



Topic A:

Rectangular and Triangular Regions Defined by Inequalities

G-GPE.B.7

Focus Standard: G-GPE.B.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*

Instructional Days: 4

Lesson 1: Searching a Region in the Plane (E)¹

Lesson 2: Finding Systems of Inequalities That Describe Triangular and Rectangular Regions (P)

Lesson 3: Lines That Pass Through Regions (P)

Lesson 4: Designing a Search Robot to Find a Beacon (E)

The module opens with a modeling challenge (**G-MG.A.1, G-MG.A.3**) that re-occurs throughout the lessons. Students use coordinate geometry to program the motion of a robot bound in a polygonal region (a room) of the plane. MP.4 is highlighted throughout this module as students transition from the verbal tasks to determining how to use coordinate geometry, algebra, and graphical thinking to complete the task. The modeling task varies in each lesson as students define regions, constrain motion along segments, rotate motion, and move through a real-world task of programming a robot. While this robot moves at a constant speed and its motion is very basic, it allows students to see the usefulness of the concepts taught in this module and put them in context. In Lesson 1 students use the distance formula and previous knowledge of angles to program a robot to search a plane. Students impose a coordinate system and describe the movement of the robot in terms of line segments and points. In Lesson 2, students graph inequalities and discover that a rectangular or triangular region (**G-GPE.B.7**) in the plane can be defined by a system of algebraic inequalities (**A-REI.D.12**). In Lesson 3, students study lines that cut through these previously described regions. Students are given two points in the plane and a region and determine whether a line through those points meets the region. If it does, they describe the intersection as a segment and name the endpoints. Topic A ends with Lesson 4, where students return to programming the robot while constraining motion along line segments within the region (**G-GPE.B.7, A-REI.C.6**) and rotating a segment 90° clockwise or

¹ Lesson Structure Key: **P**-Problem Set Lesson, **M**-Modeling Cycle Lesson, **E**-Exploration Lesson, **S**-Socratic Lesson

counterclockwise about an endpoint (**G-MG.A.1**, **G-MG.A.3**). Revisiting **A-REI.C.6** (solving systems of linear equations in two variables) and **A-REI.D.12** (graphing linear inequalities in two variables and the solution sets of a system of linear inequalities) shows the coherence between algebra and geometry.