

# GEOMETRY 21

## Description

Geometry 21 offers accelerated coursework with emphasis on 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. In addition, students will perform constructions with compass and straightedge, logic and truth tables and indirect reasoning.

## Course Overview

### Course Goals

Students should:

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

### Assessments

*Common Assessments*

*Skill Assessments*

### Content Outline

- I. [Unit 1](#) - The Language of Geometry
- II. [Unit 2](#) - Reasoning and Proof
- III. [Unit 3](#) - Parallels
- IV. [Unit 4](#) - Congruent Triangles
- V. [Unit 5](#) - Triangles
- VI. [Unit 6](#) - Quadrilaterals
- VII. [Unit 7](#) - Similarity
- VIII. [Unit 8](#) - Right Triangles and Trigonometry
- IX. [Unit 9](#) - Circles
- X. [Unit 10](#) - Area and Volume of Polygons and Polyhedra
- XI. [Unit 11](#) - Coordinate Geometry
- XII. [Unit 12](#) - Transformations

### Standards

[State of Connecticut Mathematics Curriculum Frameworks](#)

Connecticut State Standards are met in the following areas:

- *Algebraic Reasoning: Patterns And Functions*
- *Numerical and Proportional Reasoning*
- *Geometry and Measurement*
- *Working with Data: Probability and Statistics*

### Grade Level Skills

Students will:

- Skills Matrix

Pacing Guide				
1st Marking Period		2nd Marking Period		
September	October	November	December	January
Unit 1  <a href="#"><u>The Language of Geometry</u></a>  2 weeks	Unit 2  <a href="#"><u>Reasoning and Proof</u></a>  5 weeks	Unit 3  <a href="#"><u>Parallels</u></a>  3 weeks	Unit 4  <a href="#"><u>Congruent Triangles</u></a>  3 weeks	Unit 5  <a href="#"><u>Triangles</u></a>  2 weeks

Pacing Guide						
3rd Marking Period			4th Marking Period			
February	March	April	May	June		
Unit 6  <a href="#"><u>Quadrilaterals</u></a>  2 weeks	Unit 7  <a href="#"><u>Similarity</u></a>  3 weeks	Unit 8  <a href="#"><u>Right Triangles and Trigonometry</u></a>  2 weeks	Unit 9  <a href="#"><u>Circles</u></a>  2 weeks	Unit 10  <a href="#"><u>Area and Volume of Polygons and Polyhedra</u></a>  4 weeks	Unit 11  <a href="#"><u>Coordinate Geometry</u></a>  1 ½ weeks	Unit 12  <a href="#"><u>Transformations</u></a>  2 weeks

## Unit 1 - The Language of Geometry, 2 weeks [top](#)

### 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.

### Unit Objective

Students will be able to:

- demonstrate an understanding of the language of geometry.

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?

### Focus Questions

- How do mathematical ideas interconnect and build on one another to produce a coherent

### Assessment

- Crossing 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.

	<p>whole?</p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How can the language of geometry be used to communicate mathematical ideas coherently and precisely?</li> <li>• How does the language of geometry provide immediate experience with the physical world?</li> </ul>	<ul style="list-style-type: none"> <li>• find the distance between points in a coordinate plane.</li> <li>• find the midpoint of a segment.</li> <li>• identify and use congruent segments.</li> <li>• identify and use parts of angles.</li> <li>• use the angle addition postulate to find the measure of angles.</li> <li>• classify angles as acute, obtuse, right and straight.</li> <li>• identify and use congruent angles and the bisector of an angle.</li> <li>• identify and use adjacent angles, vertical angles, linear pairs of angles, and supplementary angles.</li> <li>• identify and use right angles and perpendicular lines.</li> <li>• determine what information can and cannot be assumed from a figure.</li> </ul>
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## Unit 2 – Reasoning and Proof, 5 weeks [top](#)

### 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.

### Unit Objective

Students will be able to:

- use inductive and deductive reasoning to make conjectures and conclusions.

### Essential Question

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

### Focus Questions

- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- 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?

### Assessment

- Murder Mystery

### Skill Objectives

Students will:

- 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.
- write the inverse, contra-positive, and negation 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.
- use the principles of logic to create valid arguments.
- display the validity of logical statements using truth tables.

### Unit 3 - Parallels, 3 weeks [top](#)

#### 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.

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.

3.1b Students should explore non-Euclidean Geometries.

#### **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.

#### Unit Objective

Students will be able to:

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

#### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?

#### Focus Questions

- How does geometry model the physical world?

#### Assessment

- Ferris Wheel

#### 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.

	<ul style="list-style-type: none"> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How does algebra relate to geometry graphically?</li> <li>• How do parallel lines, transversals, and related angles model the physical world?</li> </ul>	<ul style="list-style-type: none"> <li>• recognize angle conditions that produce parallel lines.</li> <li>• prove two lines parallel based on given angle relationships.</li> <li>• find the slope of a line.</li> <li>• use slope to identify parallel and perpendicular lines.</li> <li>• recognize and use distance relationships among points, lines and planes.</li> </ul>
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## Unit 4 - Congruent Triangles, 3 weeks [top](#)

### 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.

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.

### Unit Objective

Students will be able to:

- demonstrate an understanding of congruent and similar polygons.

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and

### Assessment

- Buried Treasure

### Skill Objectives

Students will:

- identify the parts of a triangle.
- classify triangles.
- apply the angle sum theorem.



	<p>make sense of our world?</p> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How does the geometric principle of congruence in triangles apply to the real world?</li> </ul>	<ul style="list-style-type: none"> <li>• apply the exterior angle theorem.</li> <li>• identify congruent triangles.</li> <li>• name and label corresponding parts of congruent triangles.</li> <li>• use SAS, SSS, and ASA postulates to test for triangle congruence.</li> <li>• use AAS theorem to test for triangle congruence.</li> <li>• use properties of isosceles and equilateral triangles.</li> </ul>
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## Unit 5 - Triangles, 2 weeks [top](#)

### 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.

### Unit Objective

Students will be able to:

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

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?
- How do geometric relationships and

### Assessment

- Amusement Park

### Skill Objectives

Students will:

- identify and use medians, altitudes, angle bisectors, perpendicular bisectors,

	<p>measurements help us to solve problems and make sense of our world?</p> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How do triangles, their sides, angles, and special segments model the physical world?</li> </ul>	<p>and midsegments in a triangle.</p> <ul style="list-style-type: none"> <li>• recognize and use tests for congruence of right triangles.</li> <li>• use indirect reasoning and indirect proof to reach a conclusion.</li> <li>• recognize and apply the properties of inequalities to the measures of segments and angles.</li> <li>• apply the triangle inequality theorem.</li> </ul>
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## Unit 6 – Quadrilaterals, 2 weeks [top](#)

### 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.

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 can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Unit Objective

Students will be able to:

- apply the properties of special polygons in problem solving.

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?

### Assessment

- Home Foundation

### Skill Objectives

Students will:

- recognize and define a parallelogram.

	<ul style="list-style-type: none"> <li>• How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How does the set of quadrilaterals and their properties model the world around us?</li> </ul>	<ul style="list-style-type: none"> <li>• recognize, use and prove the properties of a parallelogram.</li> <li>• recognize and apply the conditions that ensure that a quadrilateral is a parallelogram.</li> <li>• recognize the properties of rectangles.</li> <li>• use properties of rectangles in proofs.</li> <li>• recognize the properties of squares and rhombi.</li> <li>• use properties of squares and rhombi in proofs.</li> <li>• recognize the properties of trapezoids.</li> <li>• use properties of trapezoids in proofs and other problems.</li> </ul>
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## Unit 7 – Similarity, 3 weeks [top](#)

### 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 can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Unit Objective

Students will be able to:

- demonstrate an understanding of congruent and similar polygons.

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented

### Assessment

- Cropping a Photo

### Skill Objectives

Students will:

	<p>by numbers?</p> <ul style="list-style-type: none"> <li>• How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How are appropriate techniques, tools, and formulas used in geometry to determine measurements?</li> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How is similarity used to measure indirectly and explore comparable objects?</li> </ul>	<ul style="list-style-type: none"> <li>• recognize and use ratios and proportions.</li> <li>• apply and use the properties of proportions.</li> <li>• identify similar figures.</li> <li>• solve problems involving similar figures.</li> <li>• identify similar triangles.</li> <li>• use similar triangles to solve problems.</li> <li>• use self-similarity and iteration to build fractal designs.</li> </ul>
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## Unit 8 – Right Triangles and Trigonometry, 2 weeks [top](#)

### 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 can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Unit Objective

Students will be able to:

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

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented

### Assessment

- Staircase Railing

### Skill Objectives

Students will:



	<p>by numbers?</p> <ul style="list-style-type: none"> <li>• How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How is trigonometry used to understand the functional and aesthetic uses of right triangles?</li> <li>• How do triangles, their sides, angles, and special segments model the physical world?</li> </ul>	<ul style="list-style-type: none"> <li>• use the Pythagorean Theorem and its converse.</li> <li>• use the properties of 45-45-90 and 30-60-90 triangles.</li> <li>• express trigonometric ratios as fractions or decimals.</li> <li>• recognize trigonometric relationships from right triangles.</li> <li>• use a calculator to find values of trigonometric ratios or measures of angles.</li> <li>• recognize angles of depression or elevation.</li> <li>• use trigonometry to solve triangles.</li> </ul>
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## Unit 9 – Circles, 2 weeks [top](#)

### 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 can not 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.

### Unit Objective

Students will be able to:

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

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented

### Assessment

- Billiard Balls

### Skill Objectives

Students will:

	<p>by numbers?</p> <ul style="list-style-type: none"> <li>• How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> <li>• How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>• How do circles and their parts relate to the physical world?</li> </ul>	<ul style="list-style-type: none"> <li>• name parts of circles.</li> <li>• determine relationships between lines and circles.</li> <li>• write an equation of a circle in the coordinate plane.</li> <li>• find the measures of arcs and central angles.</li> <li>• recognize and find the measure of inscribed angles.</li> <li>• use properties of inscribed figures.</li> <li>• recognize and find the measure of angles by secants and tangents of circles.</li> <li>• recognize and find the measure of segments related to circles, including secant-secant, secant-tangent, and chord-chord segments.</li> </ul>
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## Unit 10 – Area and Volume of Polygons and Polyhedra, 4 weeks [top](#)

### 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.

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 can not 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.

### Unit Objective

Students will be able to:

### Essential Questions

- How do patterns and functions help us

### Assessment

- The Seven Ancient Wonders of the World

<ul style="list-style-type: none"> <li>calculate the measure of one, two, and three-dimensional figures.</li> </ul>	<p>describe data and physical phenomena and solve a variety of problems?</p> <ul style="list-style-type: none"> <li>How are quantitative relationships represented by numbers?</li> <li>How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>How does geometry model the physical world?</li> <li>How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>How can a variety of appropriate strategies be applied in solving geometric problems?</li> <li>How do the calculations and concepts of area and volume relate to two and three-dimensional objects?</li> <li>How do triangles, their sides, angles, and special segments model the physical world?</li> <li>How is trigonometry used to understand the functional and aesthetic uses of right triangles?</li> <li>How does algebra relate to geometry graphically?</li> </ul>	<p><b><u>Skill Objectives</u></b></p> <p>Students will:</p> <ul style="list-style-type: none"> <li>identify and name polygons.</li> <li>identify faces, edges, and vertices of a polyhedron.</li> <li>find the sum of the measures of the interior and exterior angles of a convex polygon.</li> <li>find the measure of each interior and exterior angle of a regular polygon.</li> <li>use angle measures of polygons in problem solving.</li> <li>find areas of parallelograms.</li> <li>find the areas of triangles, rhombi, and trapezoids.</li> <li>find the area of regular polygons.</li> <li>find the circumference and area of circles and sectors.</li> <li>use area and length to solve problems involving geometric probability.</li> <li>create, draw, and fold three-dimensional figures.</li> <li>make two-dimensional nets for three-dimensional solids.</li> <li>identify parts of prisms and cylinders.</li> <li>find the lateral areas and surface areas of right prisms and right cylinders.</li> <li>find the lateral area of a regular pyramid.</li> <li>find the lateral area and surface area of a right circular cone.</li> <li>find the volume of a right prism and a right cylinder.</li> <li>find the volume of a pyramid and a circular cone.</li> <li>recognize and define basic properties of spheres.</li> <li>find the surface area of a sphere.</li> <li>find the volume of a sphere.</li> </ul>
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## Unit 11 – Coordinate Geometry, 1 1/2 weeks [top](#)

### 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.

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 can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

### Unit Objective

Students will be able to:

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

### Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?

### Assessment

- Name That Triangle

### Skill Objectives

Students will:

- calculate, develop, and apply algebraic

	<ul style="list-style-type: none"> <li>• How do geometric relationships and measurements help us to solve problems and make sense of our world?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>• How does geometry model the physical world?</li> <li>• How do mathematical ideas interconnect and build on one another to produce a coherent whole?</li> <li>• How does algebra relate to geometry graphically?</li> </ul>	<p>formulas of slope, distance, and midpoint.</p> <ul style="list-style-type: none"> <li>• prove theorems using coordinate proofs.</li> </ul>
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## Unit 12 – Transformations, 2 weeks [top](#)

### 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.

### Unit Objective

Students will be able to:

- recognize and use properties of transformations with geometric figures.

### Essential Questions

- How are quantitative relationships represented by numbers?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?

### Focus Questions

- How does geometry model the physical world?
- How do mathematical ideas interconnect and build on one another to produce a coherent whole?
- How do transformations provide a way of studying figures?

### Assessment

- Escher Fish

### 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



		<p>figures.</p> <ul style="list-style-type: none"> <li>• use scale factors to determine if a dilation is an enlargement, a reduction, or a congruence transformation.</li> <li>• find the center and scale factor for a given dilation.</li> <li>• find the dilation image for a given center and scale factor.</li> </ul>
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