

Isometric drawing: drawing a cuboid on dot paper

CURRICULUM ALIGNMENT

SHA.SHP.4a

construct 3-D and 2-D models or structures given defined measurements and/or specific conditions.

INTERACTIVES [Isometric Builder](#) · challenge, display, explore

WHAT THIS LESSON TEACHES

Dotted paper with slanting diagonal dots lets you draw a solid cuboid on a flat page. Draw the front face first with upright sides, then carry every depth line back at the same steady slant.

- A front face 4 wide by 3 tall, then depth lines of 2
- A 2 by 2 by 2 cube drawn edge by edge on the dots

MODEL THIS ON THE BOARD

BUILD A 4 BY 3 BY 2 CUBOID

- 1 Mark the front face: count 4 dots wide and 3 dots tall and join them with upright and base lines.
- 2 From each front corner carry a depth line back along the slanting dots for a count of 2.
- 3 Join the back ends of the depth lines to finish the top and side faces, keeping every slant the same.

LESSON ARC

Hold a real tissue box beside the dot-paper drawing on the IWB so pupils see flat dots standing in for a solid. Play the display build, pausing after the front face so the repeated depth lines make the same-slant rule for you. Draw a $4 \times 3 \times 2$ cuboid together at the board, then pupils repeat it in their copybooks and label front, top and side. The Class Challenge builds a cube and taller boxes to a target size.

TEACHING MOVES

1. **Getting Started.** Hold the real cuboid up next to the dot-paper drawing and take two or three hands-up answers only. Listen for anyone saying the side lines 'lean the same way' — revoice it: 'so the box only looks solid because every side line uses the same slant.'
2. **Watch and Notice.** Play the build once, then replay and pause the moment the front face lands. Draw the class's eye to each depth line as it appears — don't state the slant rule, let the repeated lines make it. Before the back joins up, ask 'where will those back corners land?' and take a prediction. Point to and name front, top and side as it closes; they need those names for the copybook.
3. **Try It Together.** Send a pupil to tap the front-face corners first. Then, for each depth line, ask the whole class to point in the air which way it will lean before the pupil draws it. The moment to catch is a depth line at the wrong slant — stop, hold it against the existing ones and ask 'does this one match?' Spend the time on the slant-matching talk, not the tapping.
4. **Draw the Cuboid in Your Copy.** Walk the room glancing for two things: depth lines drawn at different angles, and the three face labels. A quiet nod to hold the pencil along the run of dots fixes a wandering slant — this is practice, not marking.
5. **Class Challenge.** Brisk turns at the board, class confirms each box before moving on. Flag the $2 \times 2 \times 2$ cube — pupils expect the depth to look different for a cube and are surprised it's drawn the same way.

For the $5 \times 2 \times 3$, ask the class to predict how many dots tall the front face runs before the pupil sets it. Use the ✓ as talk: 'yes, that matches the target.'

6. **What Did We Notice?** Listen for pupils naming the slant as what makes the box look solid. Revoice a strong answer: 'if one line leaned differently, the box would look bent.' If a pupil says the drawing looks stretched, tie it back — dot paper trades a true photo look for the power to show a solid on a flat page.

COMMON MISCONCEPTIONS

⚠ A pupil draws the front face fine but sends the depth lines back at different angles — one steep, one shallow — so the box looks bent or twisted.

Stop and hold the odd depth line up against one already drawn: 'does this one match?' Have the pupil re-lay the pencil along the same slanting run of dots so both lines follow the identical diagonal of dots.

⚠ For the $2 \times 2 \times 2$ cube, pupils expect the depth to be drawn shorter or at a different angle because 'a cube is different from a box'.

Build it beside the $4 \times 3 \times 2$ they already know. Point out the depth lines follow the same slant and run the same dot-count as the width and height — a cube is just a cuboid where all three lengths match.

DIFFERENTIATION

EMERGING

- Pre-draw the front-face rectangle in the copybook so the pupil only adds the depth lines and back corners.
- Let them trace a finger along one slanting run of dots before drawing each depth line, so the slant is set before the pencil moves.

DEVELOPING

- After the copybook box, ask them to draw the same $4 \times 3 \times 2$ cuboid again but starting from the top face — does the slant rule still hold?
- Have them count and write how many edges of their drawn cuboid are true depth lines versus flat or upright lines.

PROFICIENT

- Pose: 'draw a cuboid where you can see four faces instead of three — what would have to change about the slant?' Let them try it in the copybook and explain what breaks.
- Ask them to draw a $3 \times 3 \times 3$ cube, then explain to the class why the depth still uses the same slant even though every length is equal.

✂ **Cross-curricular:** Tie to Visual Arts — pupils sketch a real classroom object (a box, a book) on dot paper, keeping every depth line on the same slant.

ANSWER KEY

Scaffold: visual check on the page

Q1: $5 \times 3 \times 2$ cuboid (isometric on dots)

Q2: $5 \times 4 \times 3$ isometric cuboid

a) Always : The lesson always starts with the upright front face.

b) Always : Matching slants keep the solid shape looking correct.

c) Never : Depth lines follow the slanting dots, not the upright direction.

d) Never : Every depth line must keep one steady slant from start to end.

EXTENSION SHEET · STRETCH ANSWERS

S1: a cuboid

S2: a square-based pyramid