

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 photo-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 six photo cards (roof trusses, farm gate, pylon, bike frame, shelf bracket, climbing frame) with job labels on the reverse.

Materials

Item	Qty	Per	Source	Low-cost substitute
equal card strips 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 photograph cards (roof truss, farm gate, pylon, bike frame, shelf bracket, climbing frame)	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 photo 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.