

Combining transformations

CURRICULUM ALIGNMENT

SHA.TRN.4a

perform and devise a range of steps involving transformations.

ALG.PRR.4a

identify, explain and apply generalisations, including properties of operations, mathematical models and patterns.

INTERACTIVES Transformation Playground · challenge, display, explore

WHAT THIS LESSON TEACHES

A slide moves a shape without turning it, a flip mirrors it across a line, and a turn rotates it around a point. The size and shape never change.

→ Slide a triangle 3 squares right then flip it across the y-axis.

→ Flip a triangle across the y-axis then slide the flipped triangle 3 squares down.

MODEL THIS ON THE BOARD

TWO-STEP TRANSFORMATION ON A GRID

- 1 Start with triangle vertices A at (2,4), B at (4,4), C at (3,6).
- 2 Apply a flip across the y-axis: A moves to (-2,4), B to (-4,4), C to (-3,6).
- 3 Then slide 3 squares down: A ends at (-2,1), B at (-4,1), C at (-3,3).

LESSON ARC

Open with a triangle on the grid interactive and the vertical mirror line; flip it, then slide three squares down, and leave the swap-order question hanging. Walk three two-step journeys on the IWB, settling Journey 1 by running slide-4-right and flip-across-y both ways from the same start. Pupils try three sequences at the board naming vertices after each move, then record flip-then-slide-3-down with primed co-ordinates in their copy. Class Challenge lands the shape on dashed targets, ending with equivalent pairs.

TEACHING MOVES

1. **Getting Started.** Show the final position after flip-then-slide-3-down. Point to the vertical mirror line and name it. Give five seconds of quiet think-time, take two or three predictions on whether slide-first would finish the same — then leave it unsettled.
2. **Watch and Notice.** Remind the class: flip sends the shape to the other side of the line; quarter-turn clockwise matches clock hands. On Journey 1 run Order A (slide 4 right, freeze intermediate, flip across y) then restart from the original start for Order B. Flag both finals — they differ, so order matters here. Journey 3 (2 right then 3 up): hold for a pupil to notice the swap lands the same, and that one combined slide matches both.
3. **Try It Together.** Pupils take turns at the board. After each first move, freeze and read vertices A, B, C before the second starts. Keep the first two sequences brisk; leave the 3-right-then-3-left pair unhurried so someone spots the undo. Watch for second moves launched from the original start.
4. **Record Each Step in Your Copy.** Walk the room. The middle row — after-flip co-ordinates before the slide — is the whole point. No marking; glance that A', B', C' are filled before anyone writes the final row.

5. **Class Challenge.** Brisk practice: about 1.5 minutes on each of the first three rounds so the final round has real time. On the last round let two pupils show different pairs that both hit the dashed target, then revoice them as equivalent moves. Check each answer as you go — do not re-teach.
6. **What Did We Notice?.** Steer off flat yes/no. Listen for ‘it depends on which two moves.’ Revoice a strong answer: the only way to be sure is to try both orders from the same start and see if the finish squares match.

COMMON MISCONCEPTIONS

⚠ Pupils apply the second move from the original start instead of from where the first move left the shape.

Freeze the board on the intermediate position. Point to it and say ‘the second move starts here — not back at the beginning.’ Restart the sequence and read the vertices before the second move.

⚠ When comparing orders, a pupil runs Order B from Order A’s intermediate square, or slides the opposite way to ‘undo’ the first move.

Clear the board back to the original start every time you swap order. Point to the start square before each run so the comparison stays clean.

⚠ Pupils claim order never matters — or always matters — without checking which pair of moves they have.

Contrast Journey 1 (slide + flip: different finals) with Journey 3 (two slides: same final). Ask: ‘which two moves are we talking about?’

DIFFERENTIATION

EMERGING

- Stay on two slides only at the board until the intermediate position is secure; add a flip once they freeze and name vertices after the first move.
- Give a pre-drawn triangle on squared paper with vertices already labelled A, B, C so they only record the after-move co-ordinates.

DEVELOPING

- After a Class Challenge round, ask them to swap the two moves from the same start and say whether the finish square changed — and why.
- On the copybook table, add one extra row: predict the final co-ordinates before drawing the second move, then check.

PROFICIENT

- On the final Class Challenge round, demand two genuinely different pairs for the same target and a one-sentence reason they are equivalent.
- Ask: ‘find a slide-and-flip pair where swapping the order happens to land in the same square — or show why you think none exists for this start.’

✂ **Cross-curricular:** Link to PE court markings — two direction calls in a row (e.g. side-step then turn) and whether swapping the calls ends you on the same spot.

ANSWER KEY

b) A(-1,5) B(-5,5) C(-3,8)

c) A(-1,2) B(-5,2) C(-3,5)

Q1: (-4, 3)

Q2: (none)

Q3: (none)

Q4: (7, -1)

a) **Sometimes** : True for a slide up with a flip in the y-axis; false for a slide right with a flip in the y-axis.

b) **Always** : Slides commute so order does not matter.

c) **Always** : Flips and slides never change the size of a shape.

d) **Never** : These moves keep the same shape, so the vertex count stays the same.