

Light: reflection, refraction and magnification

Lesson at a glance

Open with a tray of kit on the front bench and ask which object will bounce light, bend a view, or make print look huge. Groups predict orally, then aim a torch beam off a mirror onto a paper X, notice a pencil kink in water, watch the teacher coin-in-mug demo, and estimate how many times bigger a magnifier or water-drop lens makes small print. They jot on the Investigation Journal page, name the bounce and bend rules on the light-rays interactive, and pool one whole-number magnification result each into the data-recorder bar chart.

Learning objectives

- Demonstrate that light reflects and use mirrors to aim a beam at a target
- Observe and explain refraction using a bent pencil and a reappearing coin
- Estimate how many times a magnifier or water-drop lens enlarges small print

Before the bell – prep

Night before: fill one clear glass two-thirds with water per group; print small-print cards or cut newspaper strips; cut paper X targets. Kit tray per group of 3–4: 1–2 mirrors, torch, glass, pencil, coin, mug, magnifier, clear plastic square, dropper, print card, X target, books to prop. Extra mug, coin and jug at the front for the coin demo. Dim lights slightly if you can.

Materials

Item	Qty	Per	Source	Low-cost substitute
small hand mirror	2	group	school kit	card covered smoothly with aluminium foil, or the back of a shiny metal spoon
torch	1	group	school kit	teacher-supervised phone torch held by one pupil
clear plastic cup or drinking glass	1	group	classroom	clear jar or PET bottle cut safely by an adult
opaque mug or cup	1	group	classroom	yoghurt pot or any cup you cannot see through
coin (1c or 2c)	1	group	classroom	metal washer or button
pencil	1	group	classroom	straight straw or thin stick
hand magnifier	1	group	school kit	water-drop lens on clear plastic only
clear plastic sheet or cling film square	1	group	supermarket	clear lid from a food container
water dropper or pipette	1	group	school kit	wet fingertip to place one drop
small-print strip	1	group	classroom	any small text to hand: a paperback page, a magazine, or a few lines printed at the smallest size
paper target with a large X	1	group	classroom	sticky note with an X
jug of water	1	class	classroom	classroom tap and a large bottle
books or blocks to prop mirrors	2	group	classroom	pencil case or eraser stack

Safety watch-point

No torch beams at faces; never point a magnifier at the sun or a bright lamp toward eyes; glass stays on the desk; wipe water spills at once.

Teaching moves

- **Today's light words:** Pin bounce, bend and bigger to the mirror, water glass and magnifier in turn, then name reflection, refraction and magnification. Model the mirror worked example aloud once: hold torch still, tip the mirror slowly, watch the spot slide to the X. Head off 'the water bends the pencil' before groups start.
- **What do you predict?:** One oral minute only — mirror aim and coin-with-water. Take two or three spoken coin predictions; many will swear the coin cannot reappear. Ask once: 'What is the light doing in your idea?' Offer the stem I think the beam will... because... if a group stalls.
- **Bounce, bend and bigger:** Reveal one numbered test at a time. ~7 min mirror aim (two-mirror corner is early-finisher only); ~3 min side-view pencil then eyes-front coin demo — viewers keep heads still while you or one pupil pours; ~8 min magnification with ruler or letter-stack method left on the board. Insist on one journal jot per test while kit is out. Circulate: no torch at faces; wipe spills at once.
- **Record what you saw:** Tidy the Investigation Journal from the jots already made — not a rewrite from memory. Look for torch→mirror→X path, bend noted as looking shifted not the object warping, and one whole-number times-bigger estimate. Prompt with: The light went... I noticed... The letter looked about ... times bigger.
- **The rule behind bounce and bend:** Drive light-rays in guided mode one step at a time. Pupils predict aloud before you move the angle. Link mirror angles to their torch-and-X work; after water steps, say the pencil and coin did not move — the light path changed. Bridge once: a lens is curved so it bends light too, and that bending makes print look bigger.
- **How many times bigger?:** Open data-recorder explore mode; columns Lens and Times bigger. Take one agreed result per group. Show the bar chart and ask which bars are tallest, whether a water drop ever beat the magnifier, and why two groups might differ for the same tool. Challenge any call of 20× and re-check with ruler or letter-stack.
- **What did the light do?:** Revoice pupil talk into reflection, refraction and magnification. Oral exit check: point to mirror, water glass and lens; class chorus bounce, bend or bigger. Torches off, water back in the jug, mirrors stacked flat; remind never to look at the sun through a lens.

What it should show

Mirror: a small tip moves the bright spot a long way onto the X. Pencil: clear kink at the water line from the side. Coin: reappears as water rises while heads stay still. Magnifiers typically ~2×–4×; rounded water drops ~2×–5× and can beat a weak lens. Oddly huge estimates usually mean the eye was too close or the drop smeared — re-measure with ruler or letter-stack.



Misconceptions & interventions

- **‘The water bends the pencil’ or ‘lifts the coin’ — pupils think the object itself moves or warps.** — After the coin demo and light-rays water steps, say aloud: the pencil and coin stayed put; only the light path bent, so the image looked shifted. Point to the dotted apparent-ray line on the interactive.
- **‘Light comes out of our eyes to see things.’** — Trace from torch to mirror to X to eye with a finger: light travels to the eye from the bright spot or object. Ask where the light started in their mirror test.
- **A group claims the letter looked 20 times bigger.** — Send them back to the board method: ruler beside the letter, or count how many ordinary letters stack to match one magnified letter. Accept a rough whole number only.



Differentiation

Emerging	Developing	Proficient
• Stay on mirror aiming with teacher support and join the front for the coin demo; use oral stems for the journal jot. • Predict only the mirror test if two predictions feel too much.	• Compare two water-drop sizes and note which estimate is higher on the journal page. • Call a second lens row into the class chart if time and rows remain.	• Two-mirror corner challenge: bounce the beam off both mirrors to hit the X. • Fair-test critique aloud: why might two groups get different times-bigger for the same tool?



Cross-curricular hook

Tie to Maths Data — groups enter times-bigger into the class bar chart and compare mode and range of the bars.