# Grade 3 Science | Chapter 2

Lesson 1: Pushes, Pulls, and Motion

## Learn

A force is a push or a pull on an object. Motion means a change in position over time compared with a reference point. A force can start, stop, speed up, slow down, or change the direction of an object's motion. More than one force can act at once.

## Worked example

A child pushes a toy car across a level table. The push starts the car moving. When the child lets go, the car gradually slows as friction and other resistive forces act. Describe what you actually see rather than assuming every car travels the same distance.

## Investigation

Investigation: With an adult, place a toy car on a clear, level floor and mark a starting line. Give it a gentle push and measure how far it travels from the line to where it stops. Repeat three times. Use the same car and surface. Record each distance in centimeters. Next try a stronger push three times, keeping other conditions as similar as possible. Do not use stairs or aim the car at anyone.

## Advanced extension

Explain why repeating trials helps, and identify one way the strength of a hand push might be difficult to keep consistent.

# Grade 3 Science | Chapter 2

Lesson 2: Balanced and Unbalanced Forces

## Learn

The net force is the combined effect of forces on one object. Forces of equal size in opposite directions along the same line balance. A balanced net force does not change an object's motion: an object at rest stays at rest, and an object already moving continues at the same speed in the same direction if the net force remains zero. An unbalanced net force can change its motion.

## Worked example

Two people push a box in opposite directions along one line with equal strength. If those are the only horizontal forces, their horizontal forces balance. If the box starts at rest and stays there, its motion has not changed. A box can also stay still because friction balances a small single push.

## Investigation

Investigation: Set a small book on a flat table. Gently push from opposite sides with one finger from each hand. Try to keep it still, then gently increase one push and observe. Repeat safely without pushing the book off the table. Feel and describe the pushes; this activity does not measure force precisely. Other forces, including friction, can also act.

## Advanced extension

Explain how friction can keep a gently pushed box still even when only one person is pushing it.

## Learn

A pattern repeats in a recognizable way. Careful measurements can help us predict what may happen next, though a prediction is not a guarantee. Measure the same quantity using the same units and procedure. Friction, a different release point, or a bump can change a motion pattern.

## Worked example

Imaginary example, not measured data: a model car rolls 40, 42, and 41 centimeters from the same ramp and surface. The distances are similar, so a fourth distance near 41 centimeters is a reasonable prediction, not a certain result.

## Investigation

Investigation: With an adult, place a short book under one end of a piece of sturdy cardboard to make a low ramp. On a clear floor, release a toy car from the same marked point without adding a push. Measure from the bottom of the ramp to the stopping point. Do three trials. Keep the ramp, car, surface and release point the same. Record actual measurements in centimeters and look for a pattern.

## Advanced extension

Test a second ramp height with adult help, keeping the car, release position relative to the ramp, and floor as consistent as practical. Compare repeated trials and identify a limitation.

## Learn

Magnetic forces can act without direct contact. Magnets attract some materials, such as iron and many kinds of steel, but not all metals. Two magnets can attract or repel depending on which poles face each other. A magnet and a suitable steel object attract; not every object is magnetic.

## Worked example

A magnet pulls a steel paper clip before touching it. Turning one magnet around may change whether two magnets attract or repel. A material's appearance alone is not enough to determine whether it is attracted.

## Investigation

Investigation: With adult supervision, use a large classroom magnet and several objects, such as a steel paper clip, paper, a wooden craft stick and an aluminum foil ball. Predict for each object, then bring the magnet near it and record what you observe. Move the magnet slowly closer without touching the object and note whether it moves. Keep magnets away from electronics and medical devices. Never use small loose magnets around young children, and never put a magnet in the mouth.

## Advanced extension

Design a comparison of magnetic attraction through paper and thin cardboard. Keep the magnet and target the same, and explain a fair way to compare distance.

## Learn

Engineers define a problem, identify criteria for success and constraints, design a model, test it, and improve it. A fair test and honest record help reveal whether a design meets its goal. A model is a way to represent or test an idea; one successful trial does not prove it always works.

## Worked example

Problem: a paper flap will not stay closed. A model might use an adult-secured large magnet and a steel paper clip on a cardboard flap. Criterion: the flap stays closed during three gentle tilts. Constraint: use only available safe materials and avoid loose small magnets. If it fails, reposition the parts and retest.

## Investigation

Design challenge: With an adult, make a cardboard or folded-paper flap that can be opened and closed. Have the adult securely attach a large magnet and a suitable steel piece outside children's reach, or describe a design on paper if safe materials are unavailable. Test whether the flap stays shut through three gentle tilts. Record each actual result, change one feature if needed, and retest. Do not use sharp tools without an adult. A drawing is a design proposal, not a completed test.

## Advanced extension

Compare two latch designs with the same test. Explain how you would record reliability and why three trials may not be enough.