

LAUNCH:

On a separate sheet of paper, sketch several figures that each have the following properties.

- The figure is made of four segments.
- The segments intersect at their endpoints.
- Each endpoint is shared by exactly two segments.

Answer the following questions about each of your figures.

1. Is your figure closed? Can you draw a figure with the three properties listed above that is not closed?
2. Must your figure lie on a plane? Can you show a figure with the three properties listed above that does not lie on a plane?
3. Does your figure intersect itself? Explain.

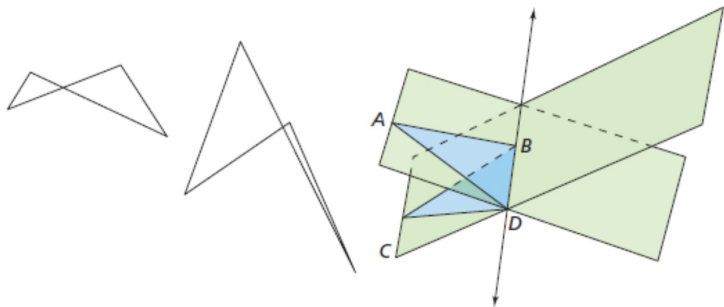
2.16 General Quadrilaterals

Objective: Students will define and classify quadrilaterals

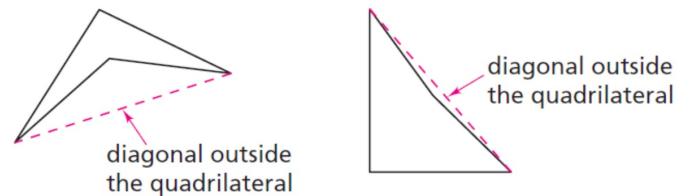
Definition

A **quadrilateral** is a figure that consists of four segments called its **sides**. The sides intersect at their endpoints, called the quadrilateral's **vertices**, so that each vertex is the endpoint of exactly two sides.

Are these figures quadrilaterals?

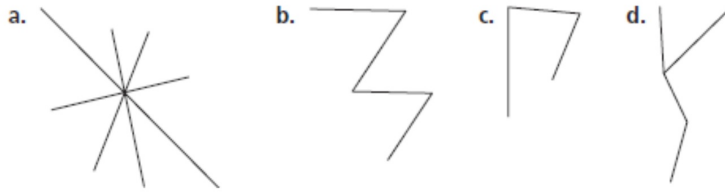


self-intersecting quadrilaterals skew quadrilateral



concave quadrilaterals

3. Explain why each figure below is not a quadrilateral.



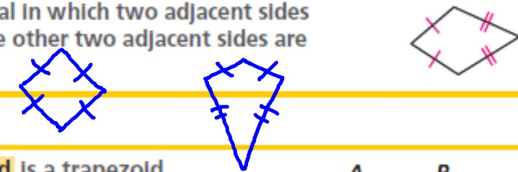
Definition

A **trapezoid** is a quadrilateral with exactly one pair of parallel sides. The two parallel sides are called the **bases** of the trapezoid.



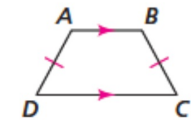
Definition

A **kite** is a quadrilateral in which two adjacent sides are congruent, and the other two adjacent sides are congruent as well.



Definition

An **isosceles trapezoid** is a trapezoid with opposite nonparallel sides that are congruent. Each pair of angles with vertices that are the endpoints of the same base are called **base angles**.



$\angle A$ and $\angle B$ are base angles.
 $\angle D$ and $\angle C$ are base angles.

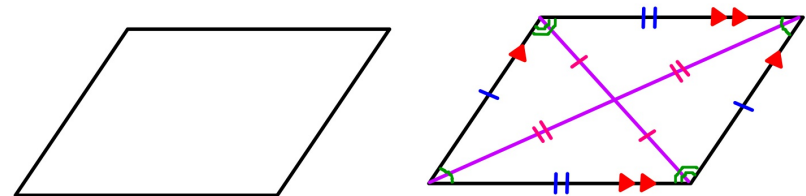
Definition

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



Is a rectangle is a parallelogram?

All about Parallelograms:

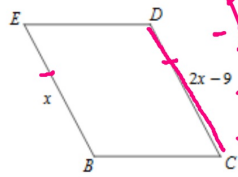


- Opposite sides are parallel
- Opposite sides are congruent
- Opposite angles are congruent
- It's consecutive angles are supplementary (add to 180°)
- Either diagonal divides the figure into two congruent triangles
- It's diagonals bisect each other

Examples:

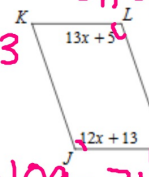
Find the measurement indicated in each parallelogram.

1) Find $DC = 9$



$$\begin{aligned} x &= 2x - 9 \\ -2x &-2x \\ -x &= -9 \\ \div -1 &\div -1 \\ x &= 9 \end{aligned}$$

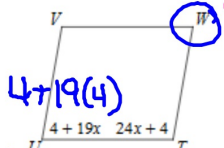
2) Find $m\angle M = 71$



$$\begin{aligned} 13x + 5 &= 12x + 13 \\ -12x &-12x \\ x + 5 &= 13 \\ -5 &-5 \\ x &= 8 \end{aligned}$$

$$\begin{aligned} 12(8) + 13 &= 109 \\ 180 - 109 &= 71 \end{aligned}$$

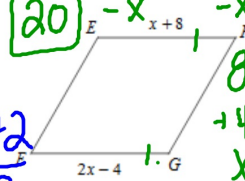
3) Find $m\angle W = 80$



$$\begin{aligned} 4 + 19(4) &= 80 \\ 4 + 19x + 24x + 4 &= 180 \\ 8 + 43x &= 180 \\ 43x &= 172 \\ \frac{43x}{43} &= \frac{172}{43} \\ x &= 4 \end{aligned}$$

$$2(4) - 9 = 18 - 9 = 9$$

4) Find $GF = 20$



$$\begin{aligned} x + 8 &= 2x - 4 \\ -x &-x \\ 8 &= x - 4 \\ +4 &+4 \\ x &= 12 \end{aligned}$$

$$2(12) - 4 = 20$$

Definitions

A **rectangle** is a parallelogram with four right angles.



A **rhombus** is a parallelogram with four congruent sides.

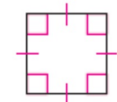
A common term for a rhombus is *diamond*.



A square is a special kind of rectangle with four congruent sides. A square is also a special kind of rhombus, with four congruent angles.

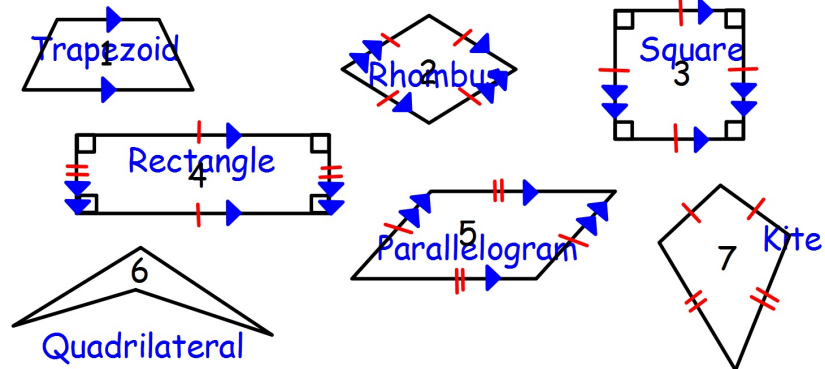
The definition for a square is given below.

A **square** is a rectangle with four congruent sides.

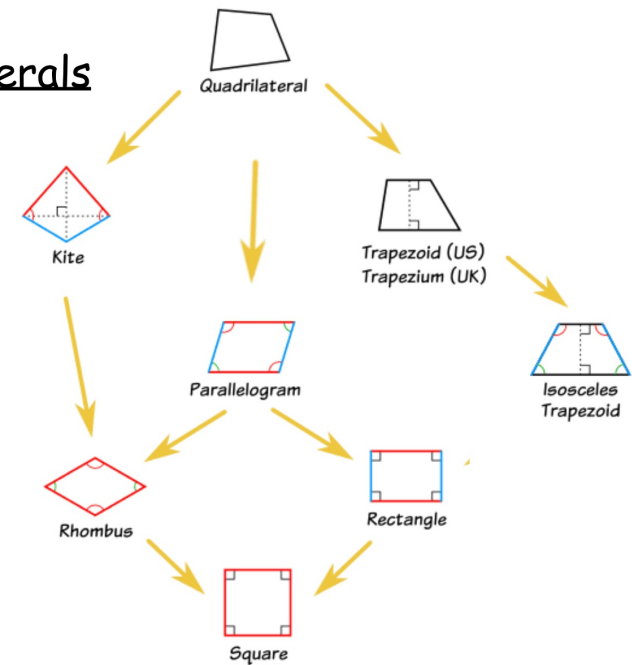


EXPLORE: (Try this in your notes)

Choose the *most precise* name for each figure:



Summary: Quadrilaterals



HOMEWORK:

**Classifying Quadrilaterals
Worksheet**