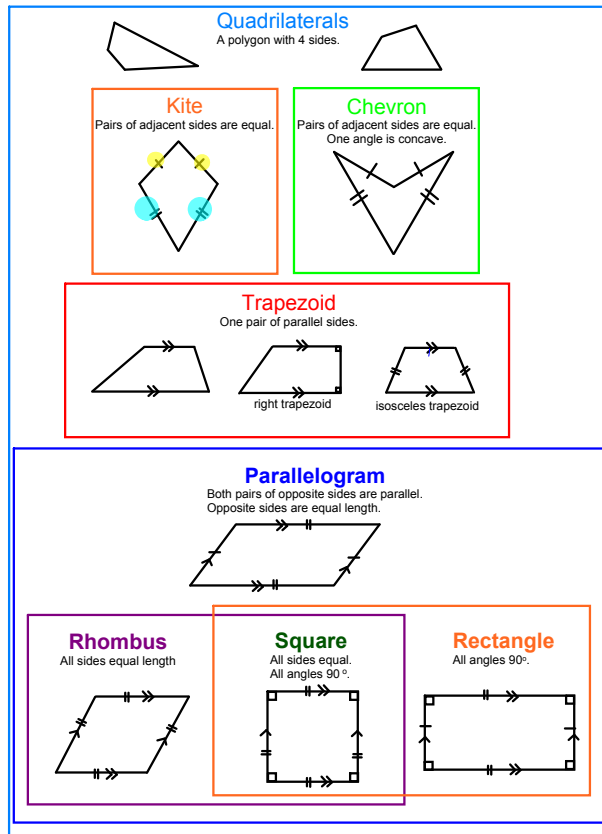
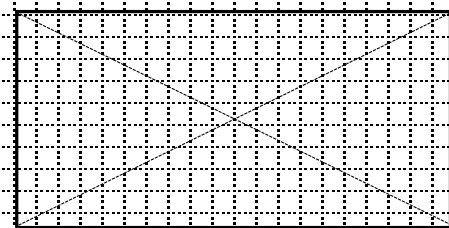
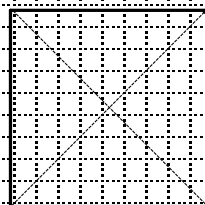
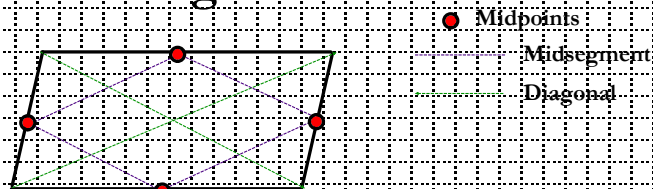
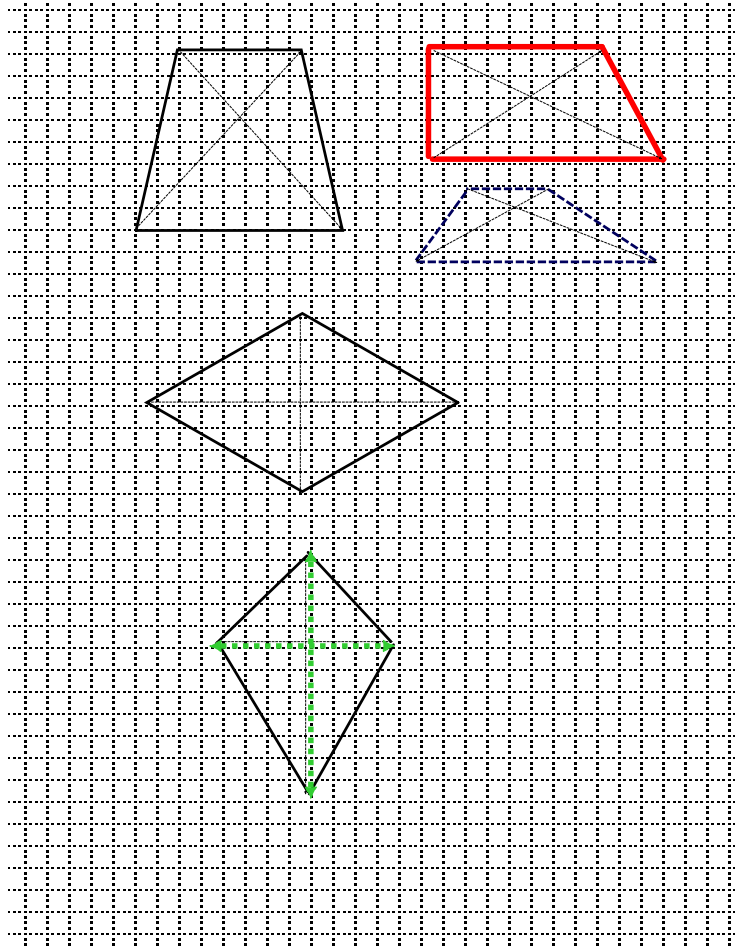


2.9 Investigate Properties of Quadrilaterals



Quadrilaterals- Draw all diagonals and midsegments





Investigate!



QUADRILATERALS

Diagonals:

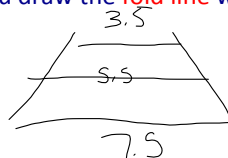
- Determine properties of the **diagonals** of all 6 quadrilaterals:
 - Are the **diagonals** equal in length?
 - Do the **diagonals** bisect each other?
 - Do the **diagonals** intersect at a right angle?

Midsegments (join adjacent midpoints)

- Mark the **midpoint** of each side.
- Draw the **midsegments** of a quadrilateral.
- What shape do the **midsegments** make?

Trapezoid

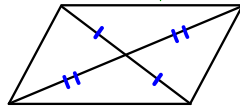
- Fold it in half so that the **parallel sides** line up.
- What do you notice about the **fold line**?
- How does the length of the **fold line** compare to the lengths of the **parallel sides**?
- How could you draw the **fold line** without folding?



Conclusions for Diagonal Properties:

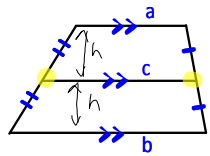
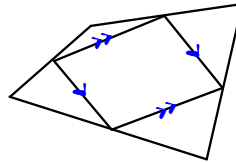
Shape	Equal Lengths?	Perpendicular?	Bisect Each Other?
Square	Yes	Yes	Yes
Rectangle	Yes	No	Yes
Parallelogram	No	No	Yes
Rhombus	No	Yes	Yes
Trapezoid	No	No	No
Kite	No	Yes	One does

→ isosceles trapezoid [Yes]



The **diagonals** of a parallelogram **bisect** each other.

The **midsegments** of any quadrilateral form a **parallelogram**.



The line joining the midpoints of the non-parallel sides of a **trapezoid** is **parallel** to the parallel sides.

Its **length** is the **average** of the lengths of the two parallel sides.

$$C = \frac{a+b}{2}$$

Fold line creates 2 trapezoids with equal heights.

Using your formulas for slope, midpoint, and distance, what would you have to do to prove that a quadrilateral is a.....

kite	lengths of all 4 sides, pairs of adjacent sides are equal
trapezoid	slopes of opposite sides, one pair of opposite sides have equal slopes (isosceles trapezoid: 2 non-parallel sides have equal length) right trapezoid → adjacent side ⊥
parallelogram	slopes of all sides, opposite sides have equal slopes
rhombus	parallelogram (with no 90°) + all sides are equal length
square	parallelogram (sides meet at 90°) + all sides are equal length
rectangle	parallelogram (sides meet at 90°) + 2 pairs of opposite sides are equal

Attachments

2.9 diagonals of parallelogram.gsp

2.9 Varignon Parallelogram.gsp

2.9 Midsegment of Trapezoid.gsp