Lesson 7: Proving Special Quadrilaterals

Standard: G.GPE.4: Use coordinates to prove simple geometric theorems algebraically. Standard: G.GPE.5: Prove the slope criteria for parallel and perpendicular lines; use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). Standard: G.GPE.6: Find the point on a directed line segment between two given points that partitions the segment in a given ratio. Standard G.GPE.7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.

Essential Question: How do you use coordinates to prove special quadrilaterals?



When a figure is in the coordinate plane, you can use the Distance Formula to prove that sides are congruent and you can use the slope formula to prove that sides are parallel or perpendicular.

Important formulas (YOU NEED TO KNOW THESE!)

Slope:

Midpoint:

Distance (length):

THREE PARTS

-Formulate a plan

-Use slope, midpoint, and/or distance formulas to execute plan

- Parallelogram
- Rhombus
- Rectangle
- Square
- Trapezoid
- Isosceles trapezoid

EXAMPLE: Prove that A(2, -1), B(1, 3), C(6, 5), and D(7, 1) are the vertices of a parallelogram.



1. Graph and prove that the points represent the vertices of a parallelogram.





2. Prove that the quadrilateral whose vertices are the points A(-1,1), B(-3,4), C(1,5) and D(3,2) is a parallelogram.



3. Quadrilateral ABCD has vertices A (2, 3), B (10, 3), C (10, -1), and D (2, -1). Prove quadrilateral ABCD is a rectangle



Quadrilateral DEFG has vertices at D (3, 4), E (8, 6), F (9, 9) and G (4, 7). Prove that DEFG is a parallelogram.



 The coordinates of the vertices of quadrilateral ABCD are A (-3,-1), B (6, 2), C (5, 5), and D (-4, 2). Prove that quadrilateral ABCD is a rectangle.



 Quadrilateral QRST has vertices Q (6, 7), R (11, 7), S (8, 3), T (3, 3). Prove quadrilateral QRST is a rhombus



The coordinates of the vertices of quadrilateral ABCD are A(4,1), B(1,5), C(-3,2) and D(0,-2). Prove the quadrilateral is a square.



8. Quadrilateral RHOM has vertices R (-3, 2), H (2, 4), O (0,-1), and M (-5,-3). Using coordinate geometry, prove that RHOM is a rhombus.

9 8 6 5 3 2 10 5 2 3 ъ 1 2 3 4 5 6 7 8 9

9. Quadrilateral EFGH has vertices E (-7, 0), F (-2, 0), G (-2, -5), and H (-7, -5). Prove quadrilateral EFGH is a square.



 Quadrilateral JKLM has vertices J (4, 7), K (11, 0), L (7, 0), and M (4, 3). Prove quadrilateral JKLM is an isosceles trapezoid.



11. Quadrilateral TRAP has vertices T(-3,0), R(-3,5), A(6,8), and P(9,4). Prove that quadrilateral TRAP is an isosceles trapezoid.



Quadrilaterals

Parallelogram

-using distance formula, prove that opposite sides are congruent

Rhombus

-using distance formula, prove that all sides are congruent

Rectangle

-using distance formula, prove that opposite sides are congruent (parallelogram) <u>and</u> diagonals are congruent

Square

-using distance formula, prove that all sides are congruent

-using slope formula, prove that there are four right angles (perpendicular sides)

Trapezoid

-using slope formula, prove one pair of sides is parallel (same slope), and the other pair is not (different slope)

Isosceles Trapezoid

-using slope formula, prove one pair of sides is parallel (same slope), and the other pair is not (different slope)

-using distance formula, prove the non-parallel sides are congruent