

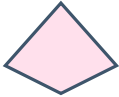






EXPLORING QUADRILATERALS

Division 2 Mathematics · Mr. Merrick · January 15, 2026

Quadrilateral Definitions (with pictures)

A quadrilateral is a polygon with [4] sides.^a

Type	Definition	Picture
Quadrilateral	A polygon with 4 sides.	
Trapezoid	Exactly one pair of opposite sides is parallel.	
Kite	Two pairs of equal adjacent sides.	
Parallelogram	Both pairs of opposite sides are parallel.	
Rectangle	A quadrilateral with 4 right angles.	
Rhombus	A quadrilateral with 4 equal side lengths.	
Square	A rectangle with 4 equal sides.	

Quick check: Circle all that are always true.

- A square is a rectangle. [True]
- A rectangle is a rhombus. [False (only if it is a square)]
- A square is a kite. [True (a square has two pairs of adjacent equal sides)]
- A trapezoid is a parallelogram. [False]

^aWe will only explore *simple* quadrilaterals (no sides cross). *Complex* quadrilaterals also exist:
<https://mathmonks.com/quadrilateral/simple-and-complex-quadrilateral>.

True or False?

Directions: Write T or F. Then justify in 1–2 sentences (or with a counterexample).

1. All squares are rhombuses.
[T. A square has 4 equal sides, so it fits the rhombus definition.]
2. All rectangles are squares.
[F. Rectangles do not need 4 equal sides; only some are squares.]
3. There exists a rectangle that is a rhombus.
[T. A square is a rectangle and has 4 equal sides, so it is also a rhombus.]
4. Every rhombus is a square.
[F. A rhombus does not have to have right angles, so it may not be a square.]
5. Every square is a parallelogram.
[T. A square has two pairs of parallel sides.]
6. If a quadrilateral has 4 right angles, then it is a rectangle.
[T. This matches the definition of a rectangle.]
7. A trapezoid can have 2 right angles.
[T. A right trapezoid has two right angles, so this is possible.]
8. No trapezoid is a parallelogram.
[T. A parallelogram has two pairs of parallel sides, but a trapezoid has exactly one pair.]
9. If both pairs of opposite sides are parallel, then it is a parallelogram.
[T. That is the definition of a parallelogram.]
10. A kite must have 4 equal sides.
[F. A kite only needs two pairs of adjacent equal sides; the pairs can be different lengths.]

Proof Practice

Directions: Answer in complete sentences.

1. Explain why every square is a rectangle.

[A square has 4 right angles, which is the definition of a rectangle.]

2. Give a counterexample to show that not every kite is a rhombus. You may draw it.

Draw your counterexample here

[Example: a kite with sides 3,3,5,5 (two adjacent pairs equal, but not all four equal).]

3. Is it possible for a trapezoid (exactly one pair of parallel sides) to also be a parallelogram? Explain.

[No. A parallelogram has two pairs of parallel sides, but a trapezoid has exactly one pair.]

Challenge: Always / Sometimes / Never

Directions: Write Always, Sometimes, or Never. Then give a reason.

- 1) A rectangle is a parallelogram.

[Always. A quadrilateral with 4 right angles has two pairs of parallel sides.]

- 2) A kite is a rhombus.

[Sometimes. If all four sides are equal, then the kite is also a rhombus.]

- 3) A trapezoid has at least one pair of parallel sides.

[Always. A trapezoid has exactly one pair of parallel sides.]

- 4) A quadrilateral is convex.

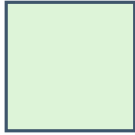
[Sometimes. Some quadrilaterals are concave.]

- 5) A square is a kite.

[Always. A square has two pairs of adjacent equal sides.]

Classification Practice

Directions: For each picture, write all names that apply. (Example: a square is also a rectangle, rhombus, parallelogram, kite, and quadrilateral.)



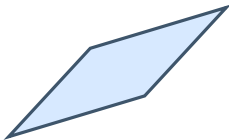
[square, rectangle, rhombus,
parallelogram, kite,
quadrilateral]



[rectangle, parallelogram,
quadrilateral]



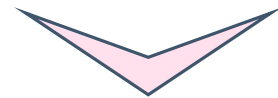
[parallelogram, quadrilateral]



[rhombus, kite, quadrilateral]



[trapezoid, quadrilateral]



[dart, kite, quadrilateral]