

MYSTERY PICTURE

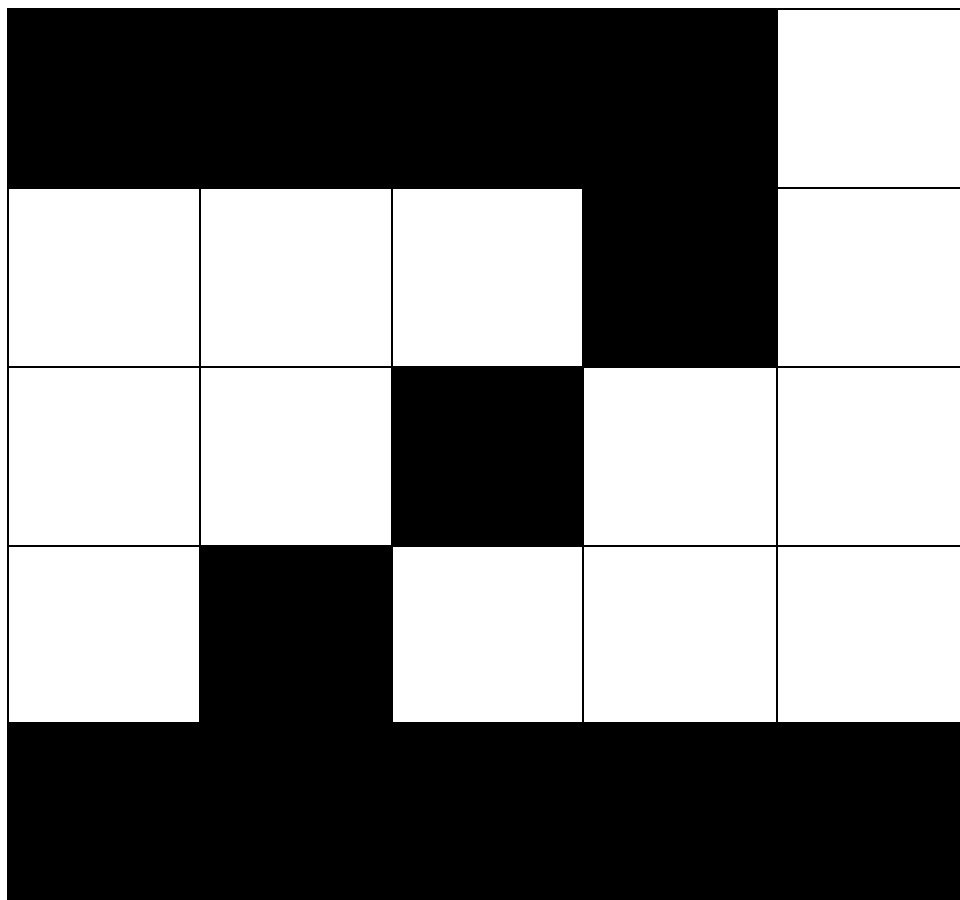


PROVING PARALLELOGRAMS

Do the Marks Make a Parallelogram?

25 quadrilaterals · read the marks

FREE



Mystery Picture — how to run it

25–35 minutes

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 it is a parallelogram. A shape that looks like a parallelogram is not enough.”*
3. **When a student finishes, look at the picture.** If it is not the letter Z, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. It shows the five ways to prove a quadrilateral is a parallelogram as small marked drawings.
Answers	page 4: the finished picture and the reason for every square.

This sheet practices reading marks, not pictures. Most shapes on the sheet are drawn as parallelograms, including every square where the marks are not enough. Only the marks and the numbers decide. A square is filled when they show one of five things: both pairs of opposite sides congruent, both pairs parallel, both pairs of opposite angles congruent, the diagonals cutting each other in half, or one pair of opposite sides both parallel and congruent.

Two kinds of square stay white. In nine squares the marks are not enough. For example, one pair of sides is parallel and the *other* pair is congruent, which an isosceles trapezoid also has. Or only one diagonal is cut in half, which a kite also has. Or the diagonals simply cross, which they do in every quadrilateral. In four squares a printed number rules it out, because two opposite sides or two opposite angles are printed with different numbers.

A student who fills every square that looks like a parallelogram 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

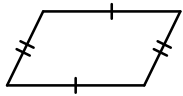
Name _____

Period _____

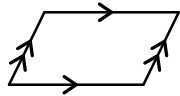
Date _____

Each square shows a quadrilateral with marks or numbers. Do the marks prove it is a parallelogram? If yes, fill the square with slanted lines. If no, leave it white.

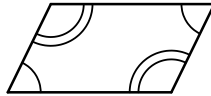
The marks **force** a parallelogram in these five ways, and in no other. Each way needs **both** pairs, or **one** pair doing **both** jobs.



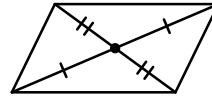
Both pairs of opposite sides are **congruent**.



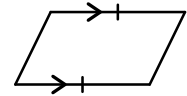
Both pairs of opposite sides are **parallel**.



Both pairs of opposite **angles** are congruent.



The diagonals **bisect** each other.



One pair of opposite sides is both parallel **and** congruent.

Leave a square white when the marks are not enough, and also when a number shows it cannot be a parallelogram. 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.

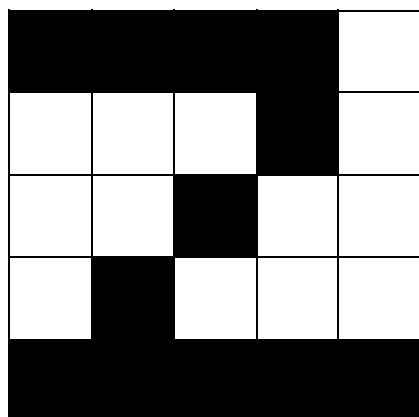
1 	2 	3 	4 	5
6 	7 	8 	9 	10
11 	12 	13 	14 	15
16 	17 	18 	19 	20
21 	22 	23 	24 	25



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Mystery Picture — answers

For the teacher



The finished picture is **the letter Z**: a bar along the top, a slanted line from the top right down to the bottom left, and a bar along the bottom.

A square is filled when its marks or numbers prove a parallelogram in one of the five ways on the student sheet.

To check a square with a student, ask: “Which pair of sides, angles or diagonal pieces is marked, and for which job?” Both pairs must match, or one pair must be both parallel and congruent.

Squares	Answer	Why
1, 22	FILL	The ticks show both pairs of opposite sides are congruent. That proves a parallelogram.
13, 24	FILL	The arrowheads show both pairs of opposite sides are parallel. That is what a parallelogram is.
9, 17	FILL	Both pairs of opposite angles are equal (the arcs, or the printed numbers). That proves a parallelogram.
2, 23	FILL	The ticks show each diagonal is cut into two equal pieces, so the diagonals bisect each other. That proves a parallelogram.
4, 21	FILL	The same pair of opposite sides has arrowheads and ticks, so one pair is both parallel and congruent. That proves a parallelogram.
3	FILL	The two printed sides are both 7, and the ticks show the other two sides are equal. Both pairs of opposite sides are congruent, so it is a parallelogram.
5, 12, 14	white	One pair is parallel and the OTHER pair is congruent. An isosceles trapezoid has these marks too, so they are not enough.
8, 15	white	Only one pair of opposite angles is equal. A kite can have that and not be a parallelogram.
7, 18	white	Only one diagonal is shown cut in half. In a kite, one diagonal cuts the other in half, so this is not enough.
25	FILL	The two sides with arrowheads are printed with the same length, so one pair is both parallel and congruent. That proves a parallelogram.
19	white	The 7 and the 4 are sides next to each other, so they do not need to be equal. One pair of parallel sides is not enough: a trapezoid has one.
10	white	Nothing is marked. The diagonals of every quadrilateral cross, so the crossing proves nothing.
6, 11, 16, 20	white	Two opposite sides, or two opposite angles, are printed with different numbers. In a parallelogram they are equal, so it cannot be one.