Unit F - *Topics in Analytic Geometry*

Overview

This large unit covers a variety of topics in Analytic Geometry (mostly graphing related). The concept of slope is analyzed with respect to the angles lines make with axes and other lines. A major portion of the unit focuses on the conic sections: parabolas, ellipses, and hyperbolas. These equations/graphs are introduced as loci of points and their various applications to the real world are explored, in particular their reflective properties. The rotation of their axes is not emphasized. Two new types of graphing are studied: parametric equations and polar equations which connect back to the conic sections.

21st Century Capacities: Analyzing, Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense sense of problems and persevere in solving them
MP4 Model with Mathematics
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSG.GPE.A.2
Derive the equation of a parabola given a focus and directrix.

CCSS.MATH.CONTENT.HSG.GPE.A.3
(+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

Transfer:

Students will be able to independently use their learning in new situations to...

1. Model relationships among quantities.
2. Manipulate equations/expressions or objects to create order and establish relationships.
3. Draw conclusions about graphs, shapes, equations, or objects. (analyzing)
4. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem. (Synthesizing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians create or use models to examine, describe, solve and/or make predictions.
2. Mathematicians examine relationships to discern a pattern, generalizations, or structure.
3. Mathematicians understand that placing a problem in a category gives one a familiar approach to solving it.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. What math tools/models/strategies can I use to solve the problem?
B. How can understanding a pattern help me?
C. How do I interpret this mathematical model?
D. What have I seen in the past that might help me now?

	Acquisition:	
	Students will know…	*Students will be skilled at…*
	1. The inclination of a line is directly related to its slope 2. The conic sections are all described by a loci of points satisfying a geometric property 3. Conic sections can be used to model a variety of real world problems 4. Parametric equations allow us to graph with motion 5. Polar coordinates are an alternative way to describe the location of a point 6. Conic sections can be graphed rectangularly, parametrically, and with polar equations 7. Vocabulary: Inclination, Parabola, Focus, Directrix, Ellipse, Vertices, Major Axis, Minor Axis, Eccentricity, Hyperbola, Transverse Axis, Asymptotes, Parametric, Polar, Pole	1. Finding the inclination of a line and the angle between two lines 2. Determine the distance between a point and a line 3. Analyzing the equations for the conic sections 4. Determining equations for the conic sections 5. Graphing parametric equations and converting them to rectangular form 6. Using parametric equations to model projectile motion 7. Plotting polar coordinates 8. Graphing polar equations 9. Analyzing polar equations of conic sections