# » **Quadrilaterals |** Proofs from Minimal Definitions

Each member of the family of quadrilaterals has a *minimal definition*. Even though these minimal definitions are very simple, we can use them to determine heaps of useful things about these shapes. Formally prove each of the following properties using the minimal definitions for each quadrilateral, but don't forget:

- Constructions may be required.

- Draw diagrams, label all points, and set out all your proofs formally (no shortcuts!).

- Once you have proved something, you can use that result later! For example:
  - Once you have proven two triangles within are shape are congruent, you can keep referring to the equal sides and angles in those triangles (just make sure it is clear which congruent triangles you are talking about).
  - Once you prove a property for one shape, you can refer to that property for related shapes. For instance, once you prove that opposite sides in a parallelogram are equal (Q7), you can use that property when you are trying to prove that a rectangle's diagonals are equal (Q13), *since a rectangle is a specialised kind of parallelogram.*
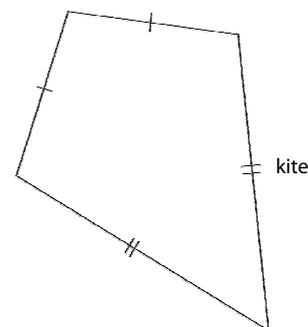
» **Quadrilateral**

1. The angle sum of a quadrilateral is 360°
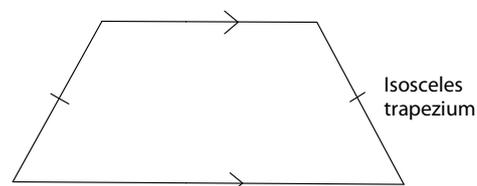
quadrilateral
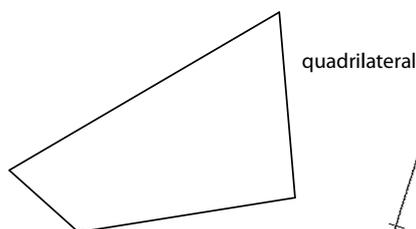
» **Kite**

2. One pair of opposite angles in a kite are equal

3. A kite's diagonals are perpendicular

4. One diagonal in a kite is bisected

5. One pair of opposite angles in a kite are bisected by the diagonal
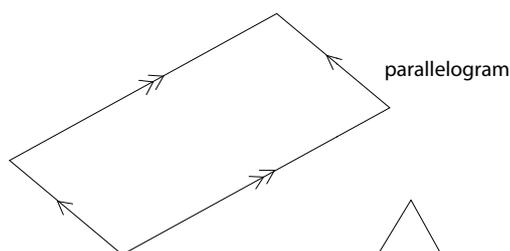
kite

» **Isosceles Trapezium**

6. Two pairs of angles in an isosceles trapezium are equal
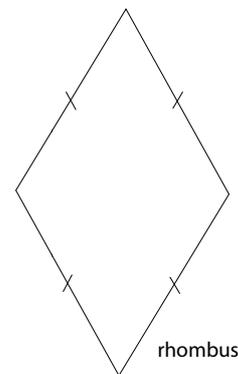
Isosceles trapezium

» **Parallelogram**

7. Opposite sides in a parallelogram are equal

8. Opposite angles in a parallelogram are equal

9. A parallelogram's diagonals bisect each other

parallelogram

» **Rhombus**

10. A rhombus' diagonals bisect at right angles

11. A rhombus' diagonals bisect the opposite angles

» **Rectangle**

12. All angles in a rectangle are 90°

13. A rectangle's diagonals are equal

rhombus

rectangle