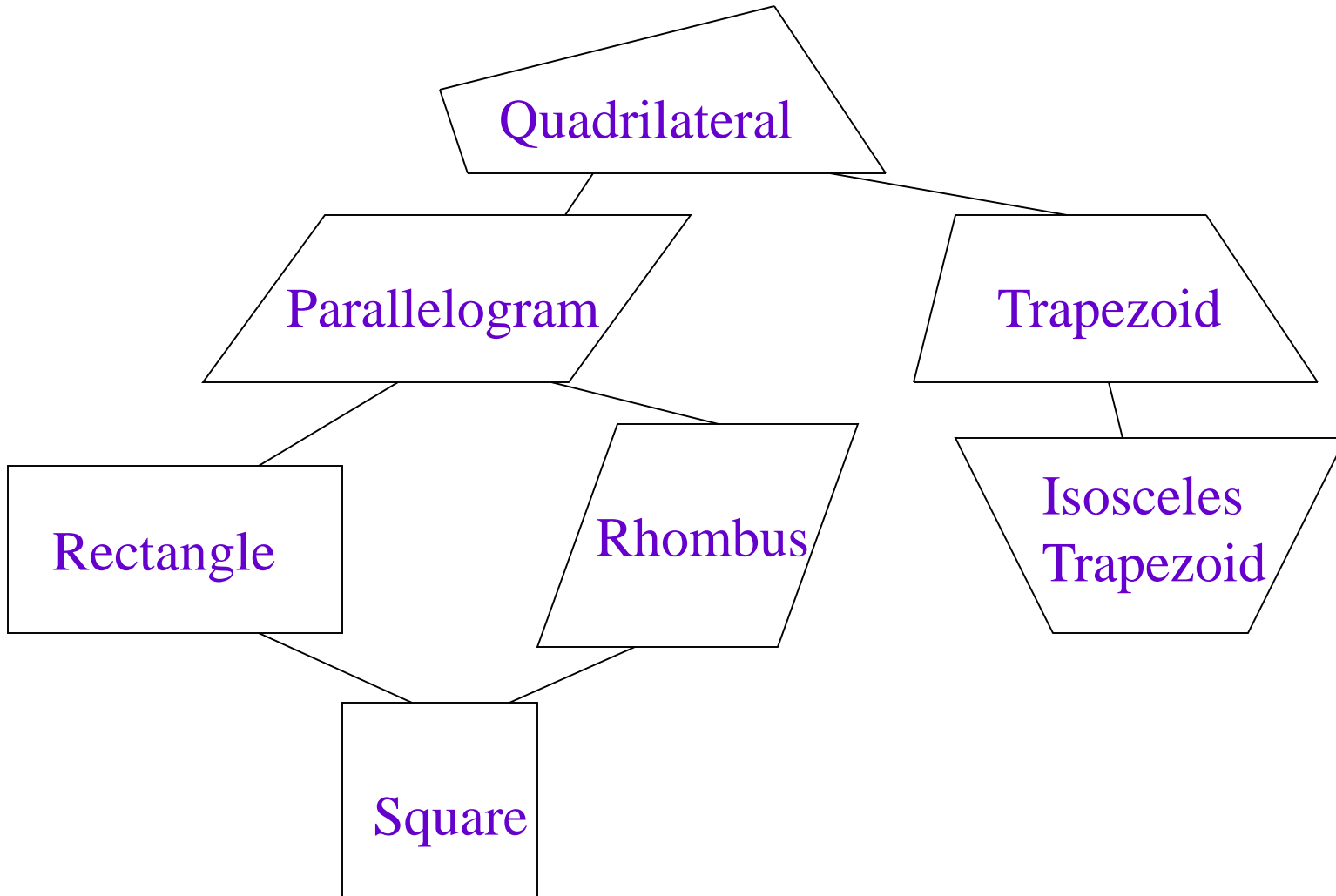
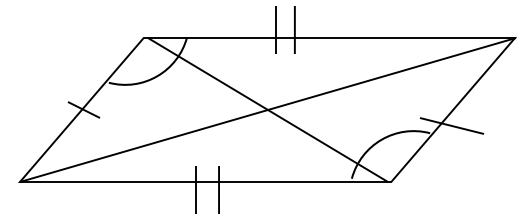


Quadrilaterals



Properties of a Parallelogram

- Properties of a parallelogram:

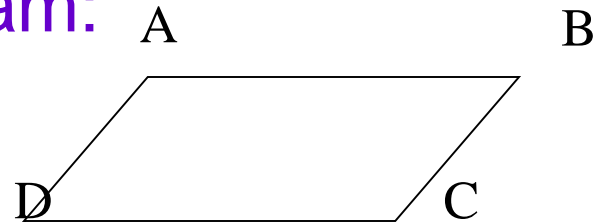


- Opposite angles are congruent
- Opposite sides are congruent
- Diagonals bisect each other
- Consecutive angles are supplementary

Properties of a Parallelogram

$$m\angle ADC = 63^\circ$$

- In the following parallelogram:
AB = 7, BC = 4,

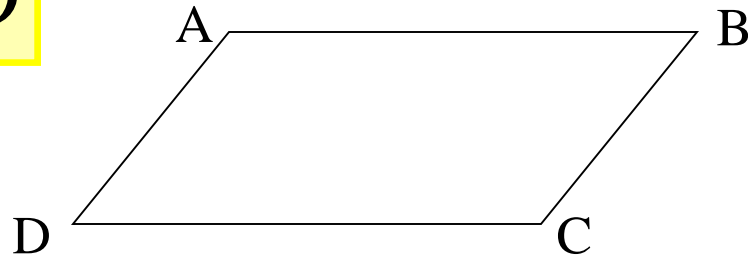


- What is CD?
- What is AD?
- What is $m\angle ABC$?
- What is $m\angle DCB$?

Properties of a Parallelogram

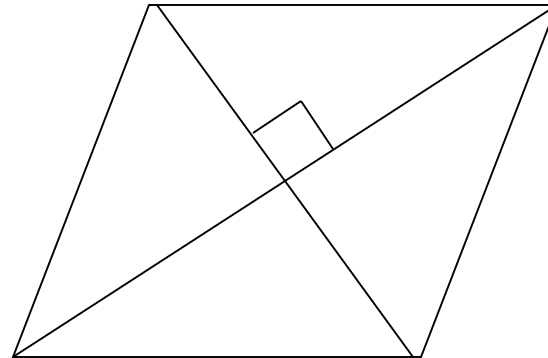
- Definition: A parallelogram is a quadrilateral in which both pairs of opposite sides are parallel.

$$\overline{AB} \parallel \overline{CD} \text{ and } \overline{BC} \parallel \overline{AD}$$



Rectangle, Square, and Rhombus

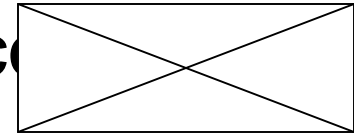
- A rhombus is a parallelogram with all sides congruent.
- The diagonals of a rhombus are perpendicular.



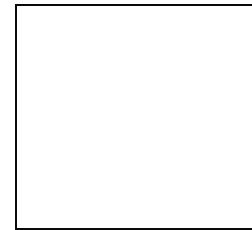
Rectangle, Square, and Rhombus

- Rectangle - a parallelogram that has 4 right angles.

- The diagonals of a rectangle are congruent.



- A square is a rectangle that has all sides congruent (regular quadrilateral).



Proofs

- Proving a quadrilateral is a parallelogram:



- Show both pairs of opposite sides are parallel (definition)
- Show one pair of opposite sides are congruent and parallel
- Show both pairs of opposite sides are congruent
- Show the diagonals bisect each other

Parallelogram

- opposite sides are parallel
- opposite angles are congruent
- opposite sides are congruent
- diagonals bisect each other
- consecutive angles are supplementary

Rhombus

- has all the properties of a parallelogram
- four sides are equal in length
- diagonals are perpendicular
- diagonals bisect each pair of opposite angles

Rectangle

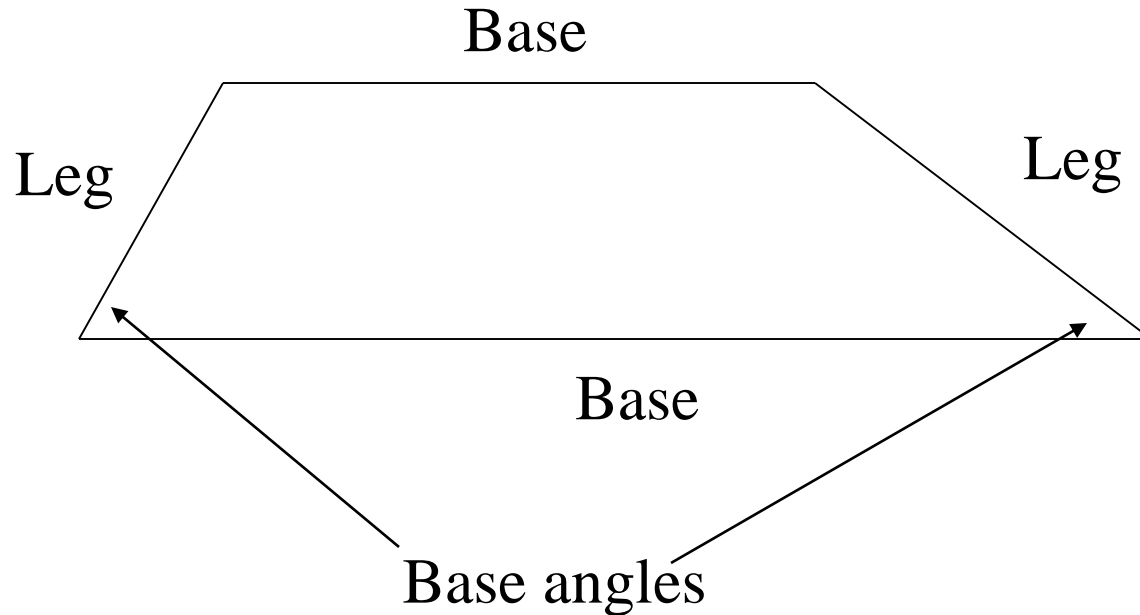
- has all the properties of a parallelogram
- diagonals are congruent
- contains four right angles

Square

- has all the properties of a parallelogram
- diagonals are congruent and perpendicular
- is a rectangle with all sides congruent
- is a rhombus with four right angles

The Trapezoid

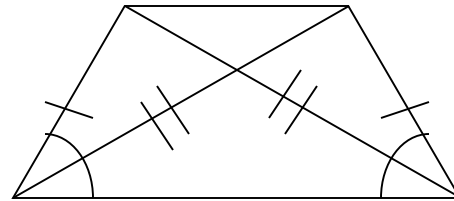
- Definition: A trapezoid is a quadrilateral with exactly 2 parallel sides.



The Trapezoid

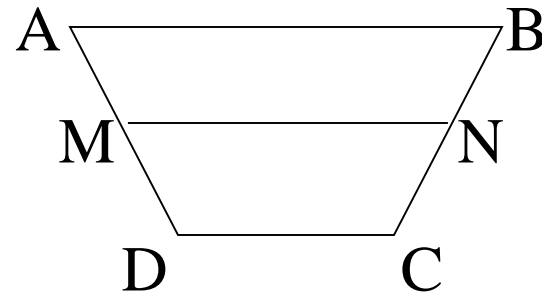
- Isosceles trapezoid:

- 2 legs are congruent
- Base angles are congruent
- Diagonals are congruent



The Trapezoid

- Median of a trapezoid: connecting midpoints of both legs



$$MN = \frac{1}{2} (AB + DC) \text{ and } \overline{AB} \parallel \overline{MN} \parallel \overline{DC}$$

Parallelogram

- opposite sides are parallel
- opposite angles are congruent
- opposite sides are congruent
- diagonals bisect each other
- consecutive angles are supplementary

Rectangle

- has all the properties of a parallelogram
- diagonals are congruent
- contains four right angles

Rhombus

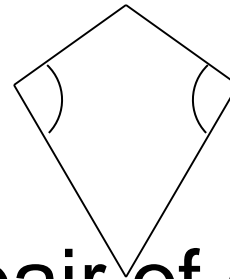
- has all the properties of a parallelogram
- four sides are equal in length
 - diagonals are perpendicular
 - diagonals bisect each pair of opposite angles

Square

- has all the properties of a parallelogram
- diagonals are congruent and perpendicular
- is a rectangle with all sides congruent
- is a rhombus with four right angles

Kites

- Kite - a quadrilateral with two distinct pairs of congruent adjacent sides.



- Theorem: In a kite, one pair of opposite angles is congruent.