Identifying forces: objects and interactions

Student activity • observation and reasoning

YEAR 10 / LESSON 3 / PHYSICS + SCIENCE (DOUBLE AWARD)

The question

Which object exerts each force, and in which direction does it act?

Observe three small stations and draw force arrows on the chosen object. Distinguish a force from the motion that may result.

Equipment

- Book, wooden block, mat and suitably rated force meter
- Two small bar magnets
- Force-diagram cards, booklet and ruler

Use small classroom magnets, not strong neodymium magnets. Do not bring magnets near medical devices or electronics; use diagrams instead where required. Keep blocks on the bench, pull gently and stay within the force meter's range. Do not release stretched equipment.

Course coverage: Shared Physics / Double Award: 1.12–1.14, 1.16, 1.18. Force types, vectors and weight.

Plan, model or apparatus sketch

Draw a labelled setup or force diagram; include the measured quantities.

Method and reasoning

Read the whole sequence before starting

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1. At the first station, observe a book resting on a table. Draw only forces on the book and name the object exerting each force.

2. At the second, gently pull a wooden block across a mat using a suitably rated force meter. Record the direction of pull and friction during steady sliding; keep the block on the bench.

3. At the third, compare attraction and repulsion between two small bar magnets held above the bench. Keep fingers out of closing gaps and magnets away from electronics.

4. Sort gravity, magnetism and electrostatic force as non-contact examples; normal contact, friction and tension require contact interactions. The electrostatic example is a diagram, not a high-voltage demonstration.

5. For a stated mass of 0.50 kg use g = 9.8 N kg^{-1} to calculate weight. Explain how moving to a place with different g changes weight but not mass.

6. Compare scalar quantities such as mass and speed with vector quantities such as force and velocity. Add an arrow direction to each force description.

Cleanup

- Return magnets with their supplied keepers if applicable; put blocks and force meters away without stretching them.

Record your evidence

Blank spaces are for your own work

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Reference and task data

A force arrow refers to one chosen object. For a stationary book, Earth pulls it down and the table pushes it up. The two forces balance on the book, but they are not a Newton's-third-law pair because they act on the same object. Friction opposes relative sliding or its tendency at contact; it does not always oppose an object's overall direction of travel.

Chosen object	Forces and directions	Evidence / explanation
Book		
Sliding block		
Magnet		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Name two non-contact forces.

2. Which object pushes upward on the book?

3. Calculate the weight of 0.50 kg.

4. Does mass change if g changes?

5. Why is force a vector?

6. Are the book’s weight and support force a third-law pair?