

Curriculum Development  
In the Fairfield Public Schools

**FAIRFIELD PUBLIC SCHOOLS**  
FAIRFIELD, CONNECTICUT

**GEOMETRY 22**

Board of Education Approved February 28, 2006

## **Geometry 22**

### **Statement of Purpose**

Geometry 22 is a course offered for students to learn by guided instruction that focuses on analyzing and using spatial relationships and basic concepts of geometry to draw, measure, and compare geometric models and their transformations. This course will make use of geometric relationships and patterns to solve real world problems.

### **Audience**

Geometry 22 is intended for grade 10 level 2 students.

### **Prerequisites**

Geometry 22 requires successful completion of Algebra 12.

### **Course Description**

The Geometry 22 course deals with the concepts of mathematical structure and formal proof (postulates, theorems, and corollaries). The properties of 1, 2, and 3 dimensional figures will be investigated and algebraic skills and concepts will be applied to geometric relationships (e.g., a study of points, lines, angles, and polygons on a plane surface and in space). The study of coordinate geometry is integrated throughout the course.

### **Course Objectives**

Students will be able to:

- calculate the measure of one, two, and three-dimensional figures.
- demonstrate an understanding of the language of geometry.
- use reasoning to make conjectures and conclusions.
- solve problems using the relationships of angles formed by parallel lines and their transversals.
- use triangles to model and problem solve real-world situations.
- demonstrate an understanding of congruent and similar polygons.
- apply the properties of special polygons in problem solving.
- demonstrate an understanding of congruent and similar polygons.
- use triangles to model and problem solve real-world situations.
- apply the properties of special polygons and circles in problem solving.
- calculate the measure of one, two, and three-dimensional figures.
- recognize and use properties of transformations with geometric figures.

### **Skill Objectives**

Students will:

- graph ordered pairs on a coordinate plane.
- identify and draw models of point, lines, and planes.
- identify collinear and coplanar points and intersecting lines and planes.
- find the distance between two points in a number line.
- find the distance between points in a coordinate plane.
- find the midpoint of a segment.
- identify and use congruent segments.
- identify and use parts of angles.
- use the angle addition postulate to find the measure of angles.
- classify angles as acute, obtuse, right and straight.

- identify and use congruent angles and the bisector of an angle.
- identify and use adjacent angles, vertical angles, linear pairs of angles, and supplementary angles.
- identify and use right angles and perpendicular lines.
- determine what information can and cannot be assumed from a figure.
- make geometric conjectures based on inductive reasoning.
- identify the hypothesis and conclusion of an “if-then” statement.
- write the converse of an “if-then” statement.
- identify and use the basic postulates about points, lines and planes.
- use properties of equality in algebraic and geometric proofs.
- describe the relationships between two lines and between two planes.
- identify the relationships among pairs of angles formed by pairs of lines and transversals.
- use the properties of parallel lines to determine angle measures.
- recognize angle conditions that produce parallel lines.
- prove two lines parallel based on given angle relationships.
- find the slope of a line.
- use slope to identify parallel and perpendicular lines.
- recognize and use distance relationships among points, lines and planes.
- identify the parts of a triangle.
- classify triangles.
- apply the angle sum theorem.
- apply the exterior angle theorem.
- identify congruent triangles.
- name and label corresponding parts of congruent triangles.
- use SAS, SSS, and ASA postulates to test for triangle congruence.
- use AAS theorem to test for triangle congruence.
- use properties of isosceles and equilateral triangles.
- identify and use medians, altitudes, angle bisectors, perpendicular bisectors, and midsegments in a triangle.
- recognize and use tests for congruence of right triangles.
- recognize and apply the properties of inequalities to the measures of segments and angles.
- apply the triangle inequality theorem.
- recognize and define a parallelogram.
- recognize, use and prove the properties of a parallelogram.
- recognize and apply the conditions that ensure that a quadrilateral is a parallelogram.
- recognize the properties of rectangles.
- use properties of rectangles in proofs.
- recognize the properties of squares and rhombi.
- use properties of squares and rhombi in proofs.
- recognize the properties of trapezoids.
- use properties of trapezoids in proofs and other problems.
- recognize and use ratios and proportions.
- apply and use the properties of proportions.
- identify similar figures.
- solve problems involving similar figures.
- identify similar triangles.

- use similar triangles to solve problems.
- use the Pythagorean Theorem and its converse.
- use the properties of 45-45-90 and 30-60-90 triangles.
- express trigonometric ratios as fractions or decimals.
- recognize trigonometric relationships from right triangles.
- use a calculator to find values of trigonometric ratios or measures of angles.
- recognize angles of depression or elevation.
- use trigonometry to solve triangles.
- name parts of circles.
- determine relationships between lines and circles.
- write an equation of a circle in the coordinate plane.
- find the measures of arcs and central angles.
- recognize and find the measure of inscribed angles.
- use properties of inscribed figures.
- identify and name polygons.
- identify faces, edges, and vertices of a polyhedron.
- find the sum of the measures of the interior and exterior angles of a convex polygon.
- find the measure of each interior and exterior angle of a regular polygon.
- use angle measures of polygons in problem solving.
- find areas of parallelograms.
- find the areas of triangles, rhombi, and trapezoids.
- find the area of regular polygons.
- find the circumference and area of circles and sectors.
- use area and length to solve problems involving geometric probability.
- create, draw, and fold three-dimensional figures.
- make two-dimensional nets for three-dimensional solids.
- identify parts of prisms and cylinders.
- find the lateral areas and surface areas of right prisms and right cylinders.
- find the lateral area of a regular pyramid.
- find the lateral area and surface area of a right circular cone.
- find the volume of a right prism and a right cylinder.
- find the volume of a pyramid and a circular cone.
- recognize and define basic properties of spheres.
- find the surface area of a sphere.
- find the volume of a sphere.
- use algebraic formulas to calculate slope, distance, and midpoint.
- show verification of theorems algebraically and graphically. Use technology of Geometer's Sketchpad to verify theorems of geometry.
- name the image and preimage of a mapping.
- recognize an isometry or congruence transformation.
- name a reflection image with respect to a line.
- recognize line symmetry and point symmetry.
- draw reflection images, lines of symmetry, and points of symmetry.
- name and draw translation images of figures.
- name and draw rotation images of figures.

- use scale factors to determine if a dilation is an enlargement, a reduction, or a congruence transformation.
- find the center and scale factor for a given dilation.
- find the dilation image for a given center and scale factor.

## **Math Standards**

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

### ***Extended***

2.2a Students should investigate mathematical properties and operations related to objects that are not numbers.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

### ***Extended***

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

### ***Extended***

3.2a Students should use a variety of coordinate systems and transformations to solve geometric problems in two- and three-dimensions using appropriate tools and technology.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

***Working with Data: Probability and Statistics - Data can be analyzed to make informed decisions using a variety of strategies, tools and technology.***

**4.3 Students should understand and apply basic concepts of probability.**

***Core***

4.3a Students should understand and apply the principles of probability in a variety of situations.

**Information and Technology Standards (used in all units)**

***Application***

**Students will use appropriate information and technology to create written, visual, oral and multimedia products to communicate ideas, information or conclusions to others.**

Students will use in depth applications of appropriate software and hardware to organize, analyze and interpret information.

***Technology Use***

**Students will operate and use computers and other technologies as tools for productivity, problem-solving and learning across the content areas.**

Students will use content-specific tools and software.

**Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How can the language of geometry be used to communicate mathematical ideas coherently and precisely?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How does algebra relate to geometry graphically?
- How are appropriate techniques, tools, and formulas used in geometry to determine measurements?

**Focus Questions**

- How does the language of geometry provide immediate experience with the physical world?
- How do reasoning and proofs provide the ideas and concepts that lead to an understanding of the deductive nature of geometry?
- How can various types of reasoning be used to make, investigate, and prove mathematical conjectures?
- How do parallel lines, transversals, and related angles model the physical world?
- How does the geometric principle of congruence in triangles apply to the real world?
- How do triangles, their sides, angles, and special segments model the physical world?

- How does the set of quadrilaterals and their properties model the world around us?
- How is similarity used to measure indirectly and explore comparable objects?
- How is trigonometry used to understand the functional and aesthetic uses of right triangles?
- How do circles and their parts relate to the physical world?
- How do the calculations and concepts of area and volume relate to two and three dimensional objects?
- How do the algebraic formulas of slope, midpoint, and distance relate to geometry graphically?
- How do transformations provide a way of studying figures?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

# UNITS OF STUDY

## 1. The Language of Geometry

### Math Standards

*Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.*

**1.1 Students should understand and describe patterns and functional relationships.**

#### *Extended*

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

*Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.*

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### *Core*

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

*Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.*

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### *Core*

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### *Core*

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### *Extended*

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Information and Technology Standards – see page 6

### Essential Questions

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?

- How does geometry model the physical world?
- How can the language of geometry be used to communicate mathematical ideas coherently and precisely?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How does the language of geometry provide immediate experience with the physical world?

### **Core Topics**

- Undefined terms of geometry: point, line, plane
- Definitions of geometrical terms
- Postulates
- Measuring length and angles

### **Unit Objective**

Students will be able to:

- demonstrate an understanding of the language of geometry.

### **Skill Objectives**

Students will:

- graph ordered pairs on a coordinate plane.
- identify and draw models of point, lines, and planes.
- identify collinear and coplanar points and intersecting lines and planes.
- find the distance between two points in a number line.
- find the distance between points in a coordinate plane.
- find the midpoint of a segment.
- identify and use congruent segments.
- identify and use parts of angles.
- use the angle addition postulate to find the measure of angles.
- classify angles as acute, obtuse, right and straight.
- identify and use congruent angles and the bisector of an angle.
- identify and use adjacent angles, vertical angles, linear pairs of angles, and supplementary angles.
- identify and use right angles and perpendicular lines.
- determine what information can and cannot be assumed from a figure.

### **Sample Assessment**

Crossing Geometry

### **Pacing**

2 weeks

## **2. Reasoning and Proof**

### **Math Standards**

*Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.*

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

#### ***Extended***

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

### **Information and Technology Standards – see page 6**

#### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

#### **Focus Questions**

- How do reasoning and proofs provide the ideas and concepts that lead to an understanding of the deductive nature of geometry?
- How can various types of reasoning be used to make, investigate, and prove mathematical conjectures?

#### **Core Topics**

- Introduction to Proofs
- Theorems

#### **Unit Objective**

Students will be able to:

- use reasoning to make conjectures and conclusions.

#### **Skill Objectives**

Students will:

- make geometric conjectures based on deductive reasoning.
- identify the hypothesis and conclusion of an “if-then” statement.
- write the converse of an “if-then” statement.
- identify and use the basic postulates about points, lines and planes.
- use properties of equality in algebraic and geometric proofs.

### **Sample Assessment**

To Tell The Truth

### **Pacing**

1 week (Semester 1) 2.5 weeks (Semester 2)

### 3. Parallels

#### Math Standards

*Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.*

**1.1 Students should understand and describe patterns and functional relationships.**

*Extended*

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

*Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.*

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

*Core*

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

*Extended*

2.2a Students should investigate mathematical properties and operations related to objects that are not numbers.

*Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.*

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

*Core*

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

*Extended*

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

*Core*

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

#### Information and Technology Standards – see page 6

#### Essential Questions

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How can a variety of appropriate strategies be applied in solving geometric problems?

- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How does algebra relate to geometry graphically?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How do parallel lines, transversals, and related angles model the physical world?

### **Core Topics**

- Parallel lines
- Transversals and their related angles
- Proofs proving lines are parallel

### **Unit Objective**

Students will be able to:

- solve problems using the relationships of angles formed by parallel lines and their transversals.

### **Skill Objectives**

Students will:

- describe the relationships between two lines and between two planes.
- identify the relationships among pairs of angles formed by pairs of lines and transversals.
- use the properties of parallel lines to determine angle measures.
- recognize angle conditions that produce parallel lines.
- prove two lines parallel based on given angle relationships.
- find the slope of a line.
- use slope to identify parallel and perpendicular lines.
- recognize and use distance relationships among points, lines and planes.

### **Sample Assessment**

Where the Streets Meet

### **Pacing**

5 Weeks

## 4. Triangles

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

#### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

#### ***Extended***

2.2a Students should investigate mathematical properties and operations related to objects that are not numbers.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

#### ***Extended***

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

#### ***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### **Information and Technology Standards – see page 6**

#### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

#### **Focus Questions**

- How do triangles, their sides, angles, and special segments model the physical world?
- How does the geometric principle of congruence in triangles apply to the real world?

#### **Core Topics**

- Classifying triangles
- Special line segments of a triangle
- Congruent polygons
- Congruent triangles
- Proving triangles congruent
- Right triangle congruence
- Inequalities in a triangle

#### **Unit Objectives**

Students will:

- use triangles to model and problem solve real-world situations.
- demonstrate an understanding of congruent and similar polygons.

#### **Skill Objectives**

Students will:

- identify the parts of a triangle.
- classify triangles.
- apply the angle sum theorem.
- apply the exterior angle theorem.
- identify congruent triangles.
- name and label corresponding parts of congruent triangles.
- use SAS, SSS, and ASA postulates to test for triangle congruence.
- use AAS theorem to test for triangle congruence.
- use properties of isosceles and equilateral triangles.

- identify and use medians, altitudes, angle bisectors, perpendicular bisectors, and midsegments in a triangle.
- recognize and use tests for congruence of right triangles.
- recognize and apply the properties of inequalities to the measures of segments and angles.
- apply the triangle inequality theorem.

### **Sample Assessments**

The Streets Of San Francisco

### **Pacing**

5 weeks

## 5. Quadrilaterals

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

#### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

#### ***Extended***

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

#### ***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

**Information and Technology Standards – see page 6**

### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How does the set of quadrilaterals and their properties model the world around us?

### **Core Topics**

- Parallelograms, rectangles, squares, rhombi, trapezoids.
- Proving a quadrilateral is a special one.

### **Unit Objective**

Students will be able to:

- apply the properties of special polygons in problem solving.

### **Skill Objectives**

Students will:

- recognize and define a parallelogram.
- recognize, use and prove the properties of a parallelogram.
- recognize and apply the conditions that ensure that a quadrilateral is a parallelogram.
- recognize the properties of rectangles.
- use properties of rectangles in proofs.
- recognize the properties of squares and rhombi.
- use properties of squares and rhombi in proofs.
- recognize the properties of trapezoids.
- use properties of trapezoids in proofs and other problems.

### **Sample Assessment**

Crank It Up

### **Pacing**

2 weeks

## 6. Similarity

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

#### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

#### ***Extended***

3.1a Students should use methods of deductive and inductive reasoning to make, test, and validate geometric conjectures.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

#### ***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

**Information and Technology Standards – see page 6**

### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How are appropriate techniques, tools, and formulas used in geometry to determine measurements?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How is similarity used to measure indirectly and explore comparable objects?

### **Core Topics**

- Similar polygons
- Dilations and scale factors
- Similar triangle postulates and theorems

### **Unit Objective**

Students will be able to:

- demonstrate an understanding of congruent and similar polygons.

### **Skill Objectives**

Students will:

- recognize and use ratios and proportions.
- apply and use the properties of proportions.
- identify similar figures.
- solve problems involving similar figures.
- identify similar triangles.
- use similar triangles to solve problems.

### **Sample Assessment**

Hit and Run

### **Pacing**

3 weeks

## 7. Right Triangle Trigonometry

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Information and Technology Standards – see page 6

### Essential Questions

- How do geometric relationships and measurements help us to solve problems and make sense of our world?

- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Questions**

- How is trigonometry used to understand the functional and aesthetic uses of right triangles?
- How do triangles, their sides, angles, and special segments model the physical world?

### **Core Topics**

- The Pythagorean Theorem
- Special right triangles
- Sine, cosine, tangent

### **Unit Objective**

Students will be able to:

- use triangles to model and problem solve real-world situations.

### **Skill Objectives**

Students will:

- use the Pythagorean Theorem and its converse.
- use the properties of 45-45-90 and 30-60-90 triangles.
- express trigonometric ratios as fractions or decimals.
- recognize trigonometric relationships from right triangles.
- use a calculator to find values of trigonometric ratios or measures of angles.
- recognize angles of depression or elevation.
- use trigonometry to solve triangles.

### **Sample Assessment**

Stop and Shop

### **Pacing**

2.5 weeks

## 8. Circles

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

***Working with Data: Probability and Statistics - Data can be analyzed to make informed decisions using a variety of strategies, tools and technology.***

**4.3 Students should understand and apply basic concepts of probability.**

***Core***

4.3a Students should understand and apply the principles of probability in a variety of situations.

## **Information and Technology Standards – see page 6**

### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How do circles and their parts relate to the physical world?

### **Core Topics**

- Special lines and line segments of a circle
- Angles formed in circles
- Measurements of angles and line segments of a circle

### **Unit Objective**

Students will be able to:

- apply the properties of special polygons and circles in problem solving.

### **Skill Objectives**

Students will:

- name parts of circles.
- determine relationships between lines and circles.
- write an equation of a circle in the coordinate plane.
- find the measures of arcs and central angles.
- recognize and find the measure of inscribed angles.
- use properties of inscribed figures.

### **Sample Assessments**

To Deliver or Not To Deliver?

### **Pacing**

2 weeks

## 9. Area and Volume of Polygons and Polyhedra

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

#### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

#### ***Extended***

3.2a Students should use a variety of coordinate systems and transformations to solve geometric problems in two- and three-dimensions using appropriate tools and technology.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

#### ***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

*Working with Data: Probability and Statistics - Data can be analyzed to make informed decisions using a variety of strategies, tools and technology.*

#### **4.3 Students should understand and apply basic concepts of probability.**

##### **Core**

4.3a Students should understand and apply the principles of probability in a variety of situations.

#### **Information and Technology Standards – see page 6**

##### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How can a variety of appropriate strategies be applied in solving geometric problems?
- How does algebra relate to geometry graphically?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

##### **Focus Questions**

- How do the calculations and concepts of area and volume relate to two and three-dimensional objects?
- How do triangles, their sides, angles, and special segments model the physical world?
- How is trigonometry used to understand the functional and aesthetic uses of right triangles?

##### **Core Topics**

- Definitions of polygons
- Area of polygons
- Angles of a polygon
- Circumference and area of a circle
- Surface area
- Volume of three-dimensional figures

##### **Unit Objective**

Students will be able to:

- calculate the measure of one, two, and three-dimensional figures.

##### **Skill Objectives**

Students will:

- identify and name polygons.
- identify faces, edges, and vertices of a polyhedron.
- find the sum of the measures of the interior and exterior angles of a convex polygon.
- find the measure of each interior and exterior angle of a regular polygon.
- use angle measures of polygons in problem solving.

- find areas of parallelograms.
- find the areas of triangles, rhombi, and trapezoids.
- find the area of regular polygons.
- find the circumference and area of circles and sectors.
- use area and length to solve problems involving geometric probability.
- create, draw, and fold three-dimensional figures.
- make two-dimensional nets for three-dimensional solids.
- identify parts of prisms and cylinders.
- find the lateral areas and surface areas of right prisms and right cylinders.
- find the lateral area of a regular pyramid.
- find the lateral area and surface area of a right circular cone.
- find the volume of a right prism and a right cylinder.
- find the volume of a pyramid and a circular cone.
- recognize and define basic properties of spheres.
- find the surface area of a sphere.
- find the volume of a sphere.

### **Sample Assessment**

A Sheet of Paper

### **Pacing**

5.5 weeks

## 10. Coordinate Geometry

### Math Standards

***Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.***

**1.1 Students should understand and describe patterns and functional relationships.**

#### ***Extended***

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

***Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.***

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### ***Core***

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

***Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.***

3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.

#### ***Core***

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### ***Core***

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

#### ***Extended***

3.2a Students should use a variety of coordinate systems and transformations to solve geometric problems in two- and three-dimensions using appropriate tools and technology.

**3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.**

#### ***Core***

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

#### ***Extended***

3.3a Students should approximate measurements that cannot be directly determined with some degree of precision using appropriate tools, techniques and strategies.

## **Information and Technology Standards – see page 6**

### **Essential Questions**

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How does algebra relate to geometry graphically?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### **Focus Question**

- How do the algebraic formulas of slope, midpoint, and distance relate to geometry graphically?

### **Core Topics**

- Slope
- Distance
- Midpoint
- Basic coordinate geometry proofs

### **Unit Objective**

Students will be able to:

- calculate the measure of one, two, and three-dimensional figures.

### **Skill Objectives**

Students will:

- use algebraic formulas to calculate slope, distance, and midpoint
- show verification of theorems algebraically and graphically. Use technology of Geometer's Sketchpad to verify theorems of geometry.

### **Sample Assessments**

Where's the Point?

### **Pacing**

2 weeks

## 11. Transformations

### Math Standards

*Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.*

**2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.**

#### *Core*

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

*Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.*

**3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.**

#### *Core*

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

**3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.**

#### *Core*

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

#### *Extended*

3.2a Students should use a variety of coordinate systems and transformations to solve geometric problems in two- and three-dimensions using appropriate tools and technology.

### Information and Technology Standards – see page 6

### Essential Questions

- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?

### Focus Question

- How do transformations provide a way of studying figures?

### Core Topics

- Mappings
- Isometries

- Reflections, rotations, and translations
- Dilations

### **Unit Objective**

Students will be able to:

- recognize and use properties of transformations with geometric figures.

### **Skill Objectives**

Students will:

- name the image and preimage of a mapping.
- recognize an isometry or congruence transformation.
- name a reflection image with respect to a line.
- recognize line symmetry and point symmetry.
- draw reflection images, lines of symmetry, and points of symmetry.
- name and draw translation images of figures.
- name and draw rotation images of figures.
- use scale factors to determine if a dilation is an enlargement, a reduction, or a congruence transformation.
- find the center and scale factor for a given dilation.
- find the dilation image for a given center and scale factor.

### **Sample Assessment**

You see Angels and I see Bats!

### **Pacing**

1.5 weeks