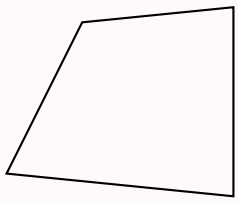
PROPERTIES OF QUADRILATERALS

A QUADRILATERAL CLASSIFICATION

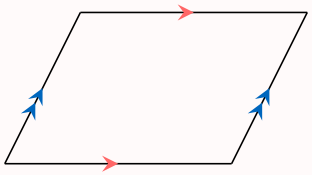
Definition Quadrilateral

A **quadrilateral** is a polygon with four sides.



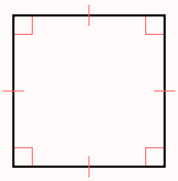
Definition Parallelogram

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



Definition Square

A **square** is a quadrilateral with four right angles and four equal sides.

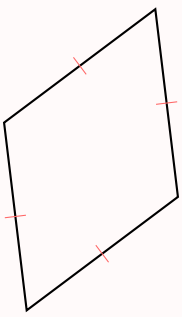


Definition Rectangle

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

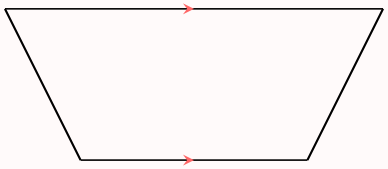
Definition Rhombus

A **rhombus** is a quadrilateral with four equal sides.



Definition **Trapezium**

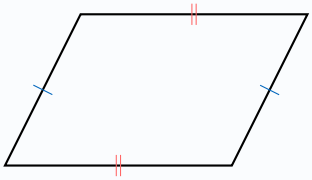
A **trapezium** is a quadrilateral with one pair of opposite sides parallel (in some countries, this is called a *trapezoid*).



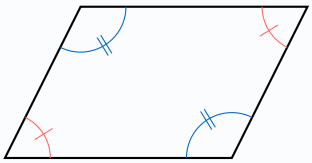
B PROPERTIES

Proposition **Properties of a Parallelogram**

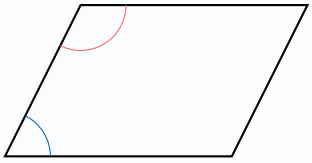
- The opposite sides are equal in length.



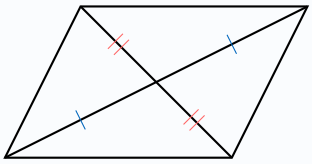
- The opposite angles are equal.



- The adjacent angles are supplementary (they add up to 180°).

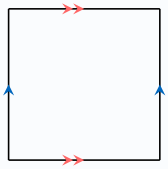


- The diagonals bisect each other (each one is cut in half by the other).

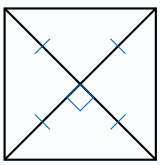


Proposition **Properties of a Square**

- The opposite sides are parallel.

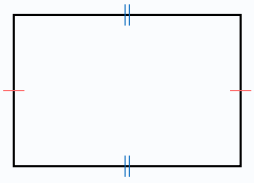


- The diagonals bisect each other, are perpendicular, and are equal in length.

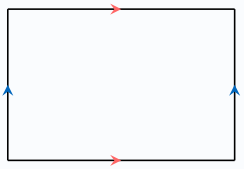


Proposition **Properties of a Rectangle**

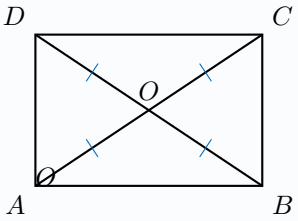
- The opposite sides are equal in length.



- The opposite sides are parallel.

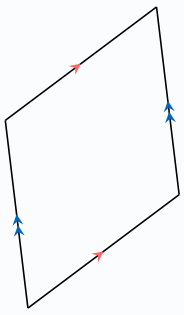


- The diagonals bisect each other and are equal in length.

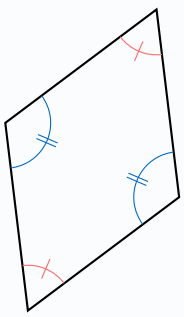


Proposition **Properties of a Rhombus**

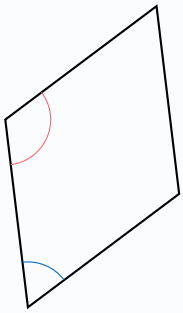
- The opposite sides are parallel.



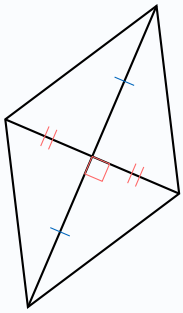
- The opposite angles are equal.



- The adjacent angles are supplementary (they add up to 180°).



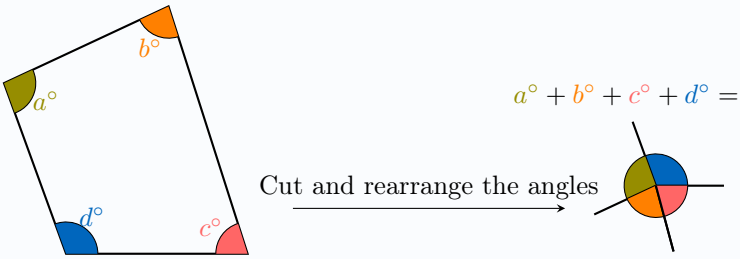
- The diagonals bisect each other at right angles.



C ANGLES

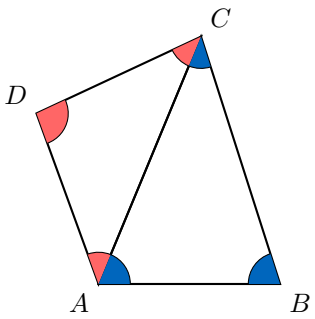
Proposition Sum of the Angles of a Quadrilateral

The sum of the interior angles of a quadrilateral is 360°.



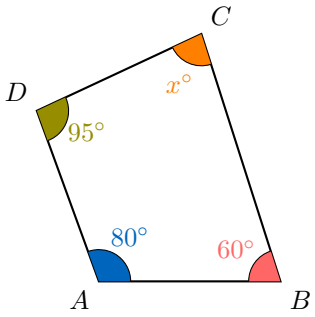
Proof

We divide the quadrilateral $ABCD$ into two triangles, ABC and ACD, using the diagonal AC.



$$\begin{aligned}\text{Sum of the interior angles of quadrilateral } ABCD &= \text{Sum of the interior angles of } \triangle ABC \\ &\quad + \text{Sum of the interior angles of } \triangle ACD \\ &= 180° + 180° \\ &= 360°\end{aligned}$$

Ex: Find the unknown angle $x°$.



Answer: The sum of the angles of a quadrilateral is 360°. The three known angles are 60°, 95°, and 80°.

$$\begin{aligned} x^\circ + 95^\circ + 80^\circ + 60^\circ &= 360^\circ \\ x^\circ + 235^\circ &= 360^\circ && \text{(adding the known angles)} \\ x^\circ &= 360^\circ - 235^\circ && \text{(subtracting } 235^\circ \text{ from both sides)} \\ x^\circ &= 125^\circ \end{aligned}$$