

Wilson Area School District Planned Course Guide

Title of planned course: Geometric Applications and Constructions

Subject Area: Mathematics

Grade Level: 12

Course Description: Students will explore geometric wonders utilizing a compass, protractor and straightedge. Students will explore curves and graphs as they are created from rational functions and conic sections. Students will apply their mathematical skills to assist with solving and creating geometric configurations. Students will leave this course with an inspiration and awe for the wonders of how and what geometry creates.

Time/Credit for this Course: Half Year / 0.5 Credit

Curriculum Writing Committee: BethAyn S. Tarsi

Curriculum Map

<u>August / January</u>	Tools of the trade Review of Geometry concepts
<u>September / February</u>	Basic Constructions and Concurrence Theorems
<u>October / March</u>	Conic Sections
<u>November / April</u>	Constructing Algebraic Curves
<u>December / May</u>	Geometric Wonders and Coincidences
<u>January / June</u>	Geometric Wonders and Coincidences

Wilson Area School District Planned Course Materials

Course Title: Geometric Applications and Constructions

Supplemental Books:

Math Wonders to Inspire Teachers and Students
Alfred S. Posamentier
Association for Supervision and Curriculum Development
2003

Teacher Resources:

- Teacher created handouts/worksheets
- Internet

Curriculum Scope & Sequence

Planned Course: Geometric Applications and Constructions

Unit: Tools of the Trade & Review of Geometry Concepts

Time frame: 1-2 week

State Standards: CC.2.3.HS.A.3, CC.2.3.HS.A.8

Anchor(s) or adopted anchor: G.1.1.1.1-4, G.1.2.1.1-3

Essential content/objectives: At the end of the unit, students will be able to:

- Utilize the compass, protractor, straight edge, and ruler properly as they apply to geometric constructions
- Review geometry properties and vocabulary utilized in constructions

Core Activities: Students will complete/participate in the following:

- Practice utilization of the compass, protractor, straight edge and ruler
- Construct angles, angle bisectors, triangles, equilateral triangles, segments, and perpendicular segments
- Apply geometry vocabulary to geometric situations
- Analyze and recreate a given geometric figure using only compass/protractor/straight edge

Extensions:

- Analyze and recreate a more complex geometric figure using only compass/protractor/straight edge

Remediation:

- Teacher/peer tutoring
- Problem sets to reinforce lower grade geometric standards

Instructional Methods:

- Direct Instruction
- Small group activities
- Hands on activities
- Warm-ups

Materials & Resources:

- Compass/Protractor/Straight edge/Ruler
- Calculator
- Handout/activity
- GeoGebra

Assessments:

- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Tests/quizzes

Curriculum Scope & Sequence

Planned Course: Geometric Applications and Constructions

Unit: Basic Constructions and Concurrence Theorems

Time frame: 2-3 week

State Standards: .CC.2.3.8.A.2, CC.2.3.HS.A.3

Anchor(s) or adopted anchor: G.1.2.1.1, G.1.2.1.3

Essential content/objectives: At the end of the unit, students will be able to:

- Interpret shorthand notation used in describing constructions
- Perform six basic constructions
- Identify the points of concurrency within a triangle
- Construct the points of concurrency within a triangle
- Construct the Line of Euler for each type of triangle

Core Activities: Students will complete/participate in the following:

- Develop a vocabulary for geometric notations and points of concurrency within a triangle
- Utilize the compass and straight edge to create a segment copy, angle copy, angle bisector, perpendicular bisector of a segment
- Utilize the compass and straight edge to 'erect' a perpendicular, and 'dropping' a perpendicular
- Create the circumcenter, incenter, orthocenter, and centroid of a triangle utilizing a compass and straight edge
- Create the Line of Euler through a unit project

Extensions:

- Create the Line of Euler for the equilateral triangle
- Research to determine other points of concurrency within a triangle which we did not explore in this unit

Remediation:

- Teacher/peer tutoring
- Unit review exercises which revisit concepts and vocabulary

Instructional Methods:

- Direct Instruction
- Small group activities
- Hands on activities
- Unit project
- Warm-ups

Materials & Resources:

- Compass/Protractor/Straight edge/Ruler
- Handout/activity
- Geogebra

Assessments:

- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Tests/quizzes
- Unit Project

Curriculum Scope & Sequence

Planned Course: Geometric Applications and Constructions

Unit: Conic Sections

Time frame: 3-4 week

State Standards: CC.2.3.HS.A.10

Anchor(s) or adopted anchor: G.2.1.2.1, G.2.1.2.2, G.2.2.2.3, M11.D.1-2, M11.C.1, M11.C.3.1, M11.D.3

Essential content/objectives: At the end of the unit, students will be able to:

- Determine which conic section an equation will create
- Graph a conic section given the equation
- Write the equation of a conic section given the graph or specific criteria
- Determine the domain and range of a conic section
- Convert the equation of a conic section from standard to graphing form

Core Activities: Students will complete/participate in the following:

- Example problems
- Algebraic skills for completing the square
- Connections between equations and graphs
- Compare and contrast graphs and equations
- Unit project connecting all conic shapes

Extensions:

- Create a picture book of conic sections found locally

Remediation:

- Teacher/peer tutoring
- Unit review exercises which revisits concepts and vocabulary

Instructional Methods:

- Direct Instruction
- Small group activities
- Hands on activities
- Unit project
- Warm-ups

Materials & Resources:

- Handout/activity
- Calculator

Assessments:

- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Tests/quizzes
- Unit Project

Curriculum Scope & Sequence

Planned Course: Geometric Applications and Constructions

Unit: Constructing Algebraic Curves

Time frame: 3-4 week

State Standards: CC.2.2.HS.C.1-3

Anchor(s) or adopted anchor: A1.1.2.1.1-3, A1.2.1.1.1-3, A1.2.1.2.1,-2, A1.2.2.1-4, A2.1.3.2.2, A2.2.1.1-4, G2.2.2.1-5

Essential content/objectives: At the end of the unit, students will be able to:

- Determine the vertical and horizontal asymptotes of a rational function
- Determine the zeroes of a polynomial function
- Utilize the asymptotes and zeroes of an equation to construct the graph
- Given the graph of a rational equation create the equation

Core Activities: Students will complete/participate in the following:

- Example problems
- Graphing rational functions
- Write the equation of a rational function given the graph

Extensions:

- Student created problem set with answer key

Remediation:

- Teacher/peer tutoring
- Unit review exercises which revisits concepts and vocabulary

Instructional Methods:

- Direct Instruction
- Small group activities
- Hands on activities
- Warm-ups

Materials & Resources:

- Handout/activity
- Calculator

Assessments:

- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Tests/quizzes

Curriculum Scope & Sequence

Planned Course: Geometric Applications and Constructions

Unit: Geometric Wonders and Coincidences

Time frame: 5-6 weeks

State Standards: CC.2.3.HS.A.8, CC.2.3.HS.A.3, CC.2.3.4.A.1, CC.2.3.5.A.2

Anchor(s) or adopted anchor: G.1.1.1, G.1.2.1.1-4, M03.C-G.1.1.1, M05.C-G.2.1.1

Essential content/objectives: At the end of the unit, students will be able to:

- Create a parallelogram within any quadrilateral
- Create an equilateral triangle within any triangle
- Create and apply Napoleon's Theorem
- Create the golden rectangle
- Create a regular pentagon within a circle
- Create and apply Pappus's Invariant
- Create and apply Pascal's Invariant
- Create and apply a point of invariant distance within an equilateral triangle
- Create a nine pointed circle given a triangle

Core Activities: Students will complete/participate in the following:

- Apply prior knowledge vocabulary in order to create geometric situations
- Construct diagrams based on geometric situations
- Apply geometric vocabulary to construct a given geometric situation
- Research architecture to determine application of golden rectangle and other geometric wonders

Extensions:

- Research another geometric wonder not created in class and present to the class

Remediation:

- Teacher/peer tutoring
- Unit review exercises which revisits concepts and vocabulary

Instructional Methods:

- Direct Instruction
- Small group activities
- Hands on activities
- Warm-ups

Materials & Resources:

- Compass/Protractor/Straight edge/Ruler
- Handout/activity
- Calculator
- Geogebra

Assessments:

- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Geometric creations
- Architecture project