

MYSTERY PICTURE

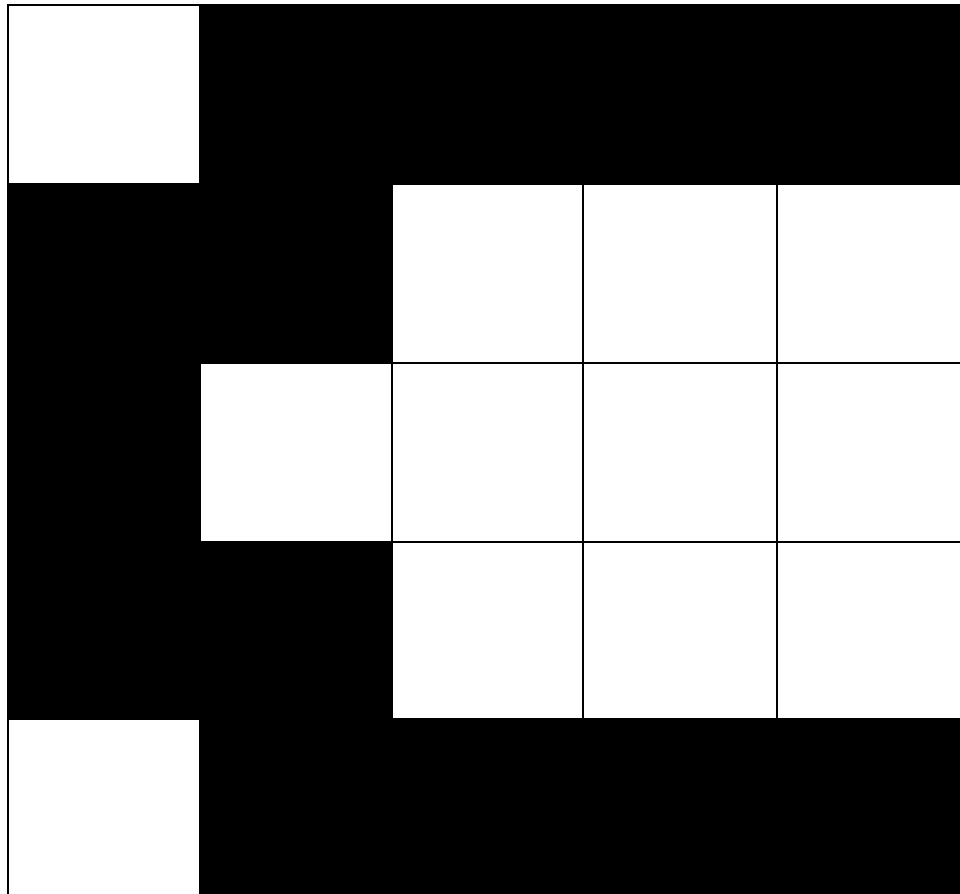


REFLECTIONS

Reflections: Is It the Image?

25 flags and 25 mirrors · no numbers · wrong answers show in the picture

FREE



1. **Hand out page 3**, one per student, with a ruler each (and a triangle ruler or any square corner of paper). That is the whole preparation.
2. **Say this once:** *“Join A to A' , and one more corner of F to the same corner of the other flag. Each segment has to cross m at a right angle. m has to cut each segment exactly in half. If both are true at both corners, it is the image.”*
3. **Fill the square with slanted lines if the second flag is the image. Leave it white if it is not.** A picture appears. Thirteen of the 25 are filled.

Student sheet page 3, one per student. The definition is printed on it as three small pictures.
Answers page 4 — the finished picture and the reason for every square.

The twelve white squares show the mistakes students make most often. In three, the flag is reflected in a straight-up or level line instead of the slanted line m . This is the most common mistake. In three, the flag is slid across, not reflected, so it still faces the same way. In four, the flag is on the correct side of m but too close to it (two) or too far past it (two). In two, the flag is turned half a turn about a point of m . Then m cuts each segment in half but is not perpendicular to it. Of the 25 mirror lines, 19 are slanted on purpose. A straight-up or level line can be judged by eye, and a slanted one needs the definition.

Why two corners. In the three slid squares, A lands exactly where its image should be. A student who checks only A gets three squares wrong (1, 10, 12). Checking a second corner catches every one.

Judging a drawing is easier than drawing a reflection. A student who gets this picture right may still not be able to draw an image on blank paper. So this sheet does not replace drawing practice. Ask students to measure, not to fold the paper.

Guessing does not work. Every simple guessing rule, such as filling every square where the second flag faces the other way, gets at least six squares wrong. The picture then has holes that a student can see from their own desk.



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

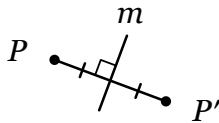
Is it the image?

Name _____

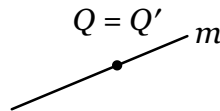
Period _____

Date _____

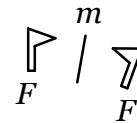
Flag F has corner A. The other flag is somebody's drawing of its image in line m , with A' for A. Join A to A' , and one more corner to its partner. Each segment must cross m at a right angle. Each segment must be cut in half by m . If both are true, fill the square with slanted lines. If either is not true, leave it white. When you finish, look at the picture. If it does not look right, check your squares again.



P' is the image of P in m
PP' perpendicular to m , and cut in half by m



a point on m is its own image
every point of m stays where it is



F' is the image of flag F
every point reflected. F' faces the other way

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

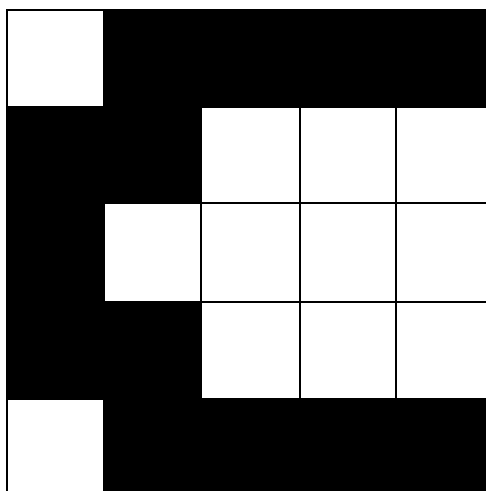


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Mystery Picture — answers

For the teacher

The finished picture is **the letter C**. The table reads left to right, as the sheet does.



1–5	white · slid, not reflected	FILL · the image	FILL · the image	FILL · the image	FILL · the image
6–10	FILL · the image	FILL · the image	white · wrong mirror	white · too close	white · slid, not reflected
11–15	FILL · the image	white · slid, not reflected	white · half turn	white · wrong mirror	white · too close
16–20	FILL · the image	FILL · the image	white · wrong mirror	white · too far	white · half turn
21–25	white · too far	FILL · the image	FILL · the image	FILL · the image	FILL · the image

slid, not reflected: A lands exactly on its image, but the flag was slid across, not reflected. It still faces the same way. **the image:** The flag is reflected correctly in m. **wrong mirror:** The flag is reflected in a straight-up or level line, not in the slanted line m. This is the most common mistake. **too close:** The flag crosses m at a right angle, but lands too close to m. **half turn:** The flag was turned half a turn about a point of m. Line m cuts each segment in half, but not at a right angle. **too far:** The flag crosses m at a right angle, but lands too far past m.

A student who checks only half of the definition gets some squares wrong. A student who checks both conditions at A but never at a second corner gets squares 1, 10 and 12 wrong. A student who checks only the right angle at both corners gets squares 1, 9, 10, 12, 15, 19 and 21 wrong. A student who checks only that m cuts each segment in half at both corners gets squares 13 and 20 wrong.

No square depends on sharp eyes. In every white square, some corner is at least 4 mm from where its image should be. A wrong distance is at most 0.6 or at least 1.4 times the right one. A slanted path is at least 25° away from a right angle. A wrong mirror is at least 25° away from the real one.