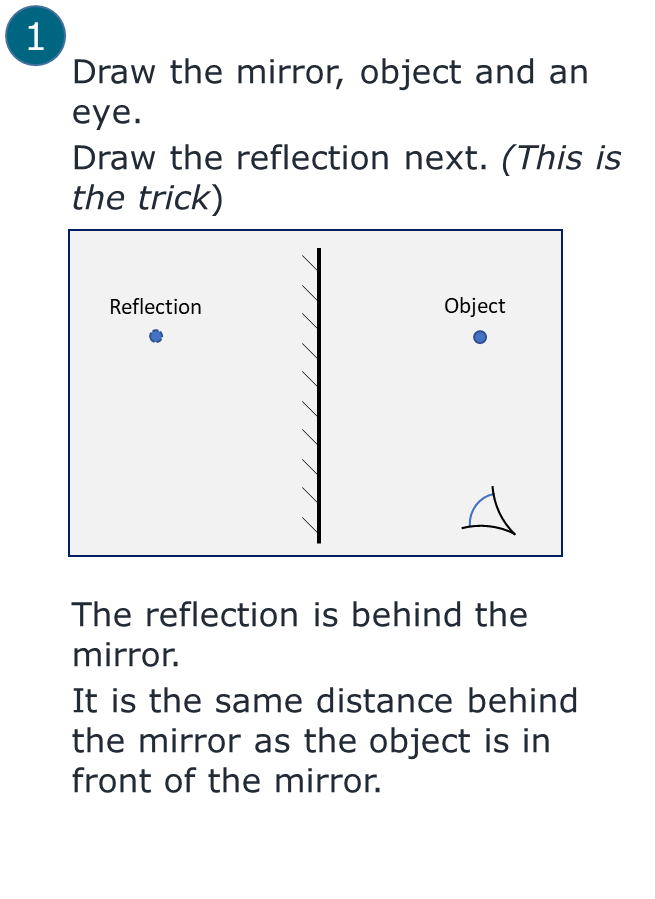
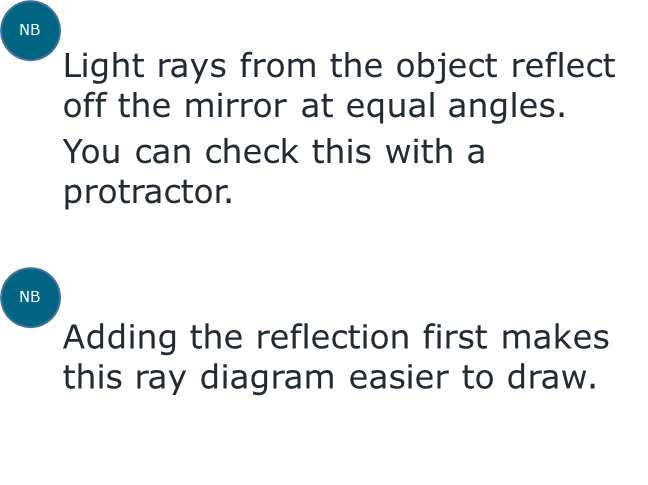
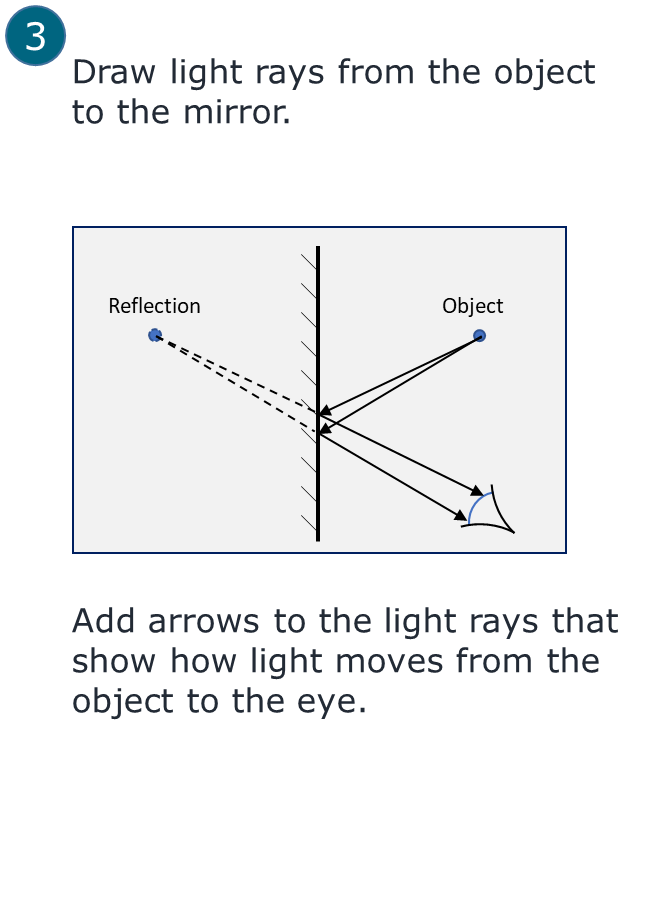
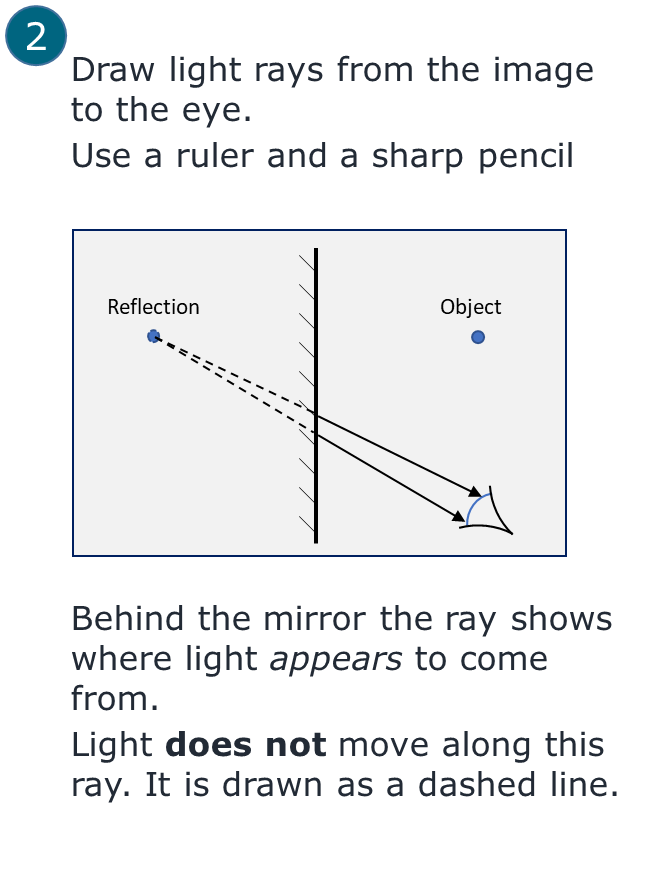
**Drawing a reflection**

Ray diagrams show how light reflects in a mirror.

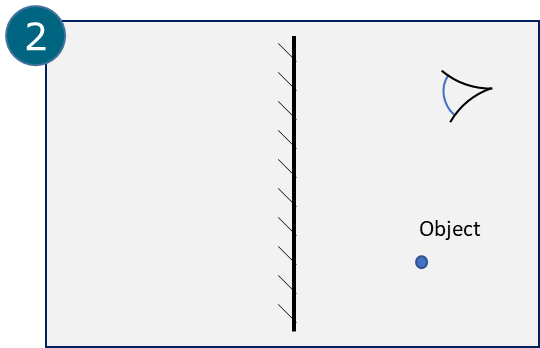
These diagrams can be difficult to draw.

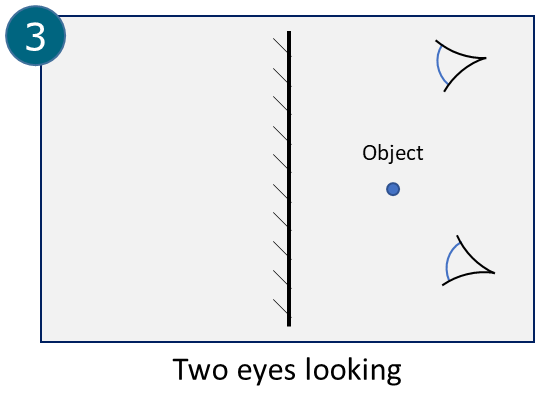
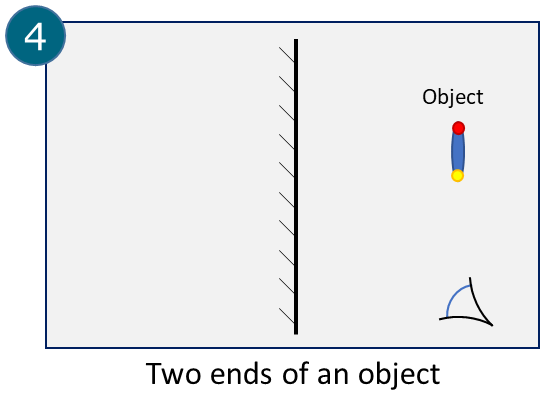
The trick is to draw the reflection *before* the rays of light.



Draw ray diagrams to show how these objects are reflected in a mirror.







*Physics > Big idea PSL: Sound, light and waves > Topic PSL3: Making images > Key concept PSL3.1: The ray model of light to explain images*

|  |
| --- |
| **Response activity** |
| **Drawing a reflection** |

**Overview**

|  |  |
| --- | --- |
| Learning focus: | A plane mirror reflects light rays from each point of an object so they appear to come from distinct points behind the mirror and the reflection is seen as if it were behind the mirror. |
| Observable learning outcome: | Explain why an object appears back to front in a plane mirror.  Draw a ray diagram to show how an object is seen when reflected in a plane mirror. |
| Activity type: | Application and practice |
| Key words: | Mirror, reflection, light ray |

This activity can help develop students’ understanding by addressing the sticking-points revealed by the following diagnostic question:

* Diagnostic question: Mirror writing

|  |  |
| --- | --- |
| **B** | **BRIDGING**  This activity explores ideas that are usually taught at age 14-16, to build a bridge to later stages of learning. |

**What does the research say?**

The virtual image in a plane mirror does not exist. It is created in the brain in order to make sense of the image on the retina in relation to everyday experience.

A challenge to understanding how an object is seen in a plane mirror is the fact that the observer is an inherent part of the optical system (Galili and Hazan, 2000; Andreou and Raftopoulos, 2011). It is perhaps helpful to discuss the *reflection* of an object in a plane mirror and the formation of an image by the eye looking at the reflection. The position of the virtual image is where the object appears to be and could be labelled ‘where the object appears to be’. The ray diagram shown here is used ‘to find where the object appears to be’.

**Ways to use this activity**

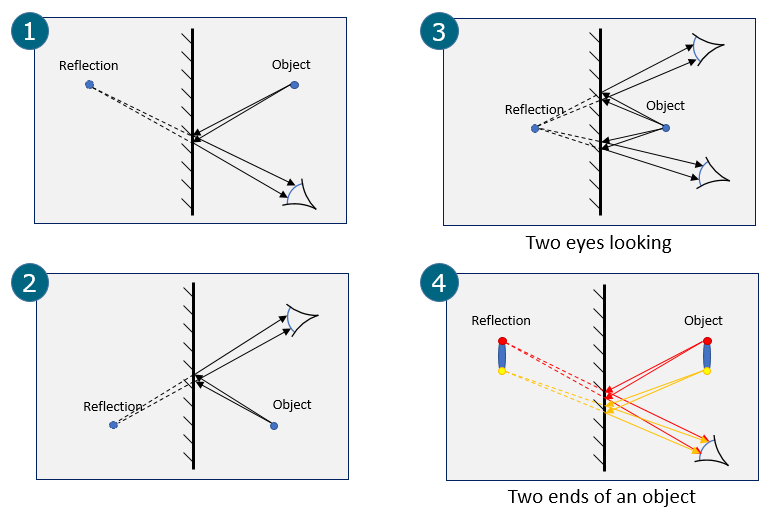
This activity gives students the opportunity to practise applying their understanding and to clarify their thinking by drawing ray diagrams that represent how light moves from an object to the eye when a reflection is made in a plane mirror.

The questions scaffold the drawing of progressively more challenging ray diagrams. The last drawing shows how an extended object is reflected and can be used to support understanding of why an object appears back-to-front in a mirror, when in fact the reflection maps to points on the object that are directly opposite. It is clear in the diagram that to look at the front of the object the observer needs to turn through 180o.

*Differentiation*

If some students are working with a teaching assistant, then a step-by-step list of prompt questions for the TA could help to make this activity more purposeful.

**Expected answers**

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NB In diagram 3 both eyes see the reflection in the same position.

In diagram 4 the reflection maps to the object opposite – red at the top (right) and yellow at the bottom (left).

In each case the image is formed in the eye, which is part of the optical system. The diverging rays entering the eye (from each point on the object) are focused onto the retina that covers the back surface of the eye.

**Acknowledgments**

Developed by Peter Fairhurst (UYSEG).

Images: Peter Fairhurst (UYSEG).

**References**

Andreou, C. and Raftopoulos, A. (2011). Lessons from the history of the concept of the ray for teaching geometric optics. *Science and Education,* 20**,** 1007-1037.

Galili, I. and Hazan, A. (2000). Learners' knowledge in optics: interpretation, structure and analysis. *International Journal of Science Education,* 22(1)**,** 57-88.