

# **DARIEN PUBLIC SCHOOLS**

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## **CURRICULUM GUIDE**



**Geometry**

**Approved by the Board of Education: January 14, 2003**  
**Revision and Update Approved by the Board of Education: October 11, 2005**

# **DARIEN PUBLIC SCHOOLS**

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## TABLE OF CONTENTS

### SECTION I – Course Information

Statement of Philosophy.....	5
Program Goals.....	6
Overview.....	7
Essential Questions.....	8
Process Skills.....	9
Student Performance Summary.....	10
Grading Guidelines.....	10

### SECTION II – Units of Study

Unit Title
UNIT 1: BASICS OF GEOMETRY
UNIT 2: REASONING AND PROOF
UNIT 3: PERPENDICULAR AND PARALLEL LINES
UNIT 4: CONGRUENT TRIANGLES
UNIT 5: QUADRILATERALS
UNIT 6: SIMILARITY
UNIT 7: RIGHT TRIANGLES AND TRIGONOMETRY
UNIT 8: POLYGONS AND AREAS
UNIT 9: SURFACE AREA AND VOLUME
UNIT 10: TRANSFORMATIONS
UNIT 11: SPECIAL PROPERTIES OF TRIANGLES
UNIT 12: CIRCLES

### SECTION III - Summary of Related Goals and Standards

The Connecticut Framework: K-12 Curricular Goals and Standards.....	39
National Standards.....	40

<b>SECTION IV – Learning Resources.....</b>	<b>41</b>
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# **SECTION I - Course Information**

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## **STATEMENT OF PHILOSOPHY**

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### **HS MATHEMATICS DEPARTMENT PHILOSOPHY**

We believe in creating learning environments where students practice and acquire the knowledge of mathematics. We believe that students should be able to proficiently apply a range of numerical, algebraic, geometric, and statistical concepts and the skills to formulate, analyze, and solve real world problems. The learning environment will facilitate inquiry, use of technology and the exploration of real world phenomena. It will support continuous development of mathematical skills and the appreciation of mathematics as a discipline. Our mathematics program seeks to graduate students who will possess a sense of numbers, data analysis, spatial relationships, symbolic representations, and the ability to communicate mathematics with others.

### **DISTRICT MATHEMATICS PHILOSOPHY**

Mathematics is a vigorous and growing discipline – a universal language useful for communication and research in other disciplines. We want our students to reason and communicate mathematically, to be mathematical problem-solvers, to value mathematics and to feel confident in their ability to use mathematics. Creating such a foundation necessitates a well-articulated and developmentally appropriate mathematics program for all, developing the mathematical power of each.

Mathematics is more than a collection of concepts and skills to be mastered. It is the exploration of ideas and concepts, the understanding of relationships, the ability to make predictions, to analyze data, to estimate results, to communicate ideas and to solve problems in this ever-changing world. It is no longer limited to the study of complex calculations and formulas. We are moving from a curriculum often dominated by memorization of isolated facts and procedures to one that emphasizes conceptual understandings, multiple representations, deliberate connections and mathematical problem solving. Rather than being a transmitter of knowledge, the teacher becomes a facilitator of learning, guiding, questioning, listening, clarifying and creating an environment in which the student is an active participant in learning.

The needs of today's society demand that all students become mathematically literate to function effectively. It will be necessary for our students to be able to use mathematics in their personal lives, further studies and future workplaces. As educators, we must recognize that students have differing abilities, performance levels, needs and interests and provide them with the best mathematics education possible so that they may achieve their personal ambitions and career goals.

Too often, students have learned to compute without understanding why the computation procedures make sense or how they apply to their lives. Instruction must focus on the behaviors that contribute to the development of mathematical thinking and number sense – explaining procedures used, justifying reasoning, judging the reasonableness of solutions and reflecting on the application of concepts.

When students gain knowledge from meaningful experiences, they are much more likely to retain and use what they have learned. Sound practice in the teaching of mathematics means that students are guided to use concrete materials and explore ideas with classmates. In this way, knowledge evolves from personal experience.

The fundamental objective of education has always been to prepare students to be contributing members of the society in which they live. The objectives of this mathematics curriculum support and affirm this tradition.

## PROGRAM GOALS

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- Introduce students to the language of geometry
- Make students comfortable with shape recognition, manipulation, and analysis
- Learn how to synthesize algebraic and geometric concepts
- Enable students to use geometry to define and solve problems
- Provide the opportunity to develop geometric logical reasoning
- Show how geometry is connected with other disciplines and real world situations
- Make students aware of the historical development of geometry
- Allow students to look for patterns through investigation and discovery
- Introduce students to deductive and inductive reasoning

## **OVERVIEW**

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This course focuses on the principles of geometry and presents it as a firm basis for the study of higher mathematics. Students will study Euclidean geometry, and learn to develop a sound foundation of logical reasoning through the study of shapes, patterns, and proofs. Through the use of real-life examples, student understanding of geometric concepts will be developed and strengthened. Students will be required to utilize the skills learned in Algebra I throughout the course.

Geometry is taken in the 8<sup>th</sup> grade in middle school (super accelerated), in the 9<sup>th</sup> grade in high school (accelerated) and in the 10<sup>th</sup> grade (regular students). The prerequisite is algebra I.

## **ESSENTIAL QUESTIONS**

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### **For Course:**

- 1) How can we better understand the world around us by analyzing and recognizing geometric patterns?
- 2) How can analyzing the general shape of objects around us (in 2 and 3 dimensions) enable us to build and design better and more efficient structures?
- 3) How can the act of “measuring the earth” enable us to more precisely explain, organize, and understand the world around us?
- 4) How can students present a logical argument?
- 5) Can students apply algebraic concepts to geometric situations?

### **K-12 Math Curriculum Essential Questions**

- How does math help us to make sense of our world?
- How does math help us to understand real-world phenomena, make decisions and meet challenges?
- What are the natural and cultural patterns around us?
- How does math, as a universal language, empower us and help us to communicate?

#### Discussion Ideas:

Understand patterns in the world around us  
To be able to function in society (ex. understand paychecks)  
Deductive reasoning  
Intelligent citizenship  
Problem-solving skills  
Abstract/concrete  
Opening the mind to possibilities  
Effective communication  
Mental math  
Understanding practical uses  
Technology and math

## **PROCESS SKILLS**

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- Reading (Comprehending)
- Reading (Analyzing)
- Reading (Appreciating)
- Writing mathematical equations
- Speaking the language of geometry
- Listening
- Viewing
- Studying
- Reasoning and Reflecting
- Using Learning Resources, manipulatives, Technology
- Working Independently and Collaboratively
- Designing
- Creating
- Quantifying
- Understanding Number Operations
- Computing
- Problem Solving
- Graphing
- Applying Probability and Statistics
- Applying Scientific Method

## **STUDENT PERFORMANCE SUMMARY**

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- Cooperative learning
- Computer based lab work
- Hands-on manipulation
- Poster projects
- Internet “Problem of the Week”

## **GRADING GUIDELINES**

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	<b><u>Expectations of Students</u></b>	<b><u>% of Report Card Grade</u></b>
Homework	100% of all assignments	0 -10%
Notebook	All notes maintained	
Tests	All tests taken/made up	45 – 60%
Quizzes	All quizzes taken/made up	30 – 40%
Mid-Year Exams		20% of semester grade
Final Exams		20% of semester grade
Projects		0 – 20%
Class Participation		0 – 5%

## **SECTION II – Units of Study**

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### **SUMMARY OF UNITS**

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Unit Title	Duration (weeks)
UNIT 1: BASICS OF GEOMETRY	3-4
UNIT 2: REASONING AND PROOF	1-2
UNIT 3: PERPENDICULAR AND PARALLEL LINES	3-4
UNIT 4: CONGRUENT TRIANGLES	2-3
UNIT 5: QUADRILATERALS	2-3
UNIT 6: SIMILARITY	2-3
UNIT 7: RIGHT TRIANGLES AND TRIGONOMETRY	3-4
UNIT 8: POLYGONS AND AREAS	2-3
UNIT 9: SURFACE AREA AND VOLUME	2-3
UNIT 10: TRANSFORMATIONS	1-2
UNIT 11: SPECIAL PROPERTIES OF TRIANGLES	2-3
UNIT 12: CIRCLES	3-4

## UNIT 1: BASICS OF GEOMETRY

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- 1) Does the student understand basic terms and geometric shapes?
- 2) Can the student measure segments and angles?
- 3) Can the student find relationships between special shapes and angles?

### STANDARDS

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**6. Spatial Relationships** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

### CONTENT KNOWLEDGE OBJECTIVES

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#### Content:

1. Points, lines and planes
2. Patterns
3. Distance formula
4. Segment postulates
5. Angle postulates
6. Classification of angles
7. Segment and angle bisectors
8. Pairs of angles
9. Perimeter

#### Skills:

1. Find and describe patterns
2. Use inductive reasoning to make conjectures
3. Understand and use geometric terminology
4. Sketch intersection of lines and planes
5. Discover the distance formula, segment and angle postulates
6. Classify angles
7. Bisect a segment and angle
8. Identify special pairs of angles
9. Find the perimeter of common plane figures

### VOCABULARY

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Acute angles, adjacent angles, angle, angle bisector, collinear, complementary angles, congruent, segments, coordinate plane, coplanar, intersection, line, linear pair, midpoint, obtuse angle, opposite rays, ordered pair, origin, perpendicular lines, plain, point, quadrants, ray, right angle, straight angle, supplementary angle, vertical angles

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## **ACTIVITIES**

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- Measure angles with a protractor
- Construct a coordinate plain

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, and Homework.

## **CAREER AWARENESS (where appropriate)**

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Engineering, architecture, teaching, construction, fine arts, industrial design, plumbing, athletics

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## **UNIT 2: BASIC CONCEPTS AND PROOFS**

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1. Can the student use inductive reasoning to make conjectures?
  2. Can the student use the laws of logic to make conclusions?
  3. Can the student recognize and understand the deductive structure which geometry is based on?
  4. Can the student use deductive reasoning to write formal two-column proofs?
- 

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

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### **CONTENT KNOWLEDGE OBJECTIVES**

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**Content:**

1. Conditional statements, converses and postulates
2. Symbolic notation
3. Laws of logic
4. Properties of algebra
5. Properties of length and measure
6. Two column proofs dealing with angles and segments

**Skills:**

1. Recognize and analyze a conditional statement
2. Write postulates about points, lines and planes using conditional statements
3. Recognize and use definitions and biconditional statements
4. Use symbolic notation to represent logical statements
5. Form conclusions using the laws of logic
6. Use properties from algebra in proofs
7. Use properties of lengths and measures in proofs
8. Write reasons for steps in proofs
9. Prove properties about special pairs of angles

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## **VOCABULARY**

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Conclusion, conditional statement, conjecture, converse, counterexample, deductive reasoning, hypothesis, if-then statement, inductive reasoning, law of detachment, law of syllogism, postulate, theorem, two-column proof

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## **ACTIVITIES**

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1. Use Geometer's Sketchpad Computer program to discover properties inductively and make conjectures
2. Write formal proofs

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## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

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## **CAREER AWARENESS (where appropriate)**

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Lawyer, Politician, Judge, Supreme Court Justice

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## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

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## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

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## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 3: PERPENDICULAR AND PARALLEL LINES

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1. Can the student use the properties of parallel lines?
2. Can the student find and use the slopes of lines?
3. Is the student able to recognize and use distance relationships between points, lines and planes?

### STANDARDS

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**3. Estimation and Approximation** Students will make estimates and approximations, and judge the reasonableness of results.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

**9. Algebra and Functions** Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

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### CONTENT KNOWLEDGE OBJECTIVES

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#### Content

1. Line relationships
2. Names of angles
3. Flow and paragraph proofs
4. Parallel lines and transversals
5. Perpendicular lines
6. Slope
7. Equations of lines in the coordinate plane

## Skills

1. Identify relationships between lines
2. Identify angles formed by transversals
3. Compare different types of proofs
4. Prove results about perpendicular lines
5. Prove and use results about parallel lines and transversals
6. Prove that two lines are parallel
7. Find the slopes of lines
8. Write the equations of parallel and perpendicular lines.

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## **VOCABULARY**

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Coplanar, parallel, parallel lines, parallel planes, slope, skew lines, transversal, reciprocal, parallelogram, parallelepiped

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## **ACTIVITIES**

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Parallel line constructions  
Optical Illusion Diagnosis  
Historical Connection

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## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

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## **CAREER AWARENESS (where appropriate)**

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Architecture, Teaching, Construction, Nursing, Fine Arts, Athletics, Department of Transportation, Bricklayer, Train Conductor

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## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 4: CONGRUENT TRIANGLES

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1. Can the student prove triangles are congruent given information about their sides and angles?
2. Can the student use congruent triangles to solve real-life problems?

### STANDARDS

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**1. Number Sense:** Students will use numbers to count, measure, compare, order, scale, locate and label, and use a variety of numerical representations to present, interpret, communicate and connect various kinds of numerical information.

**3. Estimation and approximation:** Students will make estimates and approximations, and judge the reasonableness of results.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

### CONTENT KNOWLEDGE OBJECTIVES

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#### Content:

1. Triangle classification
2. Congruent figures
3. Corresponding parts
4. Triangle congruence postulates and theorems
5. Congruent triangle proofs
6. Isosceles, equilateral and right triangle properties

#### Skills:

1. Classify triangles by their sides and angles
2. Find angle measures in triangles
3. Identify congruent figures and corresponding parts
4. Prove that two triangles are congruent
5. Use congruent triangles to plan and write proofs
6. Use properties of isosceles, equilateral and right triangles

## **VOCABULARY**

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Base, acute triangle, base angles, corollary, equiangular, equilateral, exterior angle, hypotenuse, included angle, isosceles triangle, legs, line symmetry, obtuse triangle, remote angles, right triangle, scalene triangle, sides, vertex angle, vertices

## **ACTIVITIES**

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- Construct congruent triangles
- Congruent triangle proofs

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Engineering, architecture, teaching, construction, fine arts, industrial design, plumbing, athletics, sanitation engineer.

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 5: QUADRILATERALS

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1. Will the student be able to recognize and use the properties of parallelograms, rhombi, rectangles, squares, trapezoids and kites?

### STANDARDS

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**1. Number Sense** Students will use numbers to count, measure, compare, order, scale, locate and label, and use a variety of numerical representations to present, interpret, communicate and connect various kinds of numerical information.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**9. Algebra and Functions** Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

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### CONTENT KNOWLEDGE OBJECTIVES

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#### Content

1. Polygon definition
2. Interior angles of polygons
3. Quadrilateral proofs
4. Special parallelograms
5. Special quadrilaterals
6. Area of quadrilaterals and triangles

## Skills

1. Identify, name and describe polygons
2. Find the sum of the interior angles of a quadrilateral
3. Use properties of parallelograms
4. Prove that a quadrilateral is a parallelogram
5. Discover properties of special parallelograms
6. Use the properties of trapezoids and kites
7. Prove that a quadrilateral is a special quadrilateral
8. Find the area of special quadrilaterals and triangles

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## **VOCABULARY**

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Base, Base Angle, Diagonal, Isosceles trapezoid, Leg, Median, Polygon, Parallelogram, Kite, Quadrilateral, Rectangle, Rhombus, Square, Sides, Vertices, Trapezoid

## **ACTIVITIES**

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Coordinate graphing of Quadrilaterals, Geometer's Sketchpad Assignment, and Paper Folding

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Architecture, Teaching, Construction, Fine Arts, Athletics, Appliance Repair, Sign Design

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 6: SIMILARITY

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1. Can the student prove triangles similar given information about their sides and angles.
2. Can the student apply the concept of proportionality to real life situations such as map scaling.

### STANDARDS

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**Ratios, Proportions and Percents:** Students will use ratios, proportions and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions and percents.

**Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

### CONTENT KNOWLEDGE OBJECTIVES

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**Content:**

1. Ratios
2. Properties of proportions
3. Similar polygons
4. Properties of similar polygons
5. Similarity postulate and theorems
6. Proportionality theorems

**Skills:**

1. Find and simplify the ratio of two numbers
2. Use proportions to solve real-life problems
3. Discover the properties of proportions
4. Identify similar polygons
5. Identify and prove that two triangles are similar
6. Use proportionality theorems to calculate segment lengths

### VOCABULARY

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Cross products, proportions, rates, ratio, and similar polygons

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## **ACTIVITIES**

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- Map design

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Engineering, architecture, teaching, construction, fine arts, industrial design, plumbing, athletics, cartographer

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 7: RIGHT TRIANGLES AND TRIGONOMETRY

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1. Will the student be able to discover properties related to general right triangles, similar right triangles, and special right triangles?
2. Can the student make applications of right triangles including trigonometry.

### STANDARDS

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**4. Ratios, Proportions and Percents** Students will use ratios, proportions and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions and percents.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**9. Algebra and Functions** Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

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### CONTENT KNOWLEDGE OBJECTIVES

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#### Content

1. Similar right triangles
2. The Pythagorean theorem and its converse
3. Trigonometric ratios
4. Applications of trigonometry
5. Special right triangles

#### Skills

1. Solve problems involving similar right triangles
2. Find the geometric mean between two numbers
3. Prove the Pythagorean theorem
4. Apply the Pythagorean theorem and its converse
5. Use side lengths to classify triangles by their angle measures

6. Find the side lengths of special right triangles
7. Find the sine, cosine and the tangent of an acute angle
8. Solve a right triangle

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## **VOCABULARY**

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Angle of Depression, Angle of Elevation, Cosine, Sine, Tangent, Geometric Mean, Law of Cosines, Law of Sines, Pythagorean Theorem, Trigonometry, Trigonometric Ratio

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## **ACTIVITIES**

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Calculator Exploration  
Geometer's Sketchpad Assignment  
Flag Pole Experiment

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## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

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## **CAREER AWARENESS (where appropriate)**

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Architecture, Teaching, Construction, Fine Arts, Athletics, Navigator, Pilot, Ship's Captain

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## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

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## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

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## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 8: POLYGONS AND AREA

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1. Can the student identify parts of polygons and polyhedrons?
2. Can the student find the area of polygons?
3. Can the student find the area and circumference of circles?

### STANDARDS

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**3. Estimation and Approximation** Students will make estimates and approximations, and judge the reasonableness of results.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

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### CONTENT KNOWLEDGE OBJECTIVES

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#### Content

1. Polygons and Polyhedra
2. Angles of Polygons
3. Area of Parallelograms
4. Area of Triangles
5. Area of Rhombi
6. Area of Trapezoids
7. Area of Regular Polygons
8. Area and Circumference of triangles
9. Geometric Probability

#### Skills

1. Classify and identify parts of polygons and polyhedrons

2. Find the measure of angles in polygons
3. Find the area of parallelograms
4. Find the area of triangles, rhombi, and trapezoids
5. Find the circumference and area of a circle
6. Find geometric probabilities

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## **VOCABULARY**

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Altitude, Apothem, Area, Base, Central Angle, Circumference, Concave, Complex, Edge, Face, Height, Polygon, Polyhedron, Regular, Sector of a circle, vertex

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## **ACTIVITIES**

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Diagonals Assignment  
Geometer's Sketchpad Assignment  
Street Sign Assessment

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## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

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## **CAREER AWARENESS (where appropriate)**

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Mineralogy, Architecture, Landscaping, Engineering, Interior design, Real Estate, Gardening, Construction, Bicycling, Sewing, Travel

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## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

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## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

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## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 9: SURFACE AREA AND VOLUME

1. Can the student solve problems by making models?
2. Can a student draw three-dimensional figures?
3. Can the student find lateral areas, surface areas, and volumes of solids?

### STANDARDS

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**2. Operations** Students will add, subtract, multiply and divide with whole numbers, fractions, decimals and integers, and develop strategies for selecting the appropriate computational and operational methods for solving problems.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

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### CONTENT KNOWLEDGE OBJECTIVES

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#### Content:

1. Exploring surface Area
2. Surface area and volume of prisms
3. Surface area and volume of cylinders
4. Surface area and volume of pyramids
5. Surface area and volume of cones
6. Surface area and volume of spheres

#### Skills:

1. Find the lateral areas and total surface areas of right prisms
2. Find the lateral areas and total surface areas of right cylinders.
3. Find the lateral areas and surface areas of regular pyramids
4. Find the lateral areas and total surface areas of right circular cones
5. Find the volume of right prisms
6. Find the volume of right cylinders
7. Find the volume of circular cones
8. Find the volume of pyramids
9. Find the surface area and volume of spheres

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## **VOCABULARY**

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Altitude, axis, base, chord, cone, cylinder, diameter, great circle, height, hemisphere, lateral area, lateral edge, lateral face, prism, pyramid, radius, regular pyramid, right circular cone, right cylinder, right prism, slant height, solid, sphere, surface area, tangent, volume

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## **ACTIVITIES**

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Construct mathematical models of prisms, pyramids, cylinders, cones, spheres

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## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

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## **CAREER AWARENESS (where appropriate)**

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Manufacturing, Aircraft, Agriculture, Mining, Highway management, Construction, Sports, Travel

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## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

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## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

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## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 10: TRANSFORMATIONS

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1. Can the student draw reflection images, lines of symmetry and points of symmetry?
2. Can the student draw translation, rotation and dilation images?

## STANDARDS

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**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

## CONTENT KNOWLEDGE OBJECTIVES

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### Content:

1. Mappings
2. Reflections
3. Translations
4. Rotations
5. Dilations

### Skills:

1. Name the image and preimage of a mapping.
2. Recognize an isometry or congruence transformation.
3. Name a reflection image with respect to a line.
4. Recognize line symmetry and point symmetry
5. Draw reflection images, lines of symmetry and points of symmetry.
6. Name and draw translation images of figures with respect to parallel lines.
7. Name and draw rotation images of figures with respect to intersecting lines.
8. Use scale factors to determine if a dilation is an enlargement, a reduction or a congruence transformation.
9. Find the center and scale factor for a given dilation.
10. Find the dilation image for a given center and scale factor.

## VOCABULARY

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Angle of rotation, center of dilation, center of rotation, composite of reflections, congruence transformation, dilation, image, isometry, line of symmetry, point of

symmetry, preimage, reflection, rotation, scale factor, similarity transformation, transformation and translation.

## **ACTIVITIES**

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- Tile manipulatives to visualize mappings
- Create personal “M.C. Escher” artwork

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Geography, art, cartoons, manufacturing, computers, photography and publishing.

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 11: SPECIAL PROPERTIES OF TRIANGLES

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- 1) Can the student use properties of special lines and segments related to triangles?
- 2) Can the student compare side lengths and angle measures in one or more triangles?

### STANDARDS

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**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

### CONTENT KNOWLEDGE OBJECTIVES

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**Content:**

6. Special segments in triangles
7. Triangle inequality theorem
8. Side-angle relationships
9. Indirect proofs
10. Hinge theorem

**Skills:**

1. Use properties of perpendicular bisectors
2. Use properties of angle bisectors
3. Use properties of medians of a triangle
4. Use properties of altitudes of a triangle
5. Use properties of midsegments of a triangle
6. Use triangle measurements to decide largest and smallest angle and side
7. Apply the triangle inequality theorem
8. Read and write an indirect proof
9. Apply the hinge theorem

### VOCABULARY

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Altitude, angle bisector, indirect proof, indirect reasoning, median, perpendicular bisector

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## **ACTIVITIES**

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- Problem solving strategies with indirect reasoning
- Straw bending for triangle inequality

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Engineering, architecture, teaching, construction, fine arts, industrial design, plumbing, athletics, private investigator.

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## UNIT 12: CIRCLES

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1. Can the student name parts of circles?
2. Can the student find relationships between lines and circles?
3. Can the student write the equation of a circle in the coordinate plane?

### STANDARDS

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**4. Ratios, Proportions and Percents:** Students will use ratios, proportions and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions and percents.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

**9. Algebra and Functions** Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

### CONTENT KNOWLEDGE OBJECTIVES

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#### Content:

2. Parts of circles
3. Angles and arcs
4. Arcs and chords
5. Inscribed angles
6. Tangents
7. Angle measures
8. Special Segments
9. Problem solving

#### Skills:

1. Name parts of circles
2. Find degree measure of arcs and central angles
3. Recognize and use relationships between arcs chords and diameters
4. Recognize and find the measures of inscribed angles
5. Use properties of tangents
6. Find the measure of angles formed by the intersections of secants and tangents in relation to intersected angles.

7. Use properties of chords secants and tangents.

## **VOCABULARY**

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Cross products, proportions, rates, ratio, and similar polygons

## **ACTIVITIES**

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- Map design

## **PERFORMANCE ASSESSMENT**

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Tests, Quizzes, Homework, Special Assignments, Class participation, Oral Presentations, Group Projects Tests, Homework.

## **CAREER AWARENESS (where appropriate)**

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Engineering, architecture, teaching, construction, fine arts, industrial design, plumbing, athletics, cartographer

## **CORE TEXT FOR STUDENTS**

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Basic Geometry, Houghton Mifflin  
Geometry, Applications and Connections, Merrill  
Geometry for Enjoyment and Challenge, McDougal Littell

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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See section IV, Learning Resources

## **MATERIALS AND SUPPLIES**

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See section IV, Learning Resources

## **SECTION III - Goals and Standards**

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## **Connecticut Content Standards**

**1. Number Sense** Students will use numbers to count, measure, compare, order, scale, locate and label, and use a variety of numerical representations to present, interpret, communicate and connect various kinds of numerical information.

**2. Operations** Students will add, subtract, multiply and divide with whole numbers, fractions, decimals and integers, and develop strategies for selecting the appropriate computational and operational methods for solving problems.

**3. Estimation and Approximation** Students will make estimates and approximations, and judge the reasonableness of results.

**4. Ratios, Proportions and Percents** Students will use ratios, proportions and percents to represent relationships between quantities and measures and solve problems involving ratios, proportions and percents.

**5. Measurement** Students will make and use measurements in both customary and metric units to approximate, measure and compute length, area, volume, mass, temperature, angle and time.

**6. Spatial Relationships and Geometry** Students will analyze and use spatial relationships and basic concepts of geometry to construct, draw, describe and compare geometric models and their transformations, and use geometric relationships and patterns to solve problems.

**7. Probability and Statistics** Students will use basic concepts of probability and statistics to collect, organize, display and analyze data, simulate events and test hypotheses.

**8. Patterns** Students will discover, analyze, describe, extend and create patterns, and use patterns to describe mathematical and other real-world phenomena.

**9. Algebra and Functions** Students will use algebraic skills and concepts, including functions, to describe real-world phenomena symbolically and graphically, and to model quantitative change.

**10. Discrete Mathematics** Students will use the concepts and processes of discrete mathematics to analyze and model a variety of real-world situations that involve recurring relationships, sequences, networks, combinations and permutations.

# NCTM Standards

## 1. Number & Operations

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems
- Understand meanings of operations and how they relate to one another
- Compute fluently and make reasonable estimates

## 2. Algebra

- Understand patterns, relations, and functions
- Represent and analyze mathematical situations and structures using algebraic symbols
- Use mathematical models to represent and understand quantitative relationships
- Analyze change in various contexts

## 3. Geometry

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems
- Apply transformations and use symmetry to analyze mathematical situations
- Use visualization, spatial reasoning, and geometric modeling to solve problems

## 4. Measurement

- Understand measurable attributes of objects and the units, systems, and processes of measurement
- Apply appropriate techniques, tools, and formulas to determine measurements

## 5. Data Analysis & Probability

- Understand and apply basic concepts of probability

## 6. Problem Solving

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving

## **7. Reasoning & Proof**

- recognize reasoning and proof as fundamental aspects of mathematics;
- make and investigate mathematical conjectures;
- develop and evaluate mathematical arguments and proofs;
- select and use various types of reasoning and methods of proof

## **8. Communication**

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely

## **9. Connections**

- recognize and use connections among mathematical ideas;
- understand how mathematical ideas interconnect and build on one another to produce a coherent whole;
- recognize and apply mathematics in contexts outside of mathematics.

## **10. Representation**

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena

## **SECTION IV – Learning Resources**

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## SUPPLEMENTAL RESOURCES

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### Texts:

- Geometry, Nichols et. al. Holt Publishing
- Geometry: Tools for a Changing World, Bass et. al. Prentice Hall Publishing
- Geometry, Foster et. al. Merrill Publishing

### Websites

- [www.nctm.org](http://www.nctm.org)
- [www.learner.org/exhibits/dailymath](http://www.learner.org/exhibits/dailymath)
- [www.math.temple.edu/~paulos](http://www.math.temple.edu/~paulos)
- [www.mathforum.org](http://www.mathforum.org)
- [www.maa.org](http://www.maa.org)
- [www.mathematicallycorrect.com](http://www.mathematicallycorrect.com)
- [www.personal.cfw.com/~clayford](http://www.personal.cfw.com/~clayford)
- [www.math.com](http://www.math.com)
- [www.math.uah.edu/psol](http://www.math.uah.edu/psol)
- [www.nilesonline.com/stats](http://www.nilesonline.com/stats)
- [www.mathmistakes.com](http://www.mathmistakes.com)
- [www.innumeracy.com](http://www.innumeracy.com)
- [www.techlar.com/fractals](http://www.techlar.com/fractals)
- [www.superstringtheory.com](http://www.superstringtheory.com)

### Other Resources

- TTL/C-5 Computer Lab
- Microsoft Excel
- TI-83 graphing calculator
- Media center
- Geometers Sketchpad
- Winplot
- Wingeom
- Internet Problem of the Week
- Protractor, Compass, Ruler