

MYSTERY PICTURE

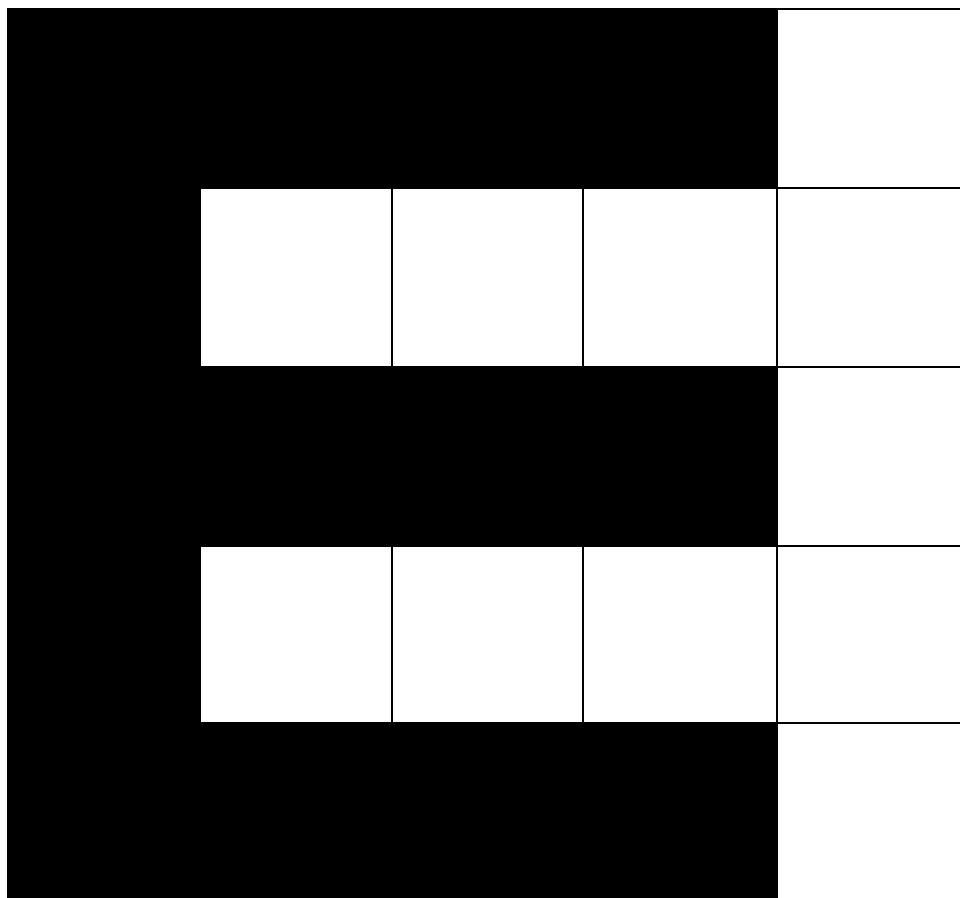


RECTANGLES, RHOMBUSES AND SQUARES

Do the Marks Make a Rhombus?

25 shapes · read the marks, not the look

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else is needed.
2. **Say this once:** *“Fill a square only when the marks prove the shape is a rhombus. A square is a rhombus too. A shape that only looks like a rhombus is not enough.”*
3. **When a student finishes, look at the picture.** If it is not the letter E, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. At the top it shows a rectangle and a rhombus side by side, with what is true of each and what proves each.
Answers	page 4: the finished picture and the reason for every square.

This sheet practices reading marks, not pictures. Almost every shape is drawn to look like a rhombus, including the ones where the marks are not enough. A square is filled when the marks show four equal sides, or show a parallelogram plus one more fact: two sides next to each other equal, perpendicular diagonals, or a diagonal that cuts a corner in half.

Squares are rhombuses. Three shapes are squares whose marks prove it, and they are filled. Many students say a square is not a rhombus. In everyday speech that is true, but in geometry a square is a rhombus and also a rectangle. Two other shapes look like squares but are marked only as rectangles (a right angle, or equal diagonals), so they stay white.

Perpendicular diagonals are not enough on their own. The diagonals must also cut each other in half. A kite has perpendicular diagonals and is not a rhombus. In all, ten white squares have marks that are not enough, and one has two sides next to each other printed with different lengths.

A student who fills every shape that looks like a rhombus gets ten squares wrong. Guessing does not work: every simple guessing rule gets at least nine squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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Mystery Picture

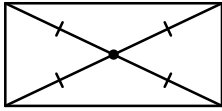
Read the marks

Name _____

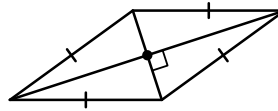
Period _____

Date _____

Each square shows a shape with marks. Do the marks prove that the shape is a rhombus? If yes, fill the square with slanted lines. If no, leave it white.



Rectangle: four right angles. Its diagonals are **equal**. They cut each other in half. A parallelogram is a rectangle if it has **one right angle**, if **two angles next to each other** are equal, or if its **diagonals are equal**.



Rhombus: four equal sides. Its diagonals are **perpendicular**. They cut each other in half. Each diagonal cuts the two corners it joins in half. A parallelogram is a rhombus if **two sides next to each other** are equal, if its **diagonals are perpendicular**, or if a diagonal **cuts a corner in half**.

A square is both a rectangle and a rhombus. Everything true of a rectangle and everything true of a rhombus is true of a square.

Arrowheads on both pairs of sides show a parallelogram. So do diagonals that cut each other in half. Use only the marks. Do not measure. When you finish, look at the picture. If part of it is missing, or one square does not fit, check that square again.

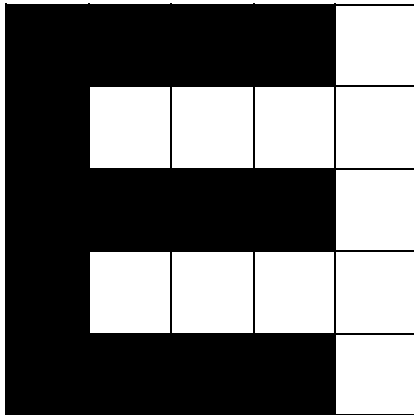
1 	2 	3 	4 	5
6 	7 	8 	9 	10
11 	12 	13 	14 	15
16 	17 	18 	19 	20
21 	22 	23 	24 	25



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Mystery Picture — answers

For the teacher



The finished picture is **the letter E**: a bar down the left side and three bars going right from it, at the top, the middle and the bottom.

A square is filled when its marks prove a rhombus: four equal sides, or a parallelogram with one more fact that makes it a rhombus. A square counts, because a square is a rhombus.

To check a square with a student, ask: “Which mark shows that the sides are all equal?” If no mark shows it, ask whether the marks show a parallelogram, and then which one more fact makes it a rhombus.

Squares	Answer	Why
1, 12, 24	FILL	All four sides have one tick, so all four sides are equal. That is what a rhombus is.
3, 16	FILL	All four sides are equal, so it is a rhombus. The right angle makes it a square, and a square is a rhombus.
13	FILL	The diagonals cut each other in half, so it is a parallelogram. They are perpendicular, so it is a rhombus (it is also a square).
11, 23	FILL	The diagonals cut each other in half, so it is a parallelogram. Two sides next to each other are equal, so it is a rhombus.
4, 14	FILL	The arrowheads show a parallelogram. Its diagonals are perpendicular, so it is a rhombus.
2, 21	FILL	The diagonals cut each other in half AND are perpendicular. Both parts together prove a rhombus.
6, 22	FILL	It is a parallelogram (arrowheads, or diagonals cut in half). A diagonal cuts a corner into two equal angles, so it is a rhombus.
5, 25	white	Only “the diagonals are perpendicular” is marked. A kite has that too, so this is not enough.
10	white	The diagonals are perpendicular, but only one is cut in half. A kite has that too. Both must be cut in half.
7	white	Diagonals that cut each other in half prove a parallelogram, but not a rhombus. A long parallelogram has that too.
9	white	The arrowheads show a parallelogram. Opposite sides are equal in every parallelogram, so the ticks add nothing.
20	white	The arrowheads and the diagonals cut in half each prove a parallelogram, and nothing more. No mark shows the sides equal.
19	white	The arrowheads show a parallelogram. Opposite angles are equal in every parallelogram, so the arcs add nothing.
17	white	The one-tick sides are equal and the two-tick sides are equal, but the two pairs need not match. A kite has these marks.
8	white	The arrowheads show a parallelogram, and one right angle makes it a rectangle. It looks like a square, but no mark shows the sides equal.
15	white	Equal diagonals that cut each other in half prove a rectangle, not a rhombus. It looks like a square, but no mark shows it.
18	white	Two sides next to each other are 7 and 4. In a rhombus all sides are equal, so it cannot be a rhombus.