Calculator Scene Investigation

Saturday, April 20, 2013 Session #635.1 (9–12)
Gallery Workshop 506/507 (Convention Center)
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What type of polygon does this look like? This is a lesson on providing numerical evidence to prove the type of polygon. "It looks like a . . ." is not sufficient evidence. After we gather and calculate numerical evidence, and present a case, a decision will be rendered before the jury convicting the polygon of classification.

Goals:
- Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle.
- Reason with general coordinates to establish properties of triangles and quadrilaterals.
- Participants will use coordinates to calculate slopes and distances, and create and reason about figures in a coordinate plane analyzing and reasoning about their properties.

Objectives:
- Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle.
- Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.
- Use coordinate representations of figures to analyze and reason about their properties.
- Reason with general coordinates to establish properties of triangles and quadrilaterals.
- Use slopes and distances to create and reason about figures in a coordinate plane.

Common Core State Standards:

G.GPE.4   Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point $(1, \sqrt{3})$ lies on the circle centered at the origin and containing the point $(0, 2)$.

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

Focus on Math: After students have been introduced to slope and distance concepts, they can now apply those skills to classification of polygon properties. This activity will extend the knowledge of parallel and perpendicular segments as they apply to properties of polygons. Students would be expected to create a poster with their numerical evidence and then present their case to their peers. Involves reasoning with general coordinates to establish properties of triangles and quadrilaterals.

Manipulatives: Participants will be given a set of points to create a case on. After creating a poster on a coordinate plane and calculating distances and slopes, the case will be presented asking participants to decide if enough evidence has been presented to classify the polygon as a square, parallelogram, rectangle, trapezoid, kite, rhombus, scalene, isosceles, equilateral, or a right triangle. If possible a connection could be made to online technology to verify calculations using NCTM Core Math Tools.

Calculator Scene Investigation

When officials arrive on a crime scene, they collect evidence for a possible case. They cannot go to court and say "It looked like this….". They have to have data to provide evidence to support their claim.

Today you have arrived at a data scene, and you have to calculate numerical evidence to support your claim that identifies your polygon. Coordinates of consecutive vertices of different triangles and quadrilaterals are given below. In each case, carefully draw the figure on a coordinate grid and answer as precisely as possible the following claim:

- If the polygon is a triangle, identify that polygon as a right, isosceles, or equilateral triangle.
- If the polygon is a quadrilateral, identify the quadrilateral as a square, rectangle, rhombus, parallelogram or kite.

Prepare a courtroom display of the collected data and your calculations that will support your claim. You will need to provide a convincing argument for the classroom room jury to render a verdict and conviction.

Case   Data
I.   A (-2, 2),   B (8, 6),   C (4, -4)

II.   D (6, 3),   E (-3, 9),   F (-6, 3),   G (3, -3)

III.   J (6, -3),   K (3, 9),   L (-6, -6)

IV.   P (-4, 0),   Q (8, 0),   R (4, 8),   S (-4, 12)

V.   T (-5, 6),   U (-1, 8),   V (3, 0),   W (-1, -2)

The court will convene in 15 minutes.

Case	Claim	Conviction	Reasoning
I			
II			
III			
IV			
V			