

Triangles hold their shape

Lesson at a glance

Hold up a loose pinned card-strip square and take quick guesses on whether a sideways push will make it lean. Teach rigid and brace, then groups build a square and a triangle from equal strips with loose split pins, push each corner, and pin one diagonal brace across the square. Results go on the Investigation Journal page. Close with a picture-card triangle hunt of Irish gates, roof trusses, bikes and frames, sorting each find by the job the triangle does.

Learning objectives

- Show that a triangle cannot be pushed out of shape while a square can
- Explain what a diagonal brace does to a square frame
- Identify triangles doing structural work in everyday Irish structures

Before the bell: prep

Cut equal card strips ~15 cm (at least 8 per group) and punch end holes the day before. Pot of split pins per table. Print the lesson's six cut-out picture cards (roof truss, farm gate, pylon, bike frame, shelf bracket, climbing frame), one set per group; the job groups are in the step notes.

Materials

Item	Qty	Per	Source	Low-cost substitute
equal strips of cereal-box board about 15 cm long	8	group	classroom	strips cut from cereal boxes or old folders
split pins	12	group	classroom	paper fasteners or short pipe cleaners twisted through the holes
hole punch	1	class	classroom	teacher pre-makes holes with a sharp pencil onto a mat
structure picture cards (the lesson's cut-out sheet)	1	group	provided printable	IWB photos of the same six structures shown one at a time

Safety watch-point

Split pins are small and sharp at the tips. Collect into pots at pack-away and supervise younger or less careful hands while pinning.

**Teaching moves**

- **Getting Started:** Hold the ready-made loose square so the whole class can see it. Do not push it yet. Take two or three hands-up guesses only (stay square or lean). Keep strip sets on the tables untouched so groups watch rather than start pinning.
- **What holds its shape?:** Teach only rigid and brace before the build; leave structure for the hunt. Model equal strips, wobbly pins and one gentle sideways push as the fair-test rules, and show how a brace pins corner to corner, but do not push the braced square yet. Say groups will find out what happens to all three frames.
- **Build and push the frames:** Groups build both frames first, then test. Circulate and loosen any pin that is too tight: a square that 'holds' is almost always a tight joint, not a shape finding. Ask: what is the only difference between the square and the triangle, and what job is the diagonal doing?
- **Record the results:** Check every group has tested the square, the triangle and the braced square before writing. Keep language concrete on the Investigation Journal page: the shape, whether it moved, what the brace changed. Offer starters if needed: The square... The triangle... When we added the brace...
- **Triangle hunt:** Introduce structure with the picture cards in front of them. Put the three short job labels on the board (Roof or frame · Gate or fence · Machine) and have groups sort by the job the triangle does, not the material. Ask what would happen if that triangle were a loose square. Finish with a two-minute doorway or window look for one real school triangle.

What it should show

The loose square leans into a parallelogram every time; the triangle does not move; one diagonal brace stops the square leaning. A square that refuses to lean almost always has a pin tightened too far: loosen every joint and re-push from a still start.

Misconceptions & interventions

- **Pupils say the triangle is 'stronger' because the strips are thicker or the pins are tighter.** Point at the matching strip lengths and deliberately wobbly pins on both frames. Re-voice the test as 'holds its shape' or 'rigid', not 'strong', so the only difference left is the shape.
- **Pupils think any extra strip makes the square hold, even one pinned along a side rather than corner to corner.** Have them remove a side-pinned strip and re-pin it diagonally corner to corner, then push again so they feel the brace only works when it locks the corners.

Differentiation

Emerging	Developing	Proficient
• Adult pinches the first two corners of the square while the group pins the rest, then they test the ready square before attempting the triangle. • Sentence starters on the Investigation Journal page: The square... The triangle... When we added the brace...	• After the three main tests, try a second brace the other way and say whether two braces change anything they can feel.	• Critique the fair test: name what must stay the same (strip length, loose pins, one-finger push) and what would break it. • On the triangle hunt, explain what would happen to one real structure if its triangle were replaced by a loose square.

Cross-curricular hook

Link to Maths shape and space: name triangle, square and parallelogram as the square leans, and count sides and corners on each frame.