

Completing symmetrical patterns across a mirror line

CURRICULUM ALIGNMENT

SHA.TRN.3

model and explain the effects of transformations on shapes and line segments.

ALG.PRR.3a

identify rules that describe the structure of a pattern and use these rules to make predictions.

INTERACTIVES Symmetry Tool · challenge, display, explore

WHAT THIS LESSON TEACHES

A mirror line is the straight line a pattern folds along so both halves match exactly. Each coloured square on one side has a mirror square the SAME number of squares out on the other side.

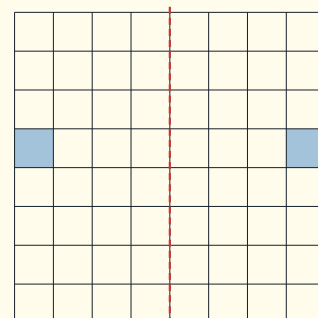
→ A square 3 squares left of the line has its mirror 3 squares right of the line.

→ A square 2 squares from the line has its mirror 2 squares from the line on the other side.

MODEL THIS ON THE BOARD

REFLECTING ONE SQUARE ACROSS THE LINE

- 1 The square on the LEFT of the mirror line is the one we started with.
- 2 Count the squares from the line: it is 4 squares out.
- 3 Count the same 4 squares out on the RIGHT of the line. That is the matching square, coloured here.



DISCUSSION STARTER

REFLECT

When you finish one half, how do you check the other half really matches?

LESSON ARC

Open with the half-butterfly image and have pupils sense where the missing spot must sit — same distance, opposite side. Walk the static Watch and Notice examples, pivoting on 'count the squares from the line, then go the same number the other way', slowing right down for the L-shape and the on-the-line trap. Pupils take turns at the board for Try It Together, then build their own three-square pattern on squared paper. Class Challenge works four- then six-square patterns ending on the square-on-the-line check.

TEACHING MOVES

1. **Getting Started.** Show the half-butterfly as pupils settle and take two or three hands-up answers only. Don't name the rule — just ask 'how far out from the line is the spot we can see?' so pupils start counting squares before any reflecting.
2. **Watch and Notice.** This is a static display — point and narrate, don't drag. Keep the one-out and three-out examples brisk, saying 'one, two, three' aloud on each side so the class hears the matching count. Slow right down for the L-shape: ask the class to predict where it lands and stress you reflect each square

separately, not the L as a lump. For the on-the-line square, ask 'where does this one go?' before confirming it doesn't move.

3. **Try It Together.** Place two or three squares on one side and call pupils up to reflect each one. Before each placement ask the class 'how many squares out is this one?' and have them count aloud. Watch for the mirror landing one square too near or too far — catch it by re-counting from the line together.
4. **Build the Mirror in Your Copy.** Pupils draw a vertical mirror line on squared paper, colour three squares left of it, then shade the mirrors on the right. Walk the room glancing at the distance count on each reflected square — the slip to catch is a mirror placed one square off, so nudge the pupil to re-count from the line.
5. **Class Challenge.** Brisk board turns through the four- then six-square patterns, checking each answer before moving on — don't re-explain each one. The square-on-the-line round is the make-or-break: ask the class to predict before confirming, and re-count distances aloud whenever a placement wobbles.
6. **What Did We Notice?.** Ask how you decide how far out a reflected square goes. Revoice a strong answer — 'so the mirror square is the same distance out, just the opposite side' — and confirm the on-the-line square stays put because it is already its own mirror.

COMMON MISCONCEPTIONS

⚠ Pupils place the mirror square one square too near or too far — they eyeball it as 'roughly opposite' instead of counting.

Stop and re-count aloud with the class: touch the line, then 'one, two, three' out to the original, then the same count back the other way. Make the counting a habit before every placement, not a fix after a wrong one.

⚠ Pupils reflect an L-shape as one lump, sliding the whole shape across instead of mirroring each square — so the L ends up facing the same way rather than flipped.

On the IWB, reflect the L square by square, counting each one separately. Point out that the reflected L faces the opposite way; if their copy of the L faces the same way, they've slid it, not mirrored it.

⚠ Pupils move a square that sits right on the mirror line, giving it a 'partner' on the other side.

Ask the class to predict before confirming. Show that a square on the line is zero squares from the line — so its mirror is also zero squares away, which is the same square. It is already its own mirror.

DIFFERENTIATION

EMERGING

- Keep squares one or two out from the line in the copybook task, and have pupils tick each square as they count out from the line so the count is visible.
- Reflect just one square at a time at the board with the pupil, confirming the distance together before the next one — leave the L-shape for the demo only.

DEVELOPING

- After the copybook three squares, give a four-square pattern that crosses the line once, so one square sits on the line and stays put.
- Swap the vertical mirror line for a horizontal one on their squared paper — does the count-from-the-line rule still work?

PROFICIENT

- During Class Challenge, narrate a harder variant from the front: a pattern where one square sits on the line and one sits two out — pupils predict both placements before you confirm.
- Pose: 'if a finished pattern is already symmetrical, could there be two different mirror lines?' Let pupils test it on squared paper rather than telling them.

✂ **Cross-curricular:** Tie to Visual Arts — pupils fold a painted square of paper down the middle to print a symmetrical butterfly, then count which blobs landed the same distance from the fold.

ANSWER KEY

Scaffold: visual check on the page

Q1: 3

a) Always : A mirror square is always the same number of squares out on the other side.

b) Always : A square on the line has zero distance to reflect, so it maps onto itself.

c) Never : A reflected square is never a different distance; it is always exactly the same distance.

d) Never : The mirror square is never on the same side; it is always on the opposite side.

EXTENSION SHEET · STRETCH ANSWERS

S1: 0 lines

S2: 8 lines

S3: 1 line

S4: 6 lines

S5: 8 lines