

CUT & GLUE SORT

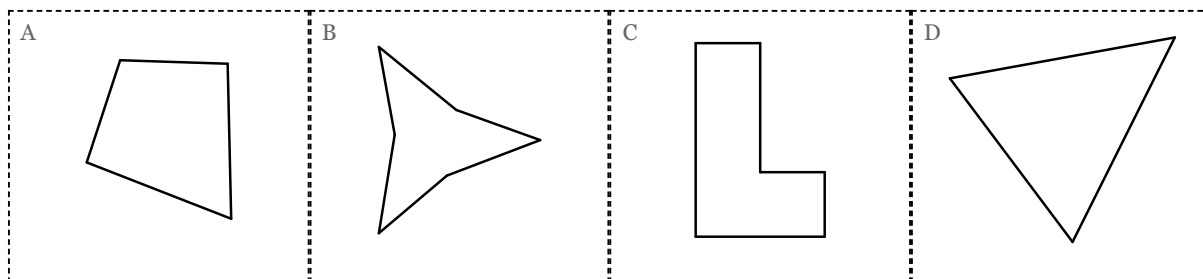


SYMMETRY: CARRYING A FIGURE ONTO ITSELF

Symmetry: Lines, Turns, or None?

only a line · only a turn · no symmetry at all

FREE



Cut & Glue Sort — how to run it

25 minutes, the cutting included

1. **Hand out pages 3 and 4**, one of each per student, with scissors, glue and a small piece of tracing paper.
2. **Say this once:** *“Test every shape two ways. Try to flip it onto itself over a line. Then try to turn it onto itself about its center. Glue it into the row that says what worked.”*
3. **Check a sheet in ten seconds:** every row gets four pieces.

Student sheets pages 3 and 4, one of each per student. Page 3 carries the two tests as pictures.
Answers page 5.

The rows sort the shapes by their kind of symmetry, not by their names. Students must also learn to say when a shape has no symmetry. The third row says “No line works. Only the full turn works.” It does not say that nothing works. That is because a full turn of 360° carries every shape onto itself, and the lesson counts it.

Every shape in the turn row is irregular: a parallelogram, an S made of four squares, a three-bladed pinwheel and a hexagon with six different corners. Students who only see turn symmetry on regular shapes often think only regular shapes have it. Many students also think the diagonals of a parallelogram are lines of symmetry. They are not. A student who thinks so finds a shape with lines and a turn, and the student sheet says that no shape has both.

No shape on the sheet has both kinds of symmetry (no rectangle, no regular polygon), so each shape fits exactly one row. Folding a shape finds only its lines of symmetry. That is why the student sheet shows the turn test next to the line test, both with tracing paper.

Guessing does not work. Sorting by any one thing a student can see, such as the number of sides or a right angle, gets at most six of the twelve pieces right.



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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Which symmetry does it have?

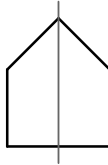
Lines, turns, or none

Name _____

Period _____

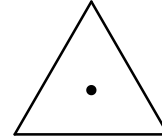
Date _____

Cut out the twelve shapes on the next page. **Decide which symmetry each shape has. Glue it into that row.** Every shape fits exactly one row. No shape here has both a line of symmetry and a turn smaller than a full turn. To test a line: trace the shape and draw the line you want to test. Turn the tracing paper over. Put the traced line back where it was. If the shape lands exactly on itself, it is a line of symmetry. To test a turn: trace the shape. Hold your pencil point on the center and turn the tracing paper. If the shape lands exactly on itself before a full turn, it has turn symmetry.



A line of symmetry

Reflect in the line. The shape lands on itself.



Turn symmetry

Turn about the dot, a third of a turn. The shape lands on itself.

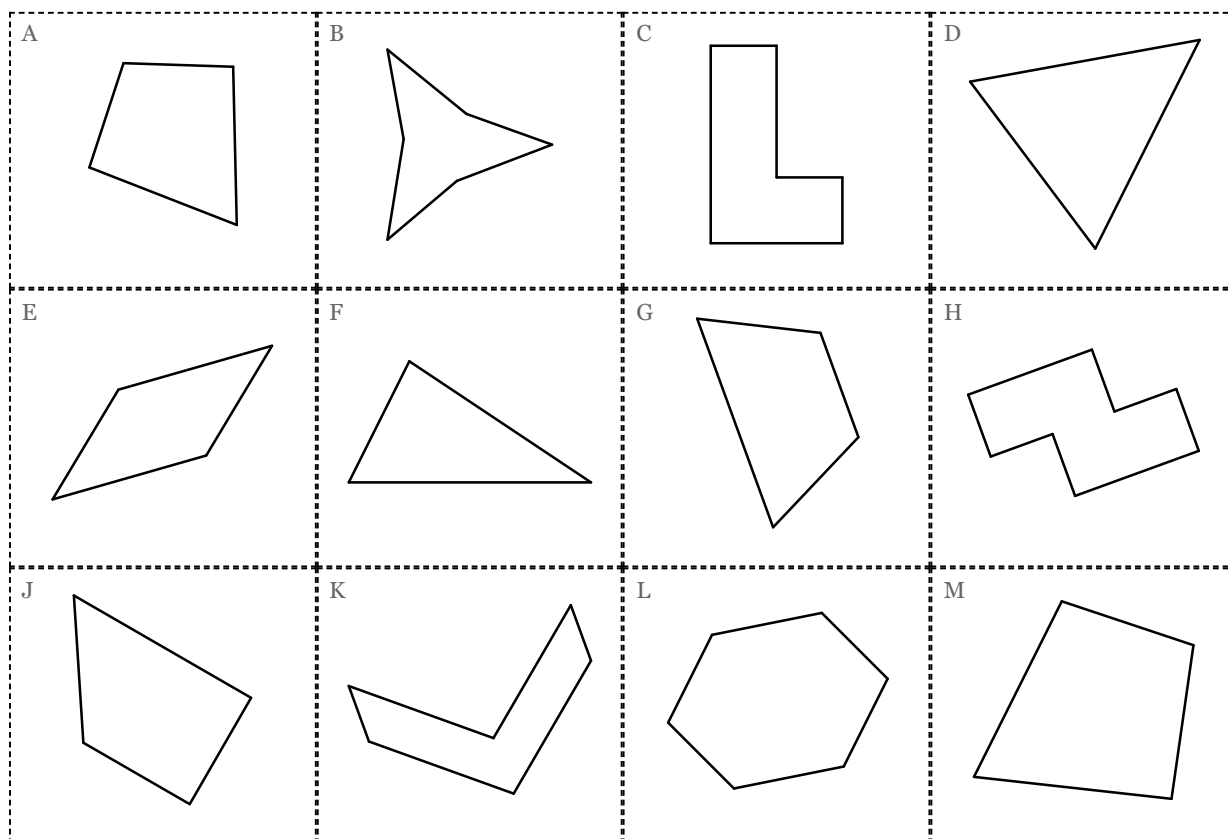
Only a line of symmetry. *A line works. No turn works except the full turn.*

Only turn symmetry. *A turn smaller than a full turn works. No line works.*

No symmetry. *No line works. Only the full turn works.*

The twelve shapes

Cut along the dotted lines



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Cut & Glue Sort — answers

For the teacher

Only a line of symmetry	A — A kite with diagonals 9 and 8. It folds onto itself along its longer diagonal. No turn smaller than 360° carries it onto itself.	D — Isosceles triangle. It folds onto itself along the line from the corner between the two equal sides to the middle of the side across. No turn smaller than 360° carries it onto itself.	G — An isosceles trapezoid. It folds onto itself along the line through the middles of its two parallel sides. No turn smaller than 360° carries it onto itself.	K — A chevron. It folds onto itself along the line through the tip of the V and the inner corner under it. No turn smaller than 360° carries it onto itself.
Only turn symmetry	B — A three-bladed pinwheel. No line folds it onto itself. A turn of 120° about its center carries it onto itself.	E — Parallelogram. No line folds it onto itself. A turn of 180° about its center carries it onto itself.	H — An S made of four squares. No line folds it onto itself. A turn of 180° about its center carries it onto itself.	L — A hexagon whose opposite sides are equal and parallel. No line folds it onto itself. A turn of 180° about its center carries it onto itself.
No symmetry	C — An L made of four squares. No line folds it onto itself, and only the full 360° turn carries it onto itself.	F — A triangle with three different sides. No line folds it onto itself, and only the full 360° turn carries it onto itself.	J — A trapezoid with two right angles. No line folds it onto itself, and only the full 360° turn carries it onto itself.	M — A quadrilateral with four different sides. No line folds it onto itself, and only the full 360° turn carries it onto itself.

Where students go wrong. Some students put the parallelogram in the first row. Its diagonals cut it into two matching triangles, but folding it along a diagonal does not put it on itself. Some put the L of four squares in the first row for the same reason. A student who only tests by folding puts the pinwheel and the S in the third row, because folding never finds a turn.