Lesson Title	Guiding Airplanes at the Secret Squirrel Mission Control Center
Length of Lesson	50 minutes
Created By	Emily Burtnett
Subject	Algebra II
Grade Level	9th-12th grade
State Standards	2f
DOK Level	2
DOK Application	Use algebraic and graphical methods to solve systems of linear equations and inequalities in mathematical and real-world situations.
National Standards	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. Recognize and use connections among mathematical ideas. Recognize and apply mathematics ion contexts outside of mathematics.
Graduate Research Element	In fluid dynamics, the Euler equations are a set of equations governing inviscid flow. Systems of equations are frequently used in computational fluid dynamics and heat transfer. For example, implicit methods are an algorithm requiring the simultaneous solution of a system of algebraic equations.

Student Learning Goal:
Students will solve systems of equations using three methods: graphing, elimination and substitution.

Materials Needed (supplies, hand-outs, resources):
Graph paper, calculators, rulers, worksheets (see attached)

Lesson Performance Task/Assessment:
Students will read the scenarios on the worksheet describing the situation. They will pretend they are watching airplanes on radar, and it is their job to ensure that two aircraft cross over the same point to ensure the common target is hit. The scenarios will all be different. In some cases, the flight paths of multiple aircraft will be given as linear equations with two unknowns and students will use one of the three solution methods to determine the location of the target. Another case will provide the students with the target coordinates and students must write equations of lines that will be the aircraft flight paths.

Lesson Relevance to Performance Task and Students:
Students will see how systems of equations can be used in the real world to plan flight paths and track aircraft.

Anticipatory Set/Capture Interest:
Pictures or video of actual radar and aircraft flight paths.

Guided Practice:
The instructor will review the process of solving two equations with two unknowns using graphing, elimination and substitution. The class will work through a few examples together as a warm-up.

Independent Practice:
Students will work independently or in groups (at the digression of the instructor) to complete the worksheets and solve the problems.

Remediation and/or Enrichment:
The lesson can be enriched by introducing the students to the concept of vectors and how they can also be used to describe a flight path. Students can be asked to solve the equations using matrices. The teacher could also use three equations with three unknowns (x, y, and z where z is the aircraft altitude) to provide students with a greater challenge, but graphing the lines would most likely be eliminated and replaced with solving using matrices.

For remediation, the instructor can reduce the number of problems the students are required to solve. Students should solve at least three problems using each method once. Individual IEPs will be supported.

Check(s) for Understanding:
The worksheets will be handed in to instructor and graded.
- Did students graph the equations correctly?
- Did the students understand that where two paths cross is the solution to the problem?
- Do students understand how to use substitution and elimination successfully?

Closure:
Teacher will bring the students' attention back to the front and show more complicated examples of real world cases and pictures of aircraft paths and how they can use math (equations) to ensure that a target is hit or to prevent aircraft from colliding.

Possible Alternate Subject Integrations:
Vector math

Teacher Notes: