Points Lining Up in the Plane

Description: Students are informally, experientially introduced to the relationship between descriptions of coordinate patterns and graphs in the Cartesian plane. Too often students don't really understand the connection between an equation and its graph. This activity fosters the understanding that graphs depict the set of points whose coordinates satisfy an equation.

Technology Strength: The ability to drag points in the coordinate plane while their coordinates are reported takes the labor out of plotting points, promotes exploration, and puts the focus on connecting a verbal rule (such as "the *y*-coordinate equals the *x*-coordinate") with the graphical representation of the points. Conversely, the ability to produce a pattern of points at the press of a button allows students to focus on formulating a verbal rule that describes the points' coordinates.

Objectives: Understand that graphs depict the set of points whose coordinates satisfy an equation; find sets of points that satisfy algebraic rules; write algebraic rules to describe sets of points

Prerequisites: Ability to plot points in the Cartesian plane; familiarity with absolute value not required

Suggested Grade Level: 7 to 10

Sketchpad Level: Beginning

Suggested Duration: 30 minutes

Suggested Classroom Setting: Whole Class, Student Pairs

Preparation: Review the Activity Notes. For a student-pairs activity, preview the student sketch, work through the steps on the worksheet, and make a copy of the worksheet for each student. For a whole-class presentation, preview the presentation sketch.

Materials: None

Student Worksheet(s): Points Lining Up in the Plane

Student Sketch: Points Line Up.gsp

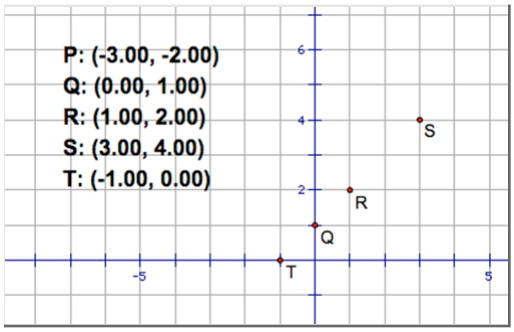
Presentation Sketch: Points Line Up Present.gsp

Vocabulary: Coordinates, absolute value

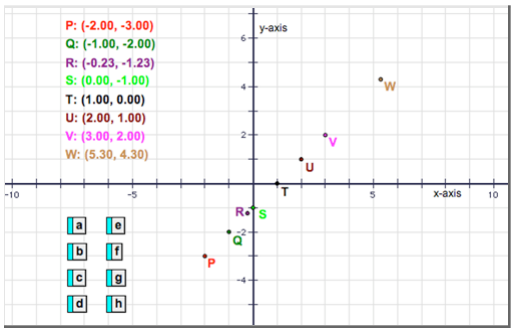
Sketchpad Version: GSP5

Using the Sketch:

In a new sketch, students construct five points and measure their coordinates, causing a coordinate system and the coordinates to be displayed. Students turn on point snapping so that dragged points land only on locations with integer coordinates. Now students are given eight verbal rules. For each rule, they drag the five points to five different locations that satisfy the rule, and record their solutions on grids provided on the worksheet.



Next, students open the prepared student sketch and are presented with the opposite challenge—they press a button to move the points into position, and then figure out the rule. In the Explore More section, students are asked to write each of the eight rules they have found as equations.



For the second Explore More challenge, students construct a Movement button that arranges the points in a pattern of their own design.

Sketch Tips:

Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	**Tip Sheet or Tip Video**
Step 1: Construct a point on an object with the **Point** tool	Using the Point Tool
Step 4: Measure the coordinates of a point using **Measure | Abscissa, Measure | Ordinate,** or **Measure | Coordinates**	Measuring Coordinates
Question 4: Create a Movement button using **Edit | Action Buttons | Movement**	Making Movement Buttons