Classifying Triangles and Quadrilaterals

Classifying Triangles and Quadrilaterals: Apply, Compare, and Design

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QUICK REVIEW

One figure can belong to several groups. Rectangles have 4 right angles; rhombuses have 4 equal sides. A square meets both definitions. For triangles, classify sides and angles separately. Isosceles means at least 2 equal sides.

Worked example

A triangle has sides $4, 4, 5$ and all angles less than $90°$. Classify it by sides and angles.

1. The two sides of length 4 are equal, while $5 \neq 4$. It is isosceles, not equilateral.

2. All 3 angles are below $90°$. That meets the definition of an acute triangle.

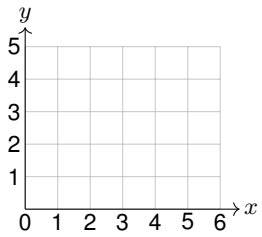
Answer: Isosceles and acute.

Practice Problems

Show your thinking.

1. Two rectangular frames each have perimeter 24 cm. One is a square. The other has a long edge of 8 cm. Find both sets of dimensions and state which frame also belongs to the rhombus group.

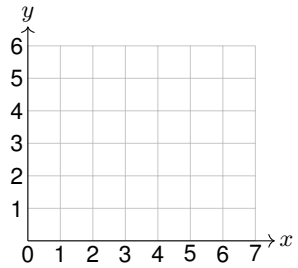
2. Plot $J(2, 1)$ and $K(2, 4)$. Choose L directly right of J so JKL is isosceles right at J. Plot L and close the triangle. Give its coordinates.



3. A tile bin contains 8 squares, 5 non-square rectangles, and 3 non-square rhombuses. How many belong to both the rectangle and rhombus groups? How many belong to at least one of those groups?

4. A logo needs an isosceles triangle that is not equilateral. The designs have side lengths $6, 6, 6$; $6, 6, 9$; and $5, 6, 8$. Which qualifies? Explain why the others fail.

5. A rectangle has consecutive corners $A(2, 1), B(6, 1), C(6, 3), D(2, 3)$. Move only its top edge straight up until it is both a rectangle and a rhombus. How far must the edge move? Draw the result.



6. An 8 cm by 4 cm rectangular panel is cut straight across. Cut A joins the midpoints of the 8 cm sides. Cut B joins the midpoints of the 4 cm sides. Which cut makes two rhombuses? Classify the pieces from each cut.

Answer Key

1. 6 by 6 cm and 8 by 4 cm. Only the square is a rhombus.
2. $L(5, 1)$.
3. 8 belong to both; 16 belong to at least one.
4. Only the $6, 6, 9$ design.
5. 2 units up; the new top corners are $C(6, 5)$ and $D(2, 5)$.
6. Cut A: two squares, both rectangles and rhombuses. Cut B: two rectangles that are not rhombuses.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The square has 4 equal edges, so each is $24 \div 4 = 6$ cm.

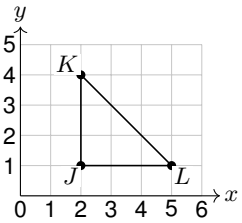
2. The two long edges use $2 \times 8 = 16$ cm. The short edges share $24 - 16 = 8$ cm, so each is $8 \div 2 = 4$ cm.

3. $6 = 6$ gives equal adjacent edges in the square, but $8 \neq 4$ in the other frame. Only the square has 4 equal edges.

Problem 2

1. JK is vertical and $4 - 1 = 3$ units long. To make the two legs equal, JL must go 3 units horizontally.

2. Use $x = 2 + 3 = 5$ and keep $y = 1$. Join $L(5, 1)$ to K and J. The equal legs meet at $90°$.



Problem 3

1. The 8 squares have 4 right angles and 4 equal sides, so they are in both groups.

2. The other tiles each belong to only one group. Count the squares once: $8 + 5 + 3 = 16$ tiles.

Problem 4

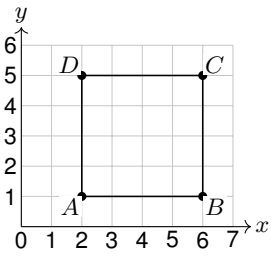
1. $6, 6, 6$ has 3 equal sides. It is isosceles but also equilateral, which the logo rules exclude.

2. $6, 6, 9$ has exactly 2 equal sides, so it fits. The lengths $5, 6, 8$ are all different, so that design is scalene.

Problem 5

1. To have both memberships, the figure must be a square. Its fixed width is $6 - 2 = 4$ units, so the height must be 4.

2. The new top is at $y = 1 + 4 = 5$, which is $5 - 3 = 2$ units up. The 4-by-4 square has equal sides and right angles.



Problem 6

1. Cut A gives $8 \div 2 = 4$ cm by 4 cm pieces. The square corners and 4 equal sides make each piece a square.

2. Cut B gives 8 cm by $4 \div 2 = 2$ cm pieces. They retain 4 right angles, but $8 \neq 2$ prevents rhombus membership.

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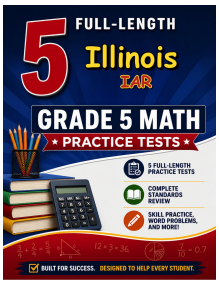

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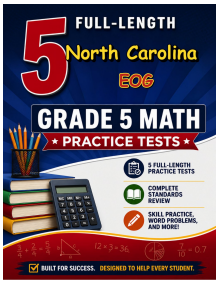

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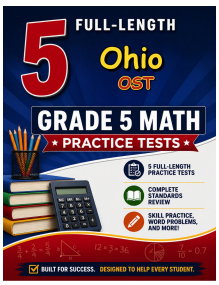

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