



# Science

## Light

# Reflecting Light



# Aim

- LO: To understand how mirrors reflect light, and how they can help us see objects.

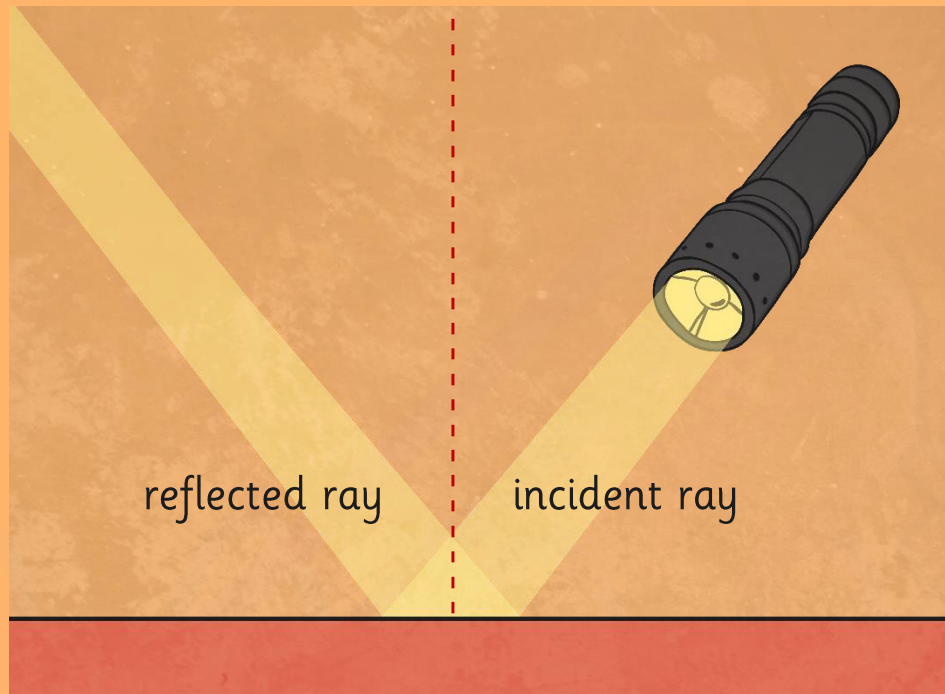
# Success Criteria

- I can explain how light is reflected.
- I can measure the angles of incidence and reflection.
- I can use my understanding of reflection to create a working periscope.
- I can explain how the periscope allows me to see objects I would not usually be able to see.

# How Is Light Reflected?

Reflection is when light bounces off a surface, changing the direction of a ray of light. All objects reflect light; smooth and shiny surface reflect all the rays of light at the same angle, rather than scattering the rays of light like rough or dull surfaces.

The light ray that hits the mirror or other object is described as the incident ray, and the ray of light that bounces off is known as the reflected ray.

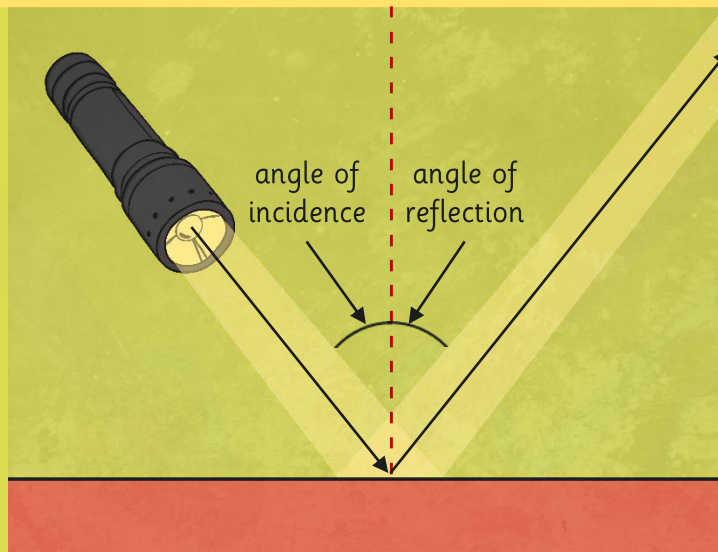


# How Is Light Reflected?

When rays of light reflect, they obey the law of reflection: The angle of incidence always equals the angle of reflection.

The red dashed line is called the 'normal' line. It is drawn at a right angle, or perpendicular to the reflector.

The angle of incidence is the angle between the normal line and the incident ray of light.



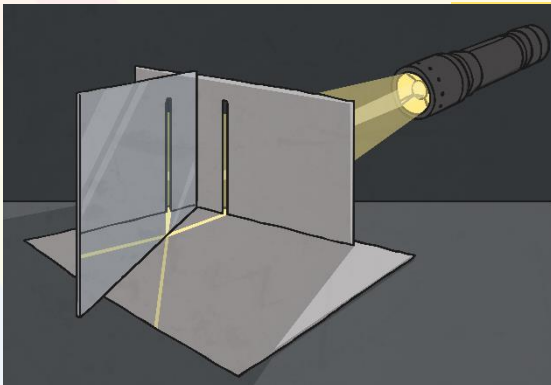
The angle of reflection is the angle between the normal line and the reflected ray of light.



# Angles of Incidence and Reflection



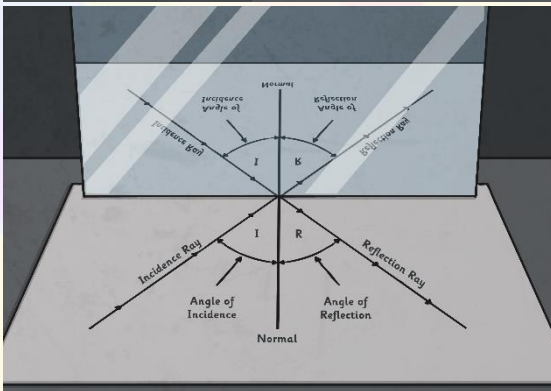
Try this challenge to prove the law of reflection!



If you can, stand a mirror up on a piece of white paper.

Make a very narrow slit in a piece of card.

Dim the lights and shine a torch through the slit towards the mirror.

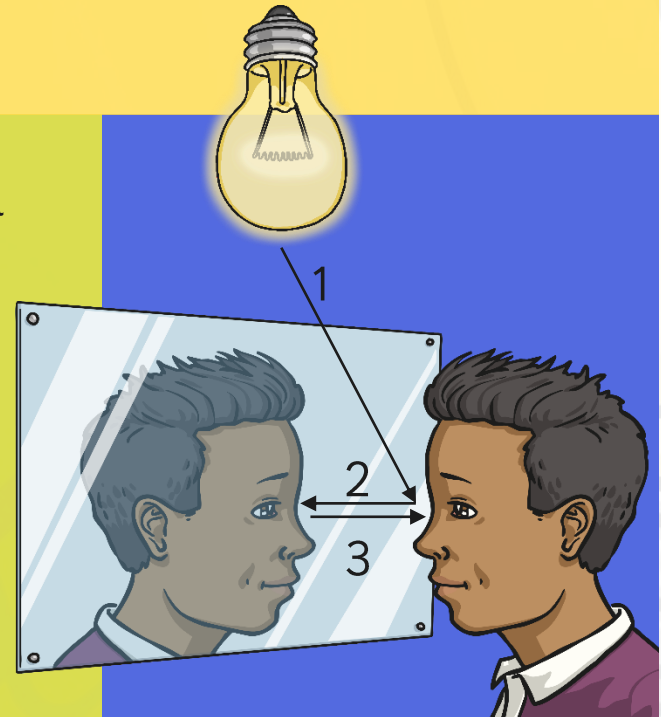


On the white paper, look for the incident ray and the reflected ray of light. You may have to play around with the angle of the torch and the distance you hold it from the mirror.

# Seeing Reflections

The law of reflection is what allows us to see an object reflected in a mirror. Look at the way light travels to enable the boy to see his face reflected in the mirror:

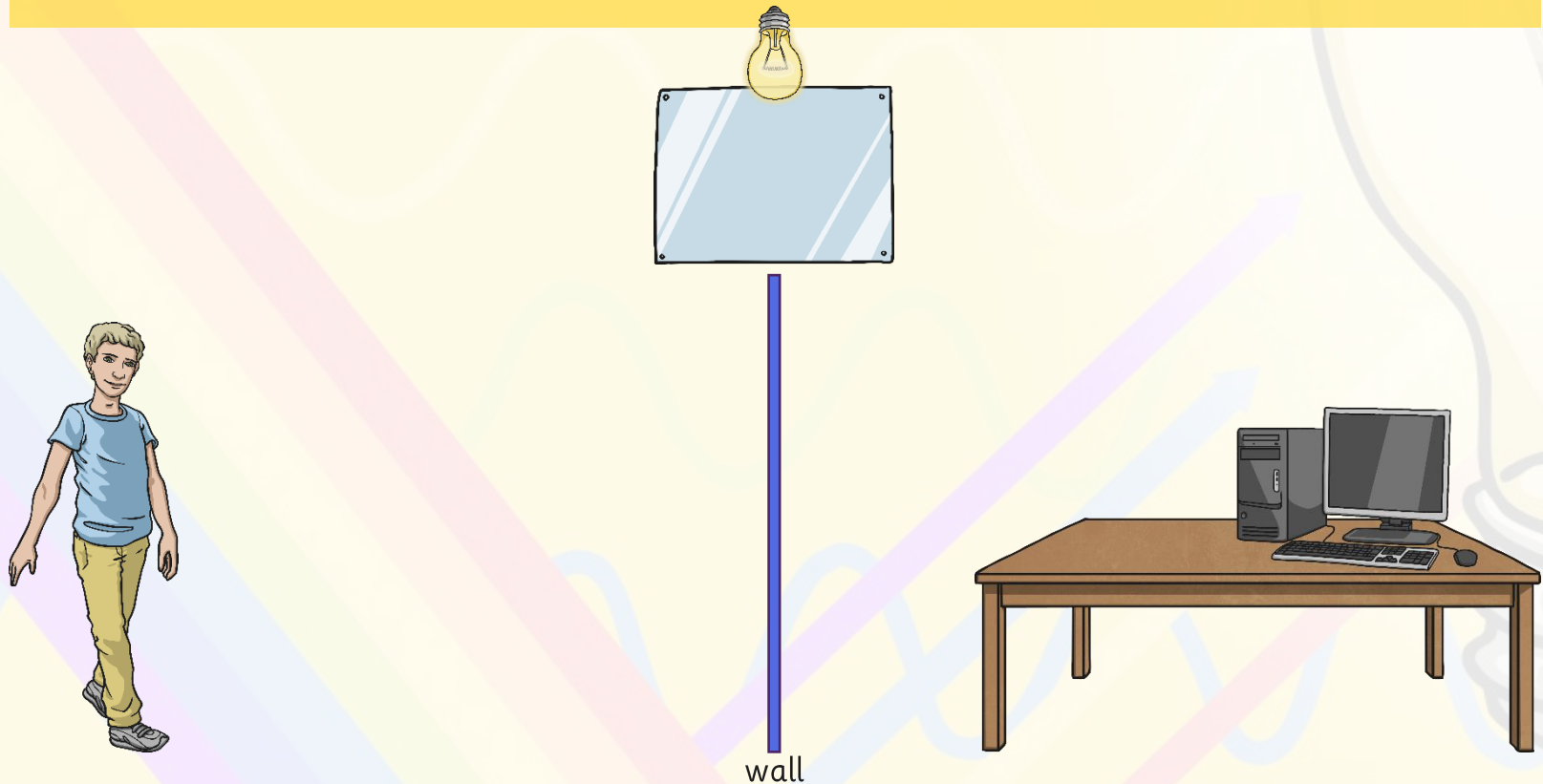
1. Light from the bulb hits the boy's face and bounces off.
2. The light reflected from the boy's face hits the mirror.
3. The light reflected from the mirror travels to the boy's eyes, so he can see the image of his face reflected in the mirror.



# Seeing Reflections



How is light travelling to enable the boy to see the computer behind the wall?





# Make a Periscope

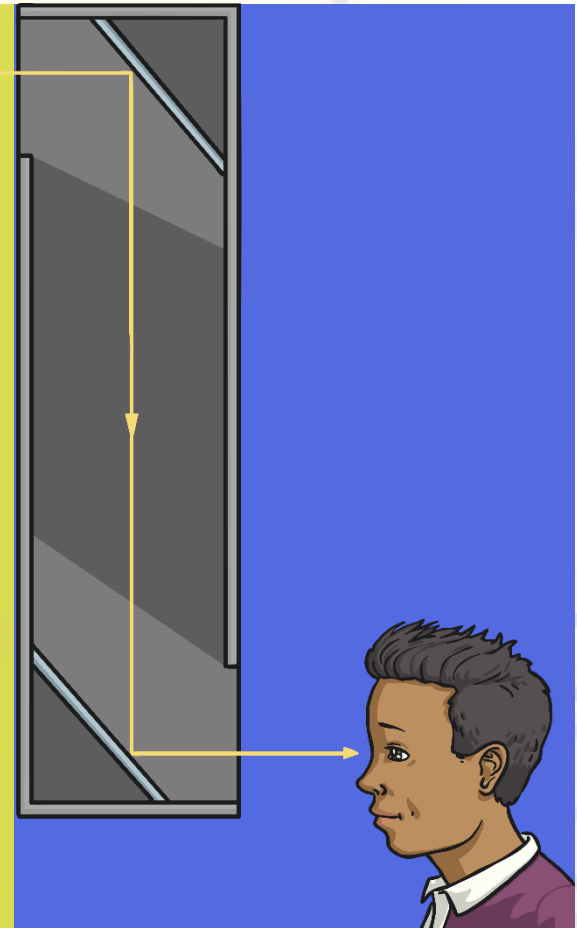


You are going to use your understanding of reflection and the angles of incidence and reflection to make a periscope.

A periscope is a device for seeing over or around something.

Periscopes were first used by sailors in around 1860, who used them in submarines to see above the surface of the water. They were also used by soldiers in the First World War, to see over the top of their trenches. They are still used today by tanks and some submarines.

A simple periscope is a tube with a mirror at either end. The mirrors need to be positioned so that the light is reflected from the mirror at one end, down the tube to the other mirror, then out of the tube to the observer's eyes.



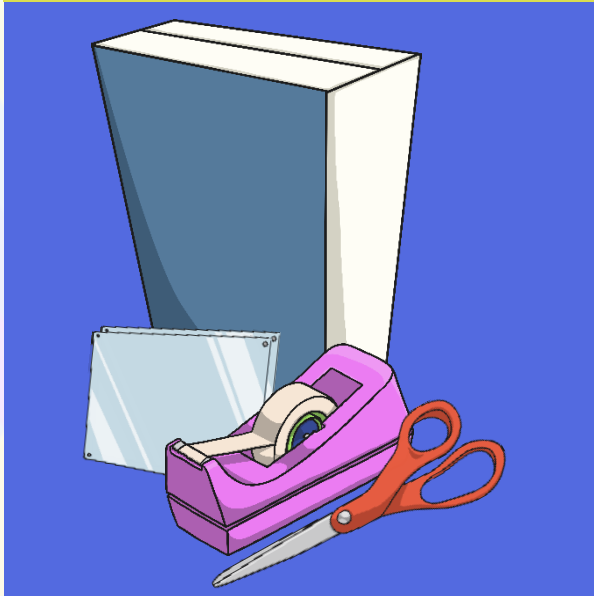
# Make a Periscope



Use a cereal box, scissors, 2 mirrors and sticky tape to make your periscope.

You might use the template or you may try to construct your own!

Use the instructions on the Making a Periscope Activity Sheet to help you.



★ Maki	★ Maki	★ Maki	★ Making a Periscope
<p>The mirrors in the periscope reflect over the top of another object. Expl</p> <p>Light: from a light source _____</p> <p>The light travels through the top wi</p> <p>I can see an image of the object!</p> <p>The mirrors in the periscope reflect over the top of another object. Con</p>	<p>The mirrors in the periscope reflect over the top of another object. Expl</p> <p>Light: from a light source _____</p> <p>The light travels through the top wi</p> <p>The light ray is _____ off this m</p> <p>I can see an image of the object!</p>	<p>The mirrors in the periscope reflect over the top of another object. Expl</p> <p>Light: from a light source _____</p> <p>The light travels through the top wi</p> <p>The light ray is _____ off this m</p> <p>I can see an image of the object!</p>	<p>Follow these instructions to make your own working periscope:</p> <p><b>You will need:</b> A cereal box, A pair of scissors, 2 sticky mirrors, Sticky tape</p> <p><b>Step 1</b> Carefully open up your cereal box and lay it out flat.</p> <p><b>Step 2</b> Stick the 'mirror' templates in the centre of the wide panels of the cereal box.</p> <p><b>Step 3</b> Stick the 'window' templates in the centre of the narrow panels of the cereal box.</p> <p><b>Step 4</b> Carefully cut along the lines for the mirrors, and cut out the windows.</p> <p><b>Step 5</b> Use sticky tape to stick the cereal box back together.</p> <p><b>Step 6</b> Push the mirrors through the mirror holes you cut, and open the other side of the box so they are held firmly in place.</p> <p>You should now be able to use your periscope to look around or over things! Look through one viewing window to see an image from the other window.</p>

# How Does It Work?



Test out your periscope by using it to look over things, such as your table or chair, or around corners.

Think about how it works. How is light reflected by the mirrors in the periscope?

Complete your Periscope Activity Sheet with your ideas.

The worksheets are titled "Making a Periscope" and "How Does it Work?". They contain instructions for making a periscope and a section for completing sentences and a word search.

**Worksheet 1 (Left):**

- You will need:** A cereal box
- Instructions:** You will need to cut slits accurately in order to make windows into your cereal box. When you have finished, look around or over the top of another object so you can see the image of the object.
- Questions:**
  - The mirrors in the periscope reflect light to enable you to see an image of an object around a corner or over the top of another object. Explain how they do this by completing the sentences below.
  - Light from a light source \_\_\_\_\_ an object.
  - The light travels through the top window and hits the first \_\_\_\_\_.
  - The light \_\_\_\_\_ off this mirror down the \_\_\_\_\_, then hits the second mirror.
  - The light ray is \_\_\_\_\_ off this mirror, and travels out of the viewing window to my \_\_\_\_\_.
  - I can see an \_\_\_\_\_ of the object!

**Worksheet 2 (Middle):**

- Questions:**
  - The mirrors in the periscope reflect light to enable you to see an image of an object around a corner or over the top of another object. Explain how they do this by completing the sentences below.
  - Light from a light source \_\_\_\_\_ an object.
  - The light travels through the top window and hits the first \_\_\_\_\_.
  - The light \_\_\_\_\_ off this mirror down the \_\_\_\_\_, then hits the second mirror.
  - The light ray is \_\_\_\_\_ off this mirror, and travels out of the viewing window to my \_\_\_\_\_.
  - I can see an \_\_\_\_\_ of the object!

**Worksheet 3 (Right):**

- How Does it Work?**
- Instructions:** The mirrors in the periscope reflect light to enable you to see an image of an object around a corner or over the top of another object. Explain how they do this by completing the sentences below.
- Questions:**
  - Light from a light source \_\_\_\_\_ an object.
  - The light travels through the top window and hits the first \_\_\_\_\_.
  - The light \_\_\_\_\_ off this mirror down the \_\_\_\_\_, then hits the second mirror.
  - The light ray is \_\_\_\_\_ off this mirror, and travels out of the viewing window to my \_\_\_\_\_.
  - I can see an \_\_\_\_\_ of the object!
- Use these words to fill the gaps.**
- Words:** periscope, eyes, bounces, travel, reflected, image, mirror, hits

# Aim



- I can understand how mirrors reflect light, and how they can help us see objects.

# Success Criteria

- I can explain how light is reflected.
- I can measure the angles of incidence and reflection.
- I can use my understanding of reflection to create a working periscope.
- I can explain how the periscope allows me to see objects I would not usually be able to see.



