

Lesson 16 • energy-forces

Forces: push, pull, friction and gravity

Lesson at a glance

Open with a yard-football wonder: what starts a ball, slows it, and makes a drop fall. Refresh push and pull briefly, then model dragging the same book on carpet versus a smooth board before naming friction. Groups rotate three shared stations—push/pull with book and elastic band, friction feel-test on carpet/board/sandpaper, gravity drops of sponge ball and bean bag—jotting on the Investigation Journal at each stop. Pool evidence in a display-only talk that names which force starts, slows or pulls down.

Learning objectives

- Identify pushes, pulls, friction and gravity in everyday classroom actions
- Describe how forces can make things start, stop, slow down or fall

Before the bell – prep

Print Investigation Journal pages and station cards A–C. Set three fixed shared stations: A books and wide elastic bands; B books, carpet samples, smooth boards, sandpaper; C sponge balls, bean bags and a clear floor-mat landing zone. Double hand-helds if two groups share a station.

Materials

Item	Qty	Per	Source	Low-cost substitute
hardcover book (push at Station A and drag tests at Station B)	1	station kit (double if two groups share the station)	classroom	a reading-scheme hardback or a small wooden block
wide elastic band (Station A only)	2	station kit (double if two groups share Station A)	classroom	a short length of elastic from a sewing kit, held at both ends
carpet sample or carpet tile (Station B only)	1	station kit (double if two groups share Station B)	classroom	a doormat offcut or a thick fabric sample
smooth wooden board or hard plastic tray (Station B only)	1	station kit (double if two groups share Station B)	classroom	a large hardback book cover used face-down as a smooth track
sheet of medium sandpaper (Station B only)	1	station kit (double if two groups share Station B)	hardware shop	a rubber non-slip mat or corrugated card
soft sponge ball (Station C only)	1	station kit (double if two groups share Station C)	school kit	a pair of rolled socks
bean bag or small soft fabric bag (Station C only)	1	station kit (double if two groups share Station C)	school kit	a small cloth bag of rice sealed with tape
floor mat or folded towel landing zone (Station C only)	1	station	classroom	a doubled PE mat square or thick newspaper stack
station label cards (A Push and pull, B Friction feel-test, C Gravity drop)	1	class	classroom	three sticky notes with A, B and C written large
Investigation Journal page	1	pupil	classroom	plain paper with teacher-dictated headings said aloud

Safety watch-point

Elastic bands stay low and aimed at the desk, never faces. Soft objects drop onto the mat only—no throws, no climbing for height, landing zone clear of feet and bags.

Teaching moves

- **Getting Started:** Keep the kit packed away. Use one short yard-football talk and a quick hands-up: kick as push, ground helping the ball stop, dropped things always falling the same way. Surface ideas only—do not correct force names yet.
- **Forces that start, stop and change:** Project only the short board key point. Thirty-second door-push and drawer-pull refresh, then run the live modelled cycle with the friction kit only: wonder, predict, drag the same book the same way on carpet then smooth board, observe, and say friction only after the class has felt the difference. Hand out journal pages and send groups to stations.
- **Force stations:** Run three fixed stations at about 6–7 minutes each; rotate on your signal. Stay mobile. At B, watch that groups keep the same book, hand and kind of pull. At C, insist on drops only onto the mat—never throws—and keep feet clear. Prompt: did that force start, slow, or pull down?
- **Record the forces you felt:** Keep this paper-only, in the room before the pooling talk. Pupils add force names and one evidence clue to the jots they already made. If someone only wrote 'it moved', prompt: what started it, what slowed it, which way did it fall?
- **Naming the force:** Display-only science talk—no typing. Revoice pupil journal evidence in precise force language. Land friction as the answer to the carpet-book wonder and gravity as the downward pull on both soft objects. If someone says the carpet pulls the book back, reframe as surfaces rubbing.
- **What we learnt:** Brisk partner talk: name one classroom push, pull, friction moment and gravity moment right now. Listen for start/stop/slow/fall language tied to real actions. Collect elastic bands first, then stack surfaces and clear the mat zone.

What it should show

Station A: push sends the book away; pull draws the free end of the band toward the hand. Station B: drag feels hardest on carpet or sandpaper and easiest on the smooth board—friction resists more on rougher surfaces. Station C: sponge ball and bean bag both fall straight down to the mat. A weak friction difference usually means the pull strength changed between surfaces—re-run with the same kind of pull.

Misconceptions & interventions

- **Pupils say friction 'pulls the book backwards' as if the carpet is tugging it.** — Have them drag the book again and feel the rubbing between book and surface. Revoice: the surfaces rub; that rubbing force is friction slowing the drag.
- **Pupils claim the heavier bean bag falls faster than the sponge ball in a short desk-height drop.** — Drop both again side by side onto the mat. Affirm both fall down so quickly that speed differences are hard to notice; the clear pattern today is direction—down toward Earth.
- **Pupils think a force is only a hard shove, so a gentle drag or a drop 'doesn't count'.** — Point back to the key point and their journal: a force is any push or pull that starts, stops, slows or makes something fall—including the quiet pull of gravity.

**Differentiation**

Emerging	Developing	Proficient
• Offer spoken sentence stems at the station: 'I felt... so I think the force is...' and pair with a peer who scribes the short journal jot. • Stay at Station A first so push versus pull is secure before friction and gravity names.	• Prompt a fair-test check at Station B: what did you keep the same so the surface comparison is fair? • Ask whether each named force started movement, slowed it, or pulled it down.	• Stretch: name two forces acting when you drag the book (hand pull and surface friction). • Challenge them to spot a classroom moment where friction is useful (grip) rather than only a slowing nuisance.

Cross-curricular hook

Link to PE and yard games—kicks, catches and grips as everyday pushes, stops and friction on different surfaces.

