

engineering

Build a strong, stable tower

Lesson at a glance

Open by holding up one sheet of newspaper and the test weight and posing the challenge: tallest free-standing tower that holds the weight. Capture base, shape and top ideas on the board, then groups sketch a labelled plan on the Investigation Journal page before kits open. They build from limited materials, run a fair height–stability–load test at shared stations, make one improvement, and share the design choice that helped most.

Learning objectives

- Plan and build a free-standing tower from limited materials
- Test height, stability and whether it holds a small weight
- Make one improvement and explain the design choice that helped most

Before the bell – prep

Pack one kit per group of 3–4 before the bell (newspaper, tape, straws, card). Set identical test weights and at least one metre stick per two groups. Pre-name a second official measurer so two test stations can run without waiting on you.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
newspaper sheets	6	group	classroom	scrap A3 paper or old worksheets taped into larger sheets
masking tape roll	1	group	classroom	ordinary sticky tape used sparingly
drinking straws	10	group	classroom	tightly rolled paper tubes from scrap paper
card offcuts	4	group	classroom	cereal-box card cut into small rectangles
test weight (small bean tin or about 200 g mass)	1	group	classroom	small sealed bags of rice or dried beans of matching mass
metre stick	1	group	classroom	a tape measure or a ruler used end to end with care
Investigation Journal page	1	pupil	provided printable	plain paper with headings for plan sketch and test results

Safety watch-point

Everyone stands well back for load tests; no faces close if a tower buckles. Keep floors clear of straws, tape scraps and bags so nobody slips or steps on a collapse.



Teaching moves

- **What makes a tower strong?:** Board only free-standing and stable for now. Do the hands-off pencil or tube gesture, then capture class ideas in three short lists: base, middle/shapes, how to hold the weight. Accept every idea; do not rank them.
- **Plan your tower:** Kits stay closed. Hand out Investigation Journal pages and agree success aloud: free-standing, as tall as possible, holds the weight. Circulate pushing labels, not pretty pictures: Where is the wide base? Which parts are tubes or triangles? Where does the weight rest?
- **Build the tower:** Issue kits together and restate no taping to furniture and leave a flat top for the weight. Walk with the same three questions on base width, strong shapes, and weight seat. Give five- and two-minute warnings; early finishers check free-standing and tidy, not start a second tower.
- **Test height, stability and load:** Model the fair routine once: measure height cm, hands off five seconds, official measurer places the same weight gently, watch five seconds. Building group stands well back; watchers record and do quick thumbs predicts. Cap each test near 90 seconds and stop on the timer to protect the improve step.
- **Improve your tower:** One change only — wider base, triangle brace, better top platform, or stronger joins. No full rebuilds. Ask: What did the test show was weak? Is your one change fixed on that weakness? Re-check free-standing first; add the weight only if a station is free.
- **Share what helped:** Fast one-sentence round per group: what was weak, what changed, which choice helped most (base, shape, or joins). Close with pylons and bridges using wide bases and triangles, then recycle newspaper and clear every floor scrap.

What it should show

Many first prototypes are tall but tippy, or steady but short; only some hold the weight for five seconds. Towers with a base wider than the top, rolled tubes or triangle braces, and a small flat platform usually do best. A sudden collapse often means a skinny base or floppy flat sheets — useful data, not failure.

Misconceptions & interventions

- **More tape always makes a stronger tower.** — Point at a floppy flat wall still sagging under lots of tape. Ask them to roll or fold that sheet into a tube or edge and try again — shape does more work than tape volume.
- **Taller no matter what wins, even if it falls or needs hands to stay up.** — Restate success: free-standing and holds the weight. A short steady tower that passes the load test beats a tall one that topples.
- **If it only stands while someone holds it or it is taped to the desk, it still counts.** — Do the hands-off check aloud: free-standing means no hands, no desk tape, no prop. If it needs any of those, it has not met the challenge yet.

**Differentiation**

Emerging	Developing	Proficient
• Sit with the group and lock one simple plan before build: wide tripod or square base, rolled tubes, small card top — kits stay closed until those three parts are labelled. • During improve, offer a forced choice of one change only: wider base or add a triangle brace.	• Prompt a second look at joins: short tape wraps and one diagonal brace on the weakest side before the re-test.	• After their one improvement, ask which single design choice — base, shape or joins — they would keep if materials were halved, and why the test supports that.

Cross-curricular hook

Tie to Maths Measures: pupils read height in centimetres on the metre stick and compare class results.