
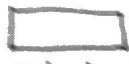



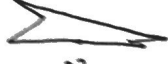




Defn: A quadrilateral is a closed figure with 4 straight sides. e.g. 

● ex:  rectangle     square     trapezoid     parallelogram     ??    not:     

Nicest Quadrilaterals:

- A rectangle is a quadrilateral with 4 right angles. — opposite pairs of sides have the same length.
- A square is a rectangle with all sides the same length. (or all sides congruent).

Notice that both rectangles & squares have 4 angles that sum to  $360^\circ$ .

Parallelograms: in the same plane

Recall that two lines are parallel if they do not intersect:



• we will use arrows to indicate two lines are parallel

A parallelogram is a quadrilateral with two pairs of opposite sides that are parallel.

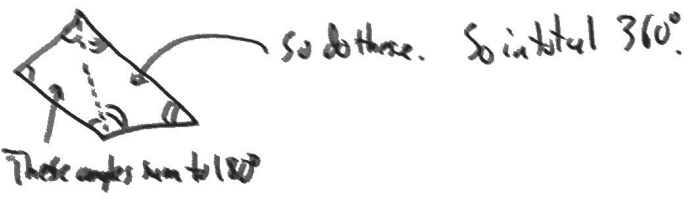


• What is the sum of the angles of a parallelogram? Why?



Therefore the sum is  $90^\circ$  (first pair) +  $90^\circ$  (second pair) +  $90^\circ$  +  $90^\circ$  (double boxed) =  $360^\circ$ .

• Is this true for all quadrilaterals? A: Yes.



Notice: Opposite angles of parallelograms are congruent. What about opposite sides?  
A: Yes.

Rhombuses or Rhombi:

A rhombus is a quadrilateral with 4 equal sides.





• It turns out that all rhombi are parallelograms: try to arrange 4 toothpicks in a quadrilateral. — they will be parallel in 2 pairs of parallel edges.

# Trapezoids

Def: A trapezoid is a quadrilateral with at least 1 pair of opposite sides that are parallel.



Note: This is not the defn in your book. However this definition (inclusive) generalizes better and works well with ideas from higher mathematics.

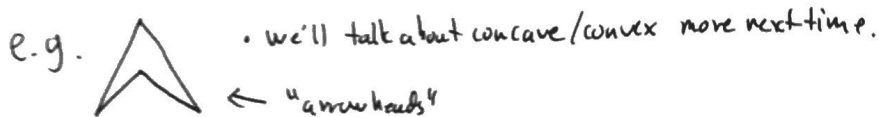
- Special trapezoids:
  - right trapezoids have 2 adjacent right angles 
  - isosceles trapezoids: have congruent nonparallel sides 

• All quadrilaterals we have discussed are convex quadrilaterals:
 

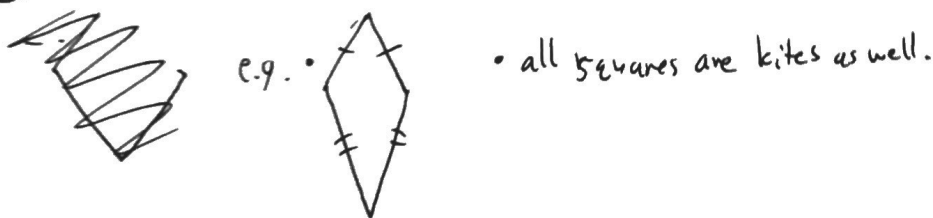
- every line segment connecting 2 points in the figure lies entirely within the figure.

There are also concave quadrilaterals:

- there is at least 1 line segment connecting two points in the figure that passes outside the figure



Defn: A kite is a convex quadrilateral with 2 pairs of adjacent sides that are congruent.



Activity: Create an Euler diagram showing the relationships among the types of quadrilaterals: quadrilaterals, parallelograms, concave quadrilaterals, convex quadrilaterals, trapezoids, kites, rhombi, squares, & rectangles.

