special Education/504 Students.
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    b. Extended time on assessments when needed.
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    e. Student may complete assessments in alternate setting when requested.
    f. Establish a non-verbal cue to redirect student when not on task.
    g. Maintain strong teacher / parent communication.
4. Gifted and Talented Students.
    a. Provide enrichment activities to expand upon the curriculum.
    b. Use higher level questioning techniques in class and on assessments.

<u>New Jersey Core Curriculum Standards – Technology</u>

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

<u>Career Readiness Practices</u>

- CRP 6. Demonstrate creativity and innovation.
- CRP 7. Employ valid and reliable research strategies.
- CRP 8. Utilize critical thinking to make sense of problems and persevere in solving them.

NJCCS Standard 9.2 – Career Awareness, Exploration, and Preparation

- 9.2.12.C.1-- Review career goals and determine steps necessary for attainment.

NJCCS Standard 9.3 – Career and Technical Education

- 9.3.ST.2 -- Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST-ET.2 -- Display and communicate STEM information.
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Unit 5: Circles **4 weeks**

Enduring Understanding

1. A radius of a circle and the tangent that intersects the endpoint of the radius on the circle have a special relationship.
2. You can use information about congruent parts of a circle or congruent circles to find information about other parts of the circle or circles.
3. Angles formed by intersecting lines have a special relationship to the arcs the intersecting lines intercept.
4. Angles formed by intersecting lines have a special relationship to the related arcs formed when the lines intersect a circle.
5. The information in the equation of a circle allows you to graph the circle. Also, you can write the equation of a circle if you know its center and radius.
6. You can find the length of part of a circle's circumference by relating it to an angle in the circle.
7. You can use the area of a circle to find the area of part of the circle formed by two radii and the arc the radii form when they intersect the circle.

Essential Question(s)

1. How can you prove relationships between angles and arcs in circles?
2. When lines intersect a circle or within a circle, how do you find the measures of resulting angles, arcs, and segments?
3. How do you find the equation of a circle in the coordinate plane?

Learning Objectives

Students will be able to:

1. Use properties of a tangent to a circle.
2. Use congruent chords, arcs, and central angles.
3. Use perpendicular bisectors to chords.

4. Find the measure of an inscribed angle and the measure of an angle formed by a tangent and a chord.
5. Find measures of angles formed by chords, secants, and tangents.
6. Find lengths of segments associated with circles.
7. Write the equation of a circle.
8. Find the area of circles, sectors, and segments of circles.
9. Find measures of central angles and arcs.
10. Find the circumference and arc lengths.

Common Core State Standards

- **G.C.2** – Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*
- **G.C.3** – Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

- **G.C.4** – Construct a tangent line from a point outside a given circle to the circle.
- **G.GPE.1 –** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

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    c. Homework
    d. Use of white boards
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2. English Language Learners.

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Unit 6: Measurement **4 weeks**

Enduring Understanding

1. The area of a region is the sum of the areas of its non-overlapping parts.
2. You can use ratios to compare areas and perimeters of similar figures.
3. You can use geometric models to solve certain types of probability problems?
4. You can analyze a three dimensional figure by using the relationships among its vertices, edges, and faces.
5. To find the surface area of a 3-d figure finds the sum of the areas of all the surfaces of the figure.
6. You can find the volume of a prism or a cylinder when you know its height and the area of its base.
7. You can find the surface area and volume of a sphere when you know its radius.

Essential Question(s)

1. How do you find the area of a polygon or find the circumference and area of a circle?
2. How do area and perimeter of similar figures compare?
3. How do you find the surface area and volume of a solid?
4. How do surface areas and volumes of similar solids compare?
5. What is the difference between experimental and theoretical probability?

Learning Objectives

Students will be able to:

1. Use segment and area models to find the probabilities o events.
2. Find the surface area of a prism, cylinder, sphere, cone, and pyramid.
3. Find the volume of a prism, cylinder, sphere, cone, and pyramid.

Common Core State Standards

- **G.GMD.3** – Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems
- **N.Q.1** – Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **S.CP.1** – Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
- **G.MG.1** – Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- **G.GMD.1** –Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*

- **G.GMD.2** – Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
- **G.GMD.3** –Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Suggested Activities/Modifications

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Unit 7: Introduction to Pre-Calculus **3 weeks**

Enduring Understanding

1. A quadratic polynomial may be factored using GCF, difference of two squares, or grouping.
2. The zeros of a factored quadratic equation can be found using the zero product property.
3. The zeros of a nonfactorable quadratic equation can be found by using completing the square or the quadratic formula.
4. Find the largest perfect square factor of a number to simplify a radical expression.
5. The slope and intercept of a linear equation determine the graph.

Essential Question(s)

1. What are the methods to solve a quadratic equation and when do you use each?
2. When is a radical simplified?
3. What is the vital information needed to graph a linear equation?

Learning Objectives

Students will be able to:

1. Factor a polynomial.
2. Solve a quadratic equation.
3. Simplify a radical expression.

4. Graph a linear equation in slope intercept, standard, and point slope form.

Common Core State Standards

- **A.SSE.2 –** Use the structure of an expression to identify ways to rewrite it.
- **A.SSE.1.a –** Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.APR.3 –** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- **A.CED.1 –** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
- **A.REI.B3 –** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- **A.REI.A3 –** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

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V. Course Materials

1. Textbook
   Geometry Prentice Hall 2009 ISBN 0-13-365952-6
2. Text Support
   Online Textbook, Practice Masters, Enrichment Masters
3. Graph Paper
4. Lab Gear
   Rulers, compasses, protractors, miras, geo-boards, scissors, markers, glue, tangrams.
5. Calculators TI N-Spire CX
6. Common Core/PARCC Materials
7. SAT Materials *10 Real SATs*
   www.collegeboard.com
8. Computer and related software
   Geometer's Sketchpad, Smart Notebook, Slate, Student Response Systems
9. Smart Board

VI. Assessments

1. Quizzes
2. Chapter Test
3. Discovery Labs
4. Pasta Bridge Project
5. Homework
6. Midterm
7. Final
8. Exit Tickets
9. Student Response Software
10. Classwork
11. PARCC Practice

VII. Cross Curricular Aspects

1.) **Pasta Bridge Project** – Students will use knowledge of physics in building a bridge.

2.) **Angle of Elevation and Depression Problems** – Students will solve trigonometric word problems involving scientific scenarios.

The purpose of Geometry Honors is to develop students' inductive and deductive reasoning skills as they learn the basics of geometry. Through the use of technology and various geometric tools students will discover the theorems and postulates. The development of critical thinking skills will help students make and test conjectures, resulting in a greater appreciation for the methods of problem solving.