

Wallingford Public Schools - HIGH SCHOOL COURSE OUTLINE

Course Title: Geometry	Course Number: A 1223, G1224
Department: Mathematics	Grade(s): 10-11
Level(s): Academic and General <i>Objectives that have an asterick * are expected to be mastered by academic level students only. General level students may be exposed to these concepts, but are not expected to have achieved mastery.</i>	Credit: 1
Course Description: In this geometry course students define, classify, and measure their world through visualizations and models. They will apply theorems and postulates to calculate perimeters, lengths, angle measures, areas, and volumes of geometric figures. They will be required to justify their work both orally and in written form. Students will review linear functions learned in Algebra 1 and then apply them to geometric concepts.	
Required Instructional Materials: Academic textbook: <i>Geometry: An Integrated Approach</i> Ronald E. Larson, Laurie Boswell, Lee Stiff Heath, McDougall Littell, 1998 General textbook: <i>Geometry Concepts and Skills</i> Ronald E. Larson, Laurie Boswell, Lee Stiff McDougall Littell, Inc 2003 <i>Geometer's Sketchpad</i> software by Key Press	Completion/Revision Date: Approved by Curriculum Council May 25, 2004 Adopted by the Board of Education June 14,2004

Mission Statement of the Curriculum Management Team
The mission of the Wallingford K-12 mathematics program is to develop mathematical literacy in all students. Students will understand the importance of mathematics and become flexible and resourceful problem solvers. They will use a range of numerical, algebraic, geometrical and statistical concepts and skills to formulate and solve authentic problems, communicating their reasoning in oral and written form.

- Enduring Understandings for the Course**
- A problem solver understands what has been done, knows why the process was appropriate, and can support it with reasons and evidence.
 - There can be different strategies to solve a problem, but some are more effective and efficient than others are.
 - The context of a problem determines the reasonableness of a solution.
 - Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
 - Geometric figures can be represented numerically, graphically, symbolically, and verbally.
 - Analyzing geometric relationships develops reasoning and justification skills.
 - Some real world situations can be represented geometrically and graphically.
 - Unique relationships exist between lines and angles.

• Different tools are needed to measure different geometric shapes.
• The sum of the interior angles of a triangle is a constant.
• The sum of the interior angles of a triangle directly relates to the sum of the interior angles of all other convex polygons.
• There is a relationship between the measure of the angles of a triangle and the measure of the sides of a triangle.
• The Pythagorean Theorem establishes an essential relationship between the sides of a right triangle.
• There is a relationship between the number of sides of a polygon and the sum of its interior angles.
• There are similarities and differences between all quadrilaterals.
• Each type of quadrilateral has properties that make it unique.
• Proportional relationships express how quantities change in relationship to each other.
• Geometric figures can change size and/or position while maintaining proportional attributes.
• Ratios can be used to compare similar figures.
• There are relationships between angles, arcs, and segments of circles.
• Every plane figure has an area and perimeter.
• Perimeter and area are measured in different ways.
• There is a constant relationship between the circumference of a circle and its diameter
• Every three dimensional shape has a surface area and volume.
• Generalizations can be made to represent the relationship between surface area and volume.

Learning Strand

1.0 Problem Solving

NOTE: This learning strand should be taught through the integration of the other learning strands. This learning strand is not meant to be taught in isolation as a separate unit.

ENDURING UNDERSTANDING(S)

- A problem solver understands what has been done, knows why the process was appropriate, and can support it with reasons and evidence.
- There can be different strategies to solve a problem, but some are more effective and efficient than others are.
- The context of a problem determines the reasonableness of a solution.

ESSENTIAL QUESTIONS

- How do I know where to begin when solving a problem?
- How does explaining my process help me to understand a problem's solution better?
- How do I decide what strategy will work best in a given problem situation?
- What do I do when I get stuck?
- How do I know when a result is reasonable?
- What is the relationship between solving problems and computation?

LEARNING OBJECTIVES The student will :

- 1.1 Distinguish between given information, unknown information, and assumptions that may be necessary.
- 1.2 Devise a plan to solve the problem.
- 1.3 Identify different strategies to solve a problem (table, diagram, number pattern).
- 1.4 Apply an appropriate strategy(ies) to solve a problem.
- 1.5 Justify the strategy and solution with mathematical reasoning and evidence.
- 1.6 Analyze strategies used to solve problems.
- 1.7 Judge the reasonableness of a solution for a problem.
- 1.8 Communicate the solution and the strategies used to solve the problem in oral and/or written form.
- 1.9 Pose problems from given situations.

INSTRUCTIONAL SUPPORT MATERIALS

- CAPT sample items and released items
- Websites for problem solving
 - Math Forum
 - NCTM Standards and Illuminations
- CSDE Goals 2000 resources (Q drive)

SUGGESTED INSTRUCTIONAL STRATEGIES

- Small group discussion about strategies and solutions
- Written explanation of strategy and solution for a problem
- Peer editing of strategies and solutions
- Revise written solutions of problems
- Oral presentation of solution strategies
- Journal writing
- Modeling
- Think aloud
- Student inquiry through guided investigations
- Graphic organizers
- TNT strategy (directions on Q drive)
- Pass a Problem (directions on Q drive)
- Cooperative learning
- See other learning strands for integration

SUGGESTED ASSESSMENTS

- Open-ended questions included on tests and quizzes

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| | <ul style="list-style-type: none">• Performance tasks• Teacher observations• Written explanation of strategy and solution for a problem• District rubric for assessing problem solving• Oral presentation of solution strategies• See other learning strands for integration |
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LEARNING STRAND

2.0 Lines and Angles

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- Some real world situations can be represented geometrically and graphically.
- Geometric figures can be represented numerically, graphically, symbolically, and verbally.
- Different tools are needed to measure different geometric figures.
- Unique relationships exist between lines and angles.
- Geometric figures can be displayed on a coordinate system.

ESSENTIAL QUESTIONS

- How do geometric models describe spatial relationships?
- How are geometric figures and objects classified?
- How do I use geometric relationships to analyze or solve problems?
- How do I decide what tool will work best in any given problem situation?
- How do the properties of lines and angles contribute to geometric understanding?
- What role do lines and angles play in interpreting the world around us?

LEARNING OBJECTIVES The student will

- 2.1 Apply vocabulary related to lines, segments, angles, rays and planes.
- 2.2 Apply the postulates related to lines, segments, angles, rays and planes.
- 2.3 Measure segments and angles using the appropriate tools.
- 2.4 Explain the relationship between different types of angle pairs.
- 2.5 Solve for an unknown variable given a geometric diagram containing algebraic expressions.
- 2.6 Name lines, planes and angles using proper notation.
- 2.7 Apply properties of parallelism and perpendicularity to problem situations.
- 2.8 Determine the measures of angles given a diagram using properties of vertical, complementary, supplementary, corresponding, and adjacent angles.
- 2.9 Determine the distance and slope between two points.
- 2.10 Find the coordinates of the midpoint of a segment.
- 2.11 Prove segment and angle congruence. *
- 2.12 Prove lines are parallel. *

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Ruler
- Protractor
- Compass
- Individual dry erase boards
- Patty paper
- CAPT released items
- *Discovering Geometry*, Key Curriculum Press
- *Teaching Reading in Mathematics*, Mary Lee Barton and Clare Heidema

SUGGESTED INSTRUCTIONAL STRATEGIES

- Teacher directed discussion
- Cooperative Learning
- Small group discussion about strategies and solutions
- Written explanation of strategy and solution for a problem
- Modeling
- Student inquiry through guided investigations
 - *Discovering Geometry*- Paper Folding: The Basics
- Graphic organizers (*Reading in Math*, pg 101-108)
- Vocabulary development strategies(*Teaching Reading in Math*)
 - Concept circles
 - Concept definition mapping

- Frayer Model
- List-Group-Label
- Semantics Feature Analysis
- Semantic Mapping
- Verbal and Visual Word Association
- Word Sort
- Revision of previous work
- Computer assisted instruction – *Geometers Sketchpad*

SUGGESTED ASSESSMENTS

- Homework/Classwork
- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observation of group activity
- Problem solving assessed with rubric
- Projects - Frequent Flyer Miles Project
- Reflective journals
- Teacher observations
- Writing assignments

LEARNING STRAND

3.0 Triangles

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- The sum of the interior angles of a triangle is a constant.
- There is a relationship between the measure of the angles of a triangle and the measure of the sides of a triangle.
- The Pythagorean Theorem establishes an essential relationship between the sides of a right triangle.

ESSENTIAL QUESTIONS

- How do the properties of triangles contribute to geometric understanding?
- Given that a geometric object has certain properties, what other properties can be inferred?
- What is the relationship between angles and sides of an angle?
- How can the Pythagorean Theorem be used to solve problems?

LEARNING OBJECTIVES The student will :

- 3.1 Identify the parts of a triangle.
- 3.2 Classify triangles by their angles and sides.
- 3.3 Find the measures of the interior and exterior angles of a triangle.
- 3.4 Verify the relationships between the sides of a right triangle using the Pythagorean Theorem.
- 3.5 Solve geometric and real world problems using the Pythagorean Theorem.
- 3.6 Classify a triangle using the Pythagorean Theorem Converse.
- 3.7 Identify the corresponding parts of congruent triangles.
- 3.8 Arrange sides and angles in order from least to greatest measures using the triangle inequality theorems.
- 3.10 Identify congruent triangles using SAS, SSS, ASA, AAS or HL.
- 3.11 Calculate the measures of the missing sides or angles in isosceles triangles.
- 3.12 Verify that two triangles are congruent.
- 3.13 Apply the definitions of median, altitude, midsegment, perpendicular bisector and angle bisector to geometric situations.
- 3.14 Determine the lengths of two sides of a 30-60-90 right triangle given the length of one side. *
- 3.15 Determine the lengths of two sides of a 45-45-90 right triangle given the length of one side. *
- 3.16 Solve for unknown variables in right triangles using geometric mean. *

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Protractor
- Ruler
- Dry erase boards
- CAPT released items
- Patty Paper
- Geoboards
- *Geometer's Sketchpad* software
- *Discovering Geometry*, Key Curriculum Press
- *Teaching Reading in Mathematics*, Mary Lee Barton and Clare Heidema

SUGGESTED INSTRUCTIONAL STRATEGIES

- Small group discussion about strategies and solutions
- Written explanation of strategy and solution for a problem
- Modeling
- Student inquiry through guided investigations
 - Congruent Triangle Investigation
- Graphic organizers (*Teaching Reading in Math*, pg 101-108)
- Vocabulary development strategies (*Teaching Reading in Math*)
- Games
- Cooperative learning
- Teacher directed discussions
- Computer assisted instruction- *Geometers Sketchpad*
- Revision of previous work

SUGGESTED ASSESSMENTS

- Homework/Classwork
- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observation of group activity
- Problem solving assessed with rubric
- Projects
- Writing assignments/reflective journals
- Teacher observations

LEARNING STRAND

4.0 Polygons

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- There is a relationship between the number of sides of a polygon and the sum of the measures of the interior angles
- There are similarities and differences between all quadrilaterals.
- Each type of quadrilateral has properties that make it unique.

ESSENTIAL QUESTIONS

- How are geometric shapes classified?
- What patterns exist among polygons?
- What makes a shape a polygon?
- How do geometric models describe spatial relationships?
- How are geometric shapes and objects classified?
- How are quadrilaterals unique?

LEARNING OBJECTIVES

The student will :

- 4.1 Classify polygons based on their properties and attributes.
- 4.2 Calculate the measure of each interior and exterior angle of a regular polygon.
- 4.3 Determine the sum of the interior angles of a polygon.
- 4.4 Use the exterior angle theorem of polygons to find the measure of angles.
- 4.5 Compare and contrast the properties of parallelograms and trapezoids.
- 4.6 Use the relationships between the angles and sides of parallelograms and trapezoids to find missing angles and sides.
- 4.7 Compare and contrast a square, rectangle, rhombus, trapezoid, isosceles trapezoid, right trapezoid and kite.
- 4.8 Verify that a quadrilateral is a parallelogram.*

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Protractor
- Ruler
- Dry erase boards
- CAPT released items
- *Teaching Reading in Mathematics*, Mary Lee Barton and Clare Heidema
- *Geometers Sketchpad* software
- *Discovering Geometry*, Key Curriculum Press

SUGGESTED INSTRUCTIONAL STRATEGIES

- Teacher directed discussion
- Classroom discussion
- Small group discussion about strategies and solutions
- Guided reading
- Guided practice
- Written explanation of strategy and solution for a problem (Shakespeare Globe Theater)
- Think-alouds
- Modeling
- Cooperative learning
- Games for reinforcement and review
- Student inquiry through guided investigations
 - Properties of a parallelogram investigation
 - Properties of special parallelograms investigation
 - Finding the angles of a polygon investigation
- Graphic organizers (*Teaching Reading in Math*, pg 101-108)
- Vocabulary development strategies(*Teaching Reading in Math*)

- Revision of previous work
- Computer assisted instruction – *Geometers Sketchpad*
- Labs

SUGGESTED ASSESSMENTS

- Homework/Classwork
- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observation of group activity
- Problem solving assessed with rubric
- Projects
- Reflective journals
- Teacher observations
- Writing assignments

LEARNING STRAND

5.0 Similar Figures

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- Proportional relationships express how quantities change in relationship to each other.
- Geometric figures can change size and/or position while maintaining proportional attributes.
- Ratios can be used to compare similar figures.

ESSENTIAL QUESTIONS

- When and why do I use proportional comparisons?
- How are similar figures described using ratios and proportions?
- How is proportional reasoning of geometric figures used to solve problems?

LEARNING OBJECTIVES The student will :

- 5.1 Identify the properties of similar figures.
- 5.2 Solve problems using ratios and proportions.
- 5.3 Determine the measures of missing parts of similar figures using ratios and proportions.
- 5.4 Determine the scale factor of two similar polygons.
- 5.5. Solve real world problems using ratios and proportions.
- 5.6 Verify that two triangles are similar.

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Ruler
- CAPT released items
- *Geometer Sketchpad* software
- *Discovering Geometry*, Key Curriculum Press
- *Teaching Reading in Mathematics*, Mary Lee Barton and Clare Heidema

SUGGESTED INSTRUCTIONAL STRATEGIES

- Teacher directed discussion
- Classroom discussion
- Small group discussion about strategies and solutions
- Guided practice
- Graphic organizers (*Reading in Math*, pg 101-108)
- Vocabulary development strategies (*Reading in Math*)
- Written explanation of strategy and solution for a problem
- Think-alouds
- Modeling
- Cooperative learning
- Revision of previous work
- Computer assisted instruction
- Student inquiry through guided investigations

SUGGESTED ASSESSMENTS

- Homework/Classwork

- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observations of group activity
- Problem solving assessed with rubric
- Projects – Enlargement Project
- Reflective journals
- Writing assignments

LEARNING STRAND

6.0 Circles

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- There are relationships between angles, arcs, and segments of circles.

ESSENTIAL QUESTIONS

- What experiences will lead me to discover the relationships in circles?
- What characteristics make a circle unique as a geometric figure?
- How can properties and relationships from other geometric figures be applied to circles?

LEARNING OBJECTIVES The students will :

- 6.1 Identify segments, lines, angles, and arcs of circles.
- 6.2 Apply the relationships between arcs, angles, and segments of circles
- 6.3 Solve for the length of a segment using the corresponding theorems. *
- 6.4 Find the equation of a circle when given its graph. *
- 6.5 Construct the graph of a circle when given its equation. *
- 6.6 Solve real world problems using the properties of circles.

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Ruler
- Compass
- Protractor
- Dry erase boards
- CAPT released items
- *Geometer Sketchpad* software
- *Discovering Geometry*, Key Curriculum Press

SUGGESTED INSTRUCTIONAL STRATEGIES

- Teacher directed discussion
- Classroom discussion
- Small group discussion about strategies and solutions
- Guided reading
- Guided practice
- Written explanation of strategy and solution for a problem
- Think-alouds
- Modeling
- Cooperative learning
- Games for reinforcement and review
- Revision of previous work
- Research real data to use in problems
- Computer assisted instruction – *Geometers Sketchpad*
- Student inquiry through guided investigations
- Labs

SUGGESTED ASSESSMENTS

- Teacher observations
- Tests
- Quizzes
- Projects

	<ul style="list-style-type: none"> • Homework/Classwork • Notebooks • Writing assignments
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<u>LEARNING STRAND</u>	
7.0 Perimeter and Area of Plane Figures	
<u>ENDURING UNDERSTANDING(S)</u>	<u>ESSENTIAL QUESTIONS</u>
<ul style="list-style-type: none"> • Geometry and spatial sense offer ways to interpret and reflect on our physical environment. • Analyzing geometric relationships develops reasoning and justification skills. • Every plane figure has an area and perimeter. • Perimeter and area are measured in different ways. • There is a constant relationship between the circumference of a circle and its diameter 	<ul style="list-style-type: none"> • How does what I measure influence how I measure? • Where does pi come from? • In what ways are the perimeter and area of a figure related? • How do the dimensions of a geometric figure affect its area?
<u>LEARNING OBJECTIVES</u> The student will :	<u>INSTRUCTIONAL SUPPORT MATERIALS</u>
<p>7.1 Determine the perimeter of plane figures.</p> <p>7.2 Derive formulas for the area of triangles, parallelograms, and trapezoids from the formula of a rectangle's area.</p> <p>7.3 Use formulas to find the area of plane figures including a square, rectangle, circle, triangle, parallelogram, and trapezoid.</p> <p>7.4 Analyze how the perimeter and the area of a plane figure are related.</p> <p>7.5 Derive the relationship between the diameter and circumference of a circle.</p> <p>7.6 Determine the circumference of circles using the relationship between the diameter and pi.</p> <p>7.7 Calculate the lengths of arcs and the area of sectors.</p> <p>7.8 Determine the areas of composite figures.</p> <p>7.9 Convert units of measure in a two dimensional setting.</p> <p>7.10 Solve problems from real life settings that involve perimeter and area.</p>	<ul style="list-style-type: none"> • Scientific calculator • Ruler • Compass • CAPT released items • Geometer Sketchpad • <i>Discovering Geometry</i>, Key Curriculum Press • String • Circular objects • Dry erase boards
	<u>SUGGESTED INSTRUCTIONAL STRATEGIES</u>
	<ul style="list-style-type: none"> • Teacher directed discussion • Classroom discussion • Small group discussion about strategies and solutions • Guided practice • Graphic organizers (<i>Teaching Reading in Math</i>, pg 101-108) • Vocabulary development strategies (<i>Teaching Reading in Math</i>) • Written explanation of strategy and solution for a problem <ul style="list-style-type: none"> ◦ Shakespeare Problem • Think-alouds • Modeling • Cooperative learning • Games for reinforcement and review • Revision of previous work • Research real data to use in problems

- Computer assisted instruction
- Student inquiry through guided investigations
 - Pi investigation
- Labs

SUGGESTED ASSESSMENTS

- Homework/Classwork
- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observation of group activity
- Problem solving assessed with rubric
- Projects - Popzi Challenge
- Reflective journals
- Teacher observations
- Writing assignments

LEARNING STRAND

8.0 Surface Area and Volume of Three Dimensional Figures

ENDURING UNDERSTANDING(S)

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Analyzing geometric relationships develops reasoning and justification skills.
- Every three dimensional shape has a surface area and volume.
- Generalizations can be made to represent the relationship between surface area and volume.

ESSENTIAL QUESTIONS

- How does what I measure influence how I measure?
- How do the dimensions of a geometric figure affect its surface area and volume?
- What connections exist between the volume of different solids?

LEARNING OBJECTIVES The students will :

- 8.1 Determine the base area, lateral area and total surface area of prisms, pyramids, cones and cylinders.
- 8.2 Use models to find and derive formulas for surface area and volume of prisms and cylinders.
- 8.3 Find the surface area of a sphere.
- 8.4 Determine the volume of prisms, pyramids, cones, cylinders and spheres.
- 8.5 Calculate the surface area and volume of composite figures.
- 8.6 Analyze how the surface area and dimensions of a three-dimensional figure affect its volume.
- 8.7 Convert units of measure in a three dimensional setting.
- 8.8 Solve real world problems that involve surface area and volume

INSTRUCTIONAL SUPPORT MATERIALS

- Scientific calculator
- Ruler
- Dry erase boards
- Three-dimensional solids
- CAPT released items

SUGGESTED INSTRUCTIONAL STRATEGIES

- Class discussions
- Small group discussion about strategies and solutions
- Guided practice
- Written explanation of strategy and solution for a problem
- Think-alouds
- Modeling
- Cooperative learning
- Games for reinforcement and review
- Revision of previous work
- Research real data to use in problems
- Student inquiry through guided investigations
 - Polyhedron gum drop investigation

SUGGESTED ASSESSMENTS

- Homework/Classwork
- Notebook
- Quizzes and tests
- Self-evaluation
- Partner quizzes
- Teacher observation of group activity
- Problem solving assessed with rubric
- Projects
- Writing assignments/ reflective journals