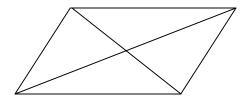
PROPERTIES OF QUADRILATERALS

Properties of Parallelograms

In a parallelogram,

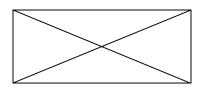
- 1. The parallel sides are parallel by definition.
- 2. The opposite sides are congruent.
- 3. The opposite angles are congruent.
- 4. The diagonals bisect each other.
- 5. Any pair of consecutive angles are supplementary.



Properties of Rectangles

In a rectangle,

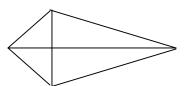
- 1. All the properties of a parallelogram apply by definition.
- 2. All angles are right angles.
- 3. The diagonals are congruent.



Properties of Kites

In a kite,

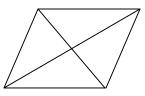
- 1. Two disjoint pairs of consecutive sides are congruent by definition.
- 2. The diagonals are perpendicular.
- 3. One diagonal is the perpendicular bisector of the other.
- 4. One of the diagonals bisects a pair of opposite angles.
- 5. One pair of opposite angles are congruent.



Properties of Rhombuses

In a rhombus.

- 1. All the properties of a parallelogram apply by definition.
- 2. Two consecutive sides are congruent by definition.
- 3. All sides are congruent.
- 4. The diagonals bisect the angles.
- 5. The diagonals are perpendicular bisectors of each other.
- 6. The diagonals divide the rhombus into four congruent right triangles.



Properties of Squares

In a square,

- 1. All the properties of a rectangle apply by definition.
- 2. All the properties of a rhombus apply by definition.
- 3. The diagonals form four isosceles right triangles.



Properties of Isosceles Trapezoids

In an isosceles trapezoid,

- 1. The legs are congruent by definition.
- 2. The bases are parallel by definition.
- 3. The lower base angles are congruent.
- 4. The upper base angles are congruent.
- 5. The diagonals are congruent.
- 6. Any lower base angle is supplementary to any upper base angle.



Proving That a Quadrilateral is a Parallelogram

Any one of the following methods might be used to prove that a quadrilateral is a parallelogram.

- 1. If both pairs of opposite sides of a quadrilateral are parallel, then it is a parallelogram (definition).
- 2. If both pairs of opposite sides of a quadrilateral are congruent, then it is a parallelogram.
- 3. If one pair of opposite sides of a quadrilateral are both parallel and congruent, then it is a parallelogram.
- 4. If the diagonals of a quadrilateral bisect each other, then the it is a parallelogram.
- 5. If both pairs of opposite angles of a quadrilateral are congruent, then it is a parallelogram.

Proving That a Quadrilateral is a Rectangle

One can prove that a quadrilateral is a rectangle by first showing that it is a parallelogram and then using either of the following methods to complete the proof.

- 1. If a parallelogram contains at least one right angle, then it is a rectangle (definition).
- 2. If the diagonals of a parallelogram are congruent, then it is a rectangle.

One can also show that a quadrilateral is a rectangle without first showing that it is a parallelogram.

3. If all four angles of a quadrilateral are right angles, then it is a rectangle.

Proving That a Quadrilateral is a Kite

To prove that a quadrilateral is a kite, either of the following methods can be used.

- 1. If two disjoint pairs of consecutive sides of a quadrilateral are congruent, then it is a kite (definition).
- 2. If one of the diagonals of a quadrilateral is the perpendicular bisector of the other diagonal, then it is a kite.

Proving That a Quadrilateral is a Rhombus

To prove that a quadrilateral is a rhombus, one may show that it is a parallelogram and then apply either of the following methods.

- 1. If a parallelogram contains a pair of consecutive sides that are congruent, then it is a rhombus (definition).
- 2. If either diagonal of a parallelogram bisects two angles of the parallelogram, then it is a rhombus

One can also prove that a quadrilateral is a rhombus without first showing that it is a parallelogram.

3. If the diagonals of a quadrilateral are perpendicular bisectors of each other, then it is a rhombus.

Proving That a Quadrilateral is a Square

The following method can be used to prove that a quadrilateral is a square:

• If a quadrilateral is both a rectangle and a rhombus, then it is a square.

Proving That a Trapezoid is an Isosceles Trapezoid

Any one of the following methods can be used to prove that a trapezoid is isosceles.

- 1. If the nonparallel sides of a trapezoid are congruent, then it is isosceles (definition).
- 2. If the lower or upper base angles of a trapezoid are congruent, then it is isosceles.
- 3. If the diagonals of a trapezoid are congruent, then it is isosceles.