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 straight edge. Students will explore curves and graphs as they are created from rational functions and conic sections. Students will apply their mathematic 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

August / January
Tools of the trade
Review of Geometry concepts

September / February
Basic Constructions and Concurrence Theorems

October / March
Conic Sections

November / April
Constructing Algebraic Curves

December / May
Geometric Wonders and Coincidences

January / June
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:** 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
**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: 4 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

**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: 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 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
Planned Course: Geometric Applications and Constructions

Unit: Geometric Wonders and Coincidences

Time frame: 5 weeks

State Standards: CC2.3.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
Assessments:
- Teacher observation
- Homework
- Warm-ups
- Questioning
- Worksheets/Activities
- Geometric creations
- Architecture project