

energy-forces

Forces: push, pull, friction and gravity

Lesson at a glance

Open with a yard football: what starts it, slows it, and what happens if it is dropped. Model a quick friction cycle by dragging the same book across carpet then a smooth board, naming friction only after the class feels the difference. Groups rotate three shared stations (push and pull, friction feel-test, gravity drop), jotting on the Investigation Journal page at each one. Pool the evidence to name push, pull, friction and gravity and say whether each force starts, slows or pulls things 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 brief cards A–C. Set three fixed shared stations with doubled kit: hardcover books and wide elastic bands (A); books, carpet samples, smooth boards, sandpaper (B); sponge balls, bean bags and a clear floor-mat landing zone (C). Label each station large.

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 kit (double if two groups share Station C)	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	provided printable	three sticky notes with A, B and C written large
Investigation Journal page	1	pupil	provided printable	plain paper with teacher-dictated headings said aloud

Safety watch-point

Elastic bands stay low over the desk, never aimed at faces. Soft objects drop onto the mat only: no throws, no climbing for height. Collect bands first at tidy-up.

Teaching moves

- **Getting Started:** Keep the football talk short. Hands-up only: who thinks a kick is a push, who thinks the ground helps the ball stop, who thinks dropped things always fall the same way. Do not unpack the full station kit yet.
- **Forces that start, stop and change:** Refresh push and pull in 30 seconds (door, drawer), then spotlight force as the umbrella. Live-model the friction cycle with the book only: wonder, predict carpet harder, drag same book same way on carpet then smooth board, observe, then name friction. Point ahead to Station C for the downward pull before handing out journals.
- **Force stations:** About 6–7 minutes per station, two groups sharing each. Stay mobile and pass Station A most often: elastic bands stay low over the desk, never aimed at faces. At C insist drops only onto the mat, never throws. Circulate with: Did that force start, slow, or pull down? What stayed the same on the friction test?
- **Record the forces you felt:** Keep journals in the room. Pupils add the force name and one evidence clue to the jots already made at each station. If a page only says 'it moved', prompt: What started it? What slowed it? Which way did it fall?
- **Naming the force:** Pool station by station and revoice pupil evidence in precise force language. Firmly name friction and gravity from what was felt. Answer the earlier carpet-book wonder: friction slows the drag most on the rougher surface.
- **What we learnt:** Brisk verbal close. Listen for force names tied to real classroom actions and start/stop/slow/fall language. Collect elastic bands first, then stack surfaces and soft objects, and clear the mat zone before dismissal.

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 slows more on rougher surfaces. Station C: sponge ball and bean bag both fall straight down onto the mat. A book that slides oddly far on carpet usually had a shove, not a steady drag; re-run with the same gentle pull.

Misconceptions & interventions

- **Pupils say the carpet 'pulls the book backwards'.** Reframe at Station B: the book and surface are rubbing. Have them drag again on smooth board then carpet and name the rubbing force friction.
- **Pupils think heavier things fall faster in a short classroom drop.** At Station C keep the focus on direction: both soft objects fall down to the mat. Say mass differences are hard to notice in these safe short drops.

**Differentiation**

Emerging	Developing	Proficient
• Say sentence stems aloud at the station: 'I felt... so I think the force is...'. • Stay beside them for one full drag or drop and help jot the feel clue before naming the force.	• Prompt: 'Did that force start the movement, slow it, or pull it down?' • Ask what they kept the same at the friction station so the comparison was fair.	• Stretch: 'Name two forces acting when you drag the book' (hand pull and surface friction). • Ask: 'If there were no friction on the carpet, what might the book do?'

Cross-curricular hook

Link to PE yard talk: kicks, catches and stops as everyday pushes, pulls and friction on the pitch.