

DMT COMPANION

Insight 46 · 2026 · for K-8 educators



TEACHING QUADRILATERALS FOR UNDERSTANDING

Questions and teacher moves for classifying from properties

Why This Matters

When a student says, “A square is not a rectangle because a rectangle has two short sides and two long sides,” the response tells us something about the student’s conception of a rectangle. The student is classifying by appearance rather than by defining properties. Much quadrilateral instruction emphasizes what shapes look like over what must be true about them. Classification by appearance breaks down when a shape is rotated, stretched, or presented in an unfamiliar form.

Key Idea • Students need to classify quadrilaterals from defining properties and relationships, not only from appearance.

Investigate Lines and Their Relationships

Give students opportunities to investigate line segments, angles, parallel relationships, and perpendicular relationships as they develop and use shape definitions.

1. A line extends in both directions without end. A line segment is the part of a line between two points.
2. The sides of a quadrilateral are line segments. Extending those segments as lines can help students reason about parallel and perpendicular relationships.
3. Parallel lines never meet, no matter how far they are extended.
4. Perpendicular lines meet at a right angle.
5. A quadrilateral is a polygon with four sides, four vertices, and four angles. Its sides are line segments that form a closed figure.

Look around the room. Which sides of the ceiling lights, windows, and cubbies are parallel? Which are perpendicular?

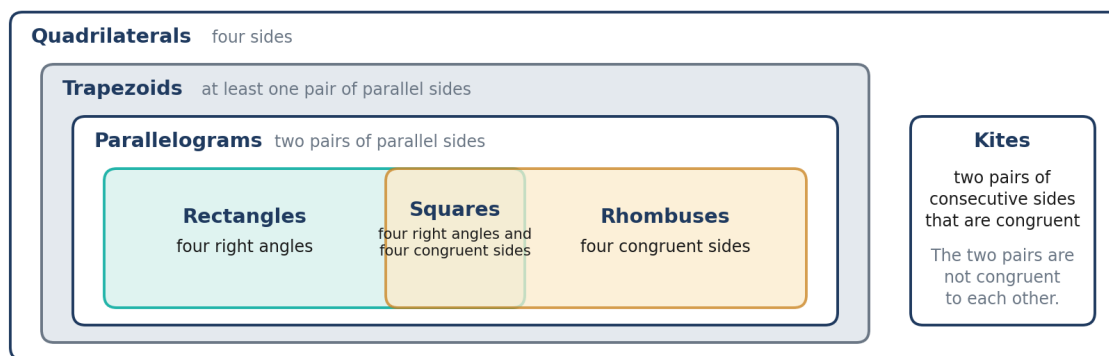
Key Idea • Rotating a shape does not change its parallel, perpendicular, or congruent relationships.

The Quadrilateral Hierarchy: How Categories Are Related

Particular side and angle properties define each quadrilateral category. The categories are inclusive, not mutually exclusive. In this document, a trapezoid is defined inclusively.

- **Quadrilateral:** a polygon with four sides.
- **Kite:** a quadrilateral with two pairs of consecutive sides that are congruent (equal in length). The sides of one pair are not congruent to the sides of the other pair, so a rhombus is not a kite.
- **Trapezoid:** a quadrilateral with at least one pair of parallel sides.
- **Parallelogram:** a quadrilateral with two pairs of parallel sides.
- **Rectangle:** a parallelogram with four right angles.
- **Rhombus:** a parallelogram with four congruent sides.
- **Square:** a parallelogram with four right angles and four congruent sides.

Say explicitly: A square satisfies all of the defining properties of a rectangle and has additional properties. That is why every square is also a rectangle.



How the categories are related.

Questions That Shift Attention to Properties

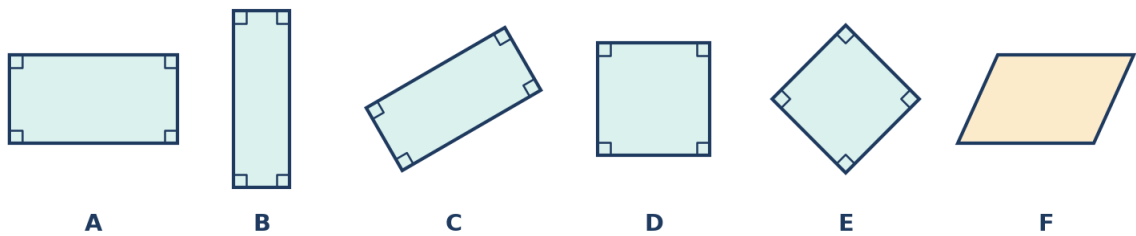
Use these questions across K-8 instruction to shift classroom talk from appearance to what must be true.

- Is the figure closed?
- Are the sides line segments?
- How many sides does it have?
- Which sides are parallel?
- Which angles are right angles?
- Which sides are congruent?
- Which quadrilateral categories does it satisfy?
- How do you know?

The questions focus on properties that do not change when a shape is rotated. Follow them with, “Could the shape belong to more than one category? Why?”

Teacher Moves for Reasoning From Properties

Investigate lines and their relationships.	Have students draw and extend line segments, examine angles, and investigate parallel and perpendicular relationships as they classify quadrilaterals.
Ask, “What must be true?”	Ask students which properties a shape must have to belong to a category. Ask students to justify the classification from the properties they observe.
Use varied examples and non-examples.	Include rotated, stretched, irregular, and non-prototypical examples alongside familiar ones. A tall, narrow rectangle is still a rectangle. A square rotated 45° is still a square. Use non-examples that have some, but not all, of the defining properties.
Make the hierarchy explicit.	Use nested diagrams that show squares inside rectangles, rectangles inside parallelograms, parallelograms inside trapezoids, and trapezoids inside quadrilaterals. Construct the diagrams with students and return to them throughout instruction.
Ask questions that reveal reasoning.	Ask: “What relationships do you notice among the sides?” “How do you know these sides are parallel?” “What would have to change for this to become a square?” The answers show whether a student is reasoning from properties or from appearance.

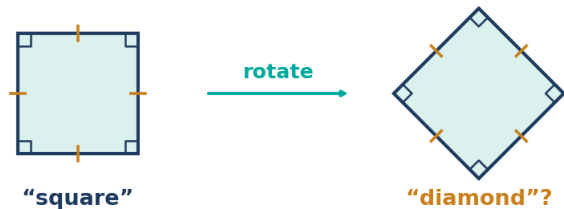


Ask: “Which of these are rectangles? How do you know?” Shapes A through E have four right angles. Shape F does not.

Common Misconceptions and Questions to Ask

A response is evidence of how a student is classifying, not a diagnosis.

What You Hear	What the Student Is Doing	Ask
“A square is not a rectangle.”	The student is treating the categories as mutually exclusive.	Ask: “Does a square have all the properties required of a rectangle? Which ones?”
“That tilted square is a diamond.”	The student is using orientation as a defining property.	Ask: “What changed when the square was rotated? What stayed the same?”
“Rectangles are the long ones.”	The student is using a familiar example, a wide rectangle, as the definition.	Show a tall, narrow rectangle. Ask: “Does it have four right angles? Which properties define a rectangle?”
“A rhombus is always a square.”	The student is treating four congruent sides as enough to define a square.	Ask: “What must be true for a rhombus to be a square?” A rhombus is a square only when it also has four right angles.

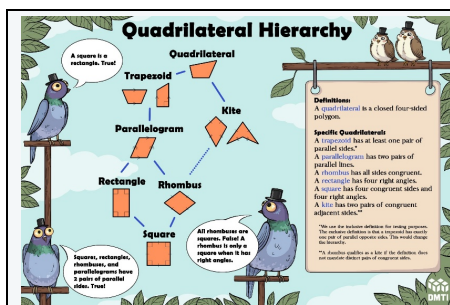


What changed? What stayed the same?

Key Idea • Classify from properties, not appearance.

Continue With DMT Insight 46

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DMTI Resource: Quadrilateral Hierarchy Poster

The Math Success by DMTI poster shows how trapezoids, parallelograms, rectangles, rhombuses, and squares relate through their defining properties, with multiple orientations of each shape. Available at teacherspayteachers.com and redbubble.com (search Math Success by DMTI).