

MYSTERY PICTURE

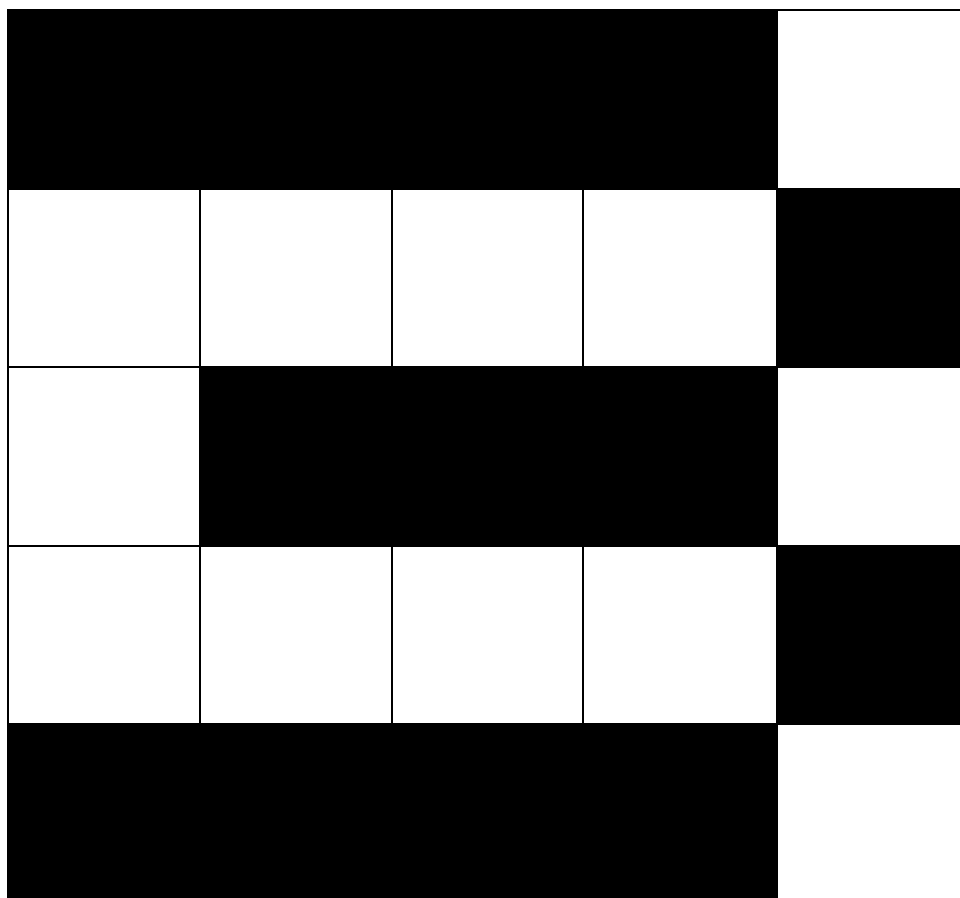


RIGID AND NON-RIGID TRANSFORMATIONS

Rigid or Not? Every Side, Every Corner

25 figures and their images · no numbers · wrong answers show in the picture

FREE



1. **Hand out page 3.** That is the whole preparation.
2. **Say this once:** *“Check every side and every corner. Check the dot too, if there is one. Do not check only one side. If anything changed, the rule is not rigid. Fill the square. If everything agrees, leave it white. Being turned around or flipped back to front does not count as a change.”*
3. **Fill the square with slanted lines if the drawing shows the rule is not rigid. Leave it white if it does not.** A picture appears. Thirteen of the 25 are filled.

Student sheet	page 3, one per student. A slide, a mirror image, a stretch and a shear are printed on it as pictures, with the three properties of a rigid motion.
Answers	page 4 — the finished picture and the reason for every square.

Each square shows a figure and its image. The student compares one side before and after, then the next side, then the corners. Lengths are counted in squares. A slanted side is counted as so many squares across and so many up, so nobody needs a ruler. A corner is judged as square or not square, or compared with the matching corner.

The common mistake is to check only one thing. Eleven filled squares keep their bottom side exactly. A student who checks only that side gets them all wrong. Six filled squares keep their area, including the shears, so area is not a test either. One keeps every side and changes only the corners, so students must check the angles too. In one square the triangle stays the same, but the dot beside it moves. On the white side, ten of the images are turned or mirrored. These are still rigid, so they stay white.

White does not mean “the rule is rigid.” A drawing shows only a few points, but the rule acts on every point of the plane. So a drawing can show that a rule is not rigid. It can never show that a rule is rigid. For example, a rule can keep every side of a four-sided figure and still swap two points outside it. The student sheet asks the question this way.

Guessing does not work. Every simple guessing rule, such as filling every image that looks backwards, gets at least five 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

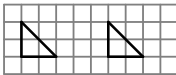
Did anything change?

Name _____

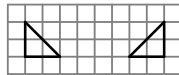
Period _____

Date _____

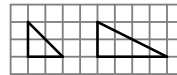
A rigid motion keeps lines straight. It keeps the distance between *every* two points of the plane the same. It keeps every angle measure the same. Nothing else is on the list. Not position. Not the way round. Each square is a figure and its image under a rule: compare every side, every corner, and any dot. Something changed? Fill the square with slanted lines. Everything agrees? Leave it white. When you finish, look at the picture. If it does not look right, check your squares again.



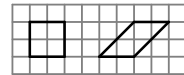
a slide
rigid



a mirror image
rigid, but the other way round



a stretch in one direction
not rigid, though lengths across it
are kept



a shear
not rigid, though the area is kept

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

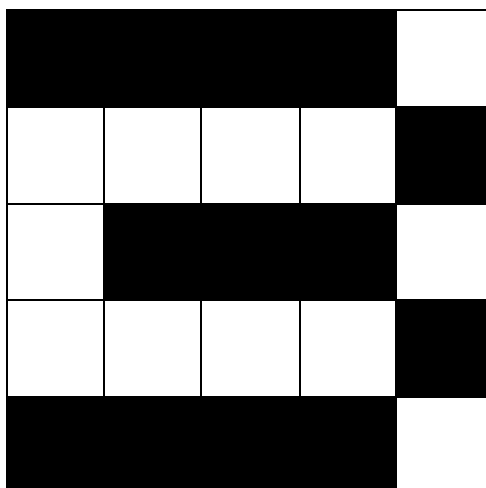


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Mystery Picture — answers

For the teacher

The finished sheet is **the number 3** — a bar across the top, straight down the right side, a bar across the middle, straight down the right side again, and a bar across the bottom. The table reads left to right, the way the sheet is read; the squares are numbered on the student's sheet.



1–5	FILL Stretched upward. The bottom side is the same, but the upright side doubled.	FILL All four sides are the same length, but the corners changed.	FILL A shear. The base, height and area are the same, but the corners are not square.	FILL The triangle is the same, but the dot is a different distance from its corners.	white A mirror image. Everything stays the same. It only goes the other way round.
6–10	white A quarter turn. Everything stays the same.	white The triangle and the dot slid together. Everything stays the same.	white A half turn. Everything stays the same.	white A mirror image in a slanted line. Everything stays the same.	FILL Stretched sideways. The upright side is the same, but the shape changed.
11–15	white A quarter turn of the tilted square. Everything stays the same.	FILL A shear. The bottom side and the area are the same, but the rest changed.	FILL Every length doubled. The angles are the same.	FILL Squashed sideways. The upright sides are the same, but the shape changed.	white A slide. Everything stays the same.
16–20	white A mirror image. Everything stays the same.	white An upside-down mirror image. Everything stays the same.	white The triangle and the dot were mirrored together. Everything stays the same.	white A quarter turn. Everything stays the same.	FILL A shear. The base, height and area are the same, but the triangle is different.
21–25	FILL A shear. The base, height, area and the box around it are the same, but the triangle is different.	FILL Stretched upward. Both flat sides are the same, but the shape changed.	FILL Squashed downward. The flat sides are the same, but the shape changed.	FILL A shear. Both flat sides and the area are the same, but the shape changed.	white A half turn. Everything stays the same.

In every filled square, some side, corner or distance changed. In every white square, all of them stay the same. A turn or a mirror image is not a change.