

MYSTERY PICTURE

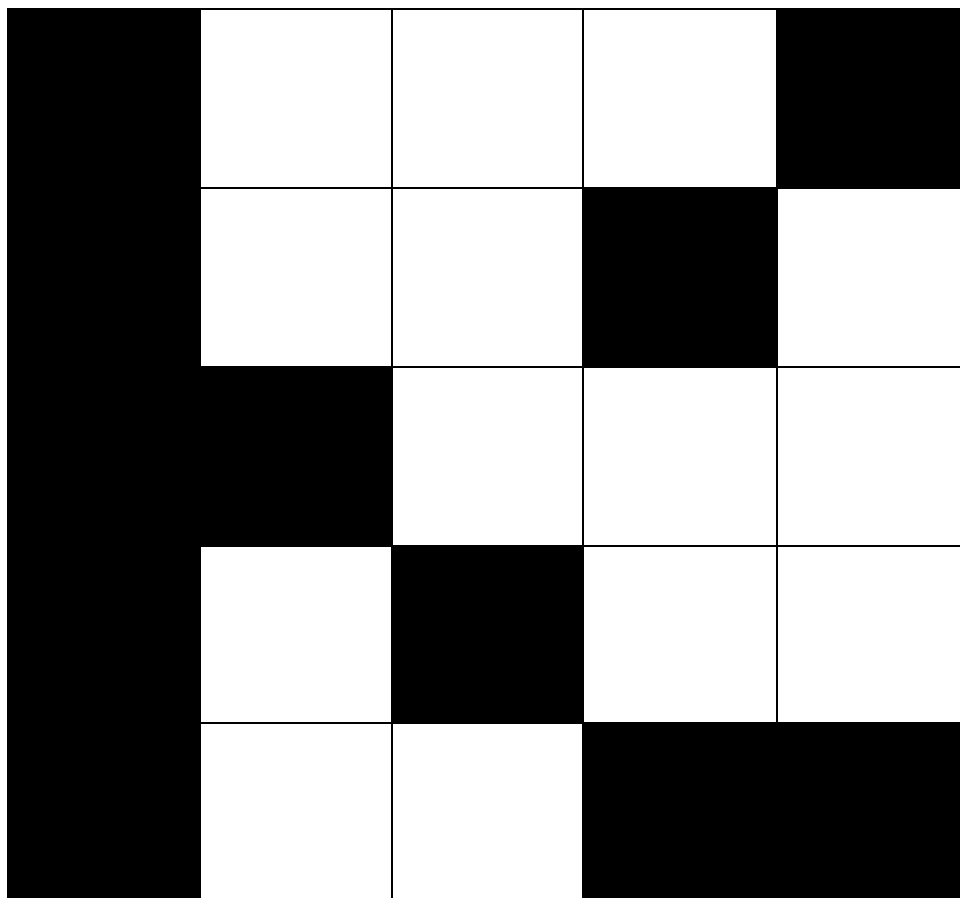


ROTATIONS

Rotations: Turned About O?

25 flags, 25 centers · a compass, no numbers · wrong answers show in the picture

FREE



1. **Hand out page 3**, one per student, with a compass each. That is the whole preparation.
2. **Say this once:** *“Put the compass point on O and the pencil on A, and swing. The circle must pass through A’. Do the same for one more corner and its partner. If both circles pass through, the second flag is F turned about O.”*
3. **Fill the square with slanted lines if the second flag is F turned about O. Leave it white if it is not.** A picture appears. Eleven of the 25 are filled.

Student sheet	page 3, one per student. Center, angle and direction are printed on it as three small pictures.
Answers	page 4 — the finished picture and the reason for every square.

The fourteen white squares show the mistakes students make most often. In three of them, the flag is turned about one of its own corners instead of O. Many students do this. In six, it is turned about a point near O, but not O. In three, it is slid without turning, and A happens to land exactly on its own circle. In two, it is turned correctly about O, but the pennant is drawn longer, so the shape has changed.

Why students check two corners. In the three slid squares, A lands exactly on its own circle. A student who checks only A gets three squares wrong. The second corner shows the mistake in every one of them.

What it does not test. The filled squares turn by different angles, and four of the eleven are quarter or half turns. But no angle is measured. Students often forget the center of a rotation, so this sheet checks only the center. It asks students to recognize a rotation, not to draw one.

Guessing does not work. Every simple guessing rule, such as filling every square where the two flags are the same shape, 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

Turned about O?

Name _____

Period _____

Date _____

Flag F has tip A. The other flag is somebody's drawing of F turned about point O, with A' for A. Put the compass point on O and the pencil on A, and swing. Does the circle pass through A'? Do the same for one more corner and its partner. If both pass through, fill the square with slanted lines. If either does not, leave it white. When you finish, look at the picture. If it does not look right, check your squares again.



center O • angle • direction
OP' is as long as OP: one circle



clockwise
the way a clock's hands go



counterclockwise
the other way round

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

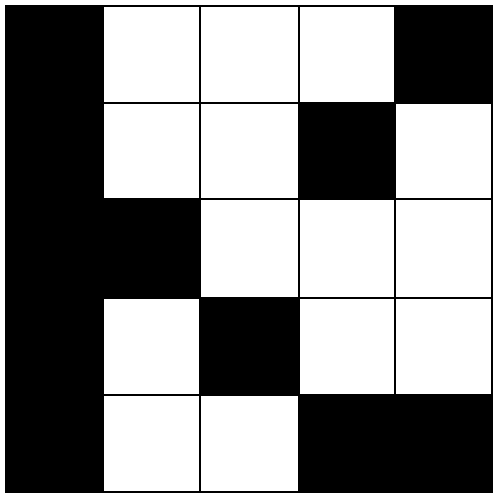


135 free geometry lessons — worksheets, worked answers and lesson plans.
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Mystery Picture — answers

For the teacher

The finished picture is **the letter K**. The table reads left to right, the same way as the sheet.



1–5	FILL · turned about O	white · about another point	white · about a corner of F	white · about another point	FILL · turned about O
6–10	FILL · turned about O	white · slid, not turned	white · about another point	FILL · turned about O	white · slid, not turned
11–15	FILL · turned about O	FILL · turned about O	white · about a corner of F	white · about another point	white · shape changed
16–20	FILL · turned about O	white · shape changed	FILL · turned about O	white · about a corner of F	white · about another point
21–25	FILL · turned about O	white · about another point	white · slid, not turned	FILL · turned about O	FILL · turned about O

Why each square is filled or white. *turned about O*: Filled. The circle about O through A passes through A', and the same is true for a second corner. So the flag is F turned about O. *about another point*: White. The flag was turned about a point near O, but not O, so a checked corner misses its circle about O. *about a corner of F*: White. The flag was turned about one of F's own corners instead of O, so a checked corner misses its circle about O. *slid, not turned*: White. The flag was slid, not turned. A' is exactly on A's circle, but the second corner misses its circle. *shape changed*: White. The flag was turned about O, but the pennant was drawn longer. A rotation never changes the shape, so a checked corner misses its circle.

Checking one corner is not enough. A student who checks only corner A gets squares 7, 10 and 23 wrong. A student who checks only the foot of the pole gets squares 2, 8, 15 and 17 wrong.

No square depends on sharp eyes. In every white square, A' misses its circle about O by at least 3 mm, or every other corner misses its circle by at least 3 mm. In every filled square, every corner is exactly on its circle.