STEM
GENERATION CHARITY

Year 6
Light

Reflecting Light

AIM

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

SUCCESS CRITERIA

1) I can explain how light is reflected
2) I can measure the angles of incidence and reflection
3) I can use my understanding of reflection to create a working periscope
4) I can explain how the periscope allows me to see objects
5) I would not usually be able to see

How is light reflected?

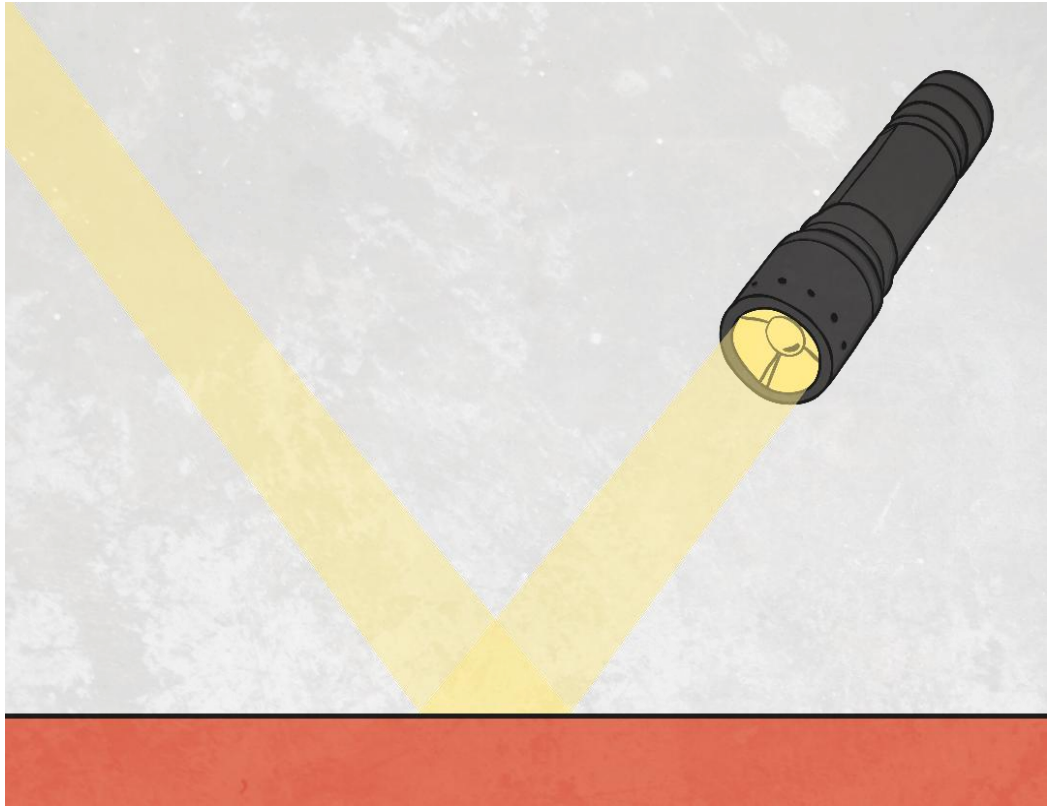
Reflection is when light bounces off a surface, changing the direction of a ray of light.

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.

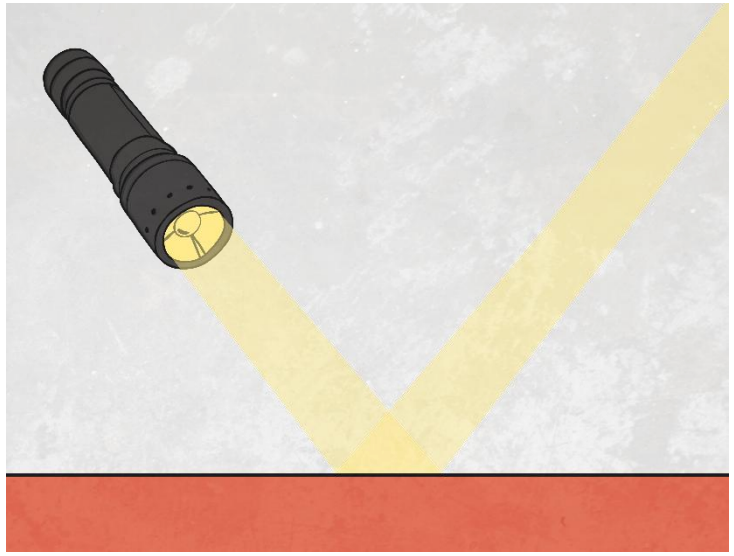


How is light reflected?

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.

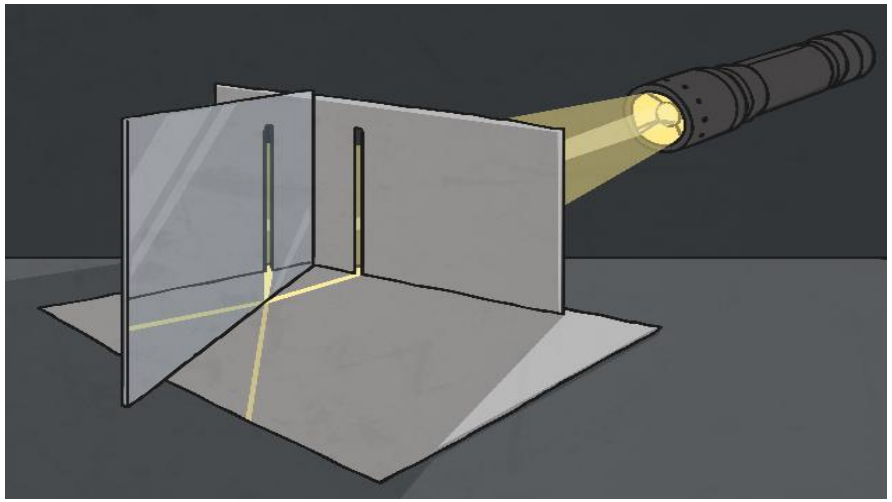
The angle of incidence is the angle between the normal line and the incident ray of light.



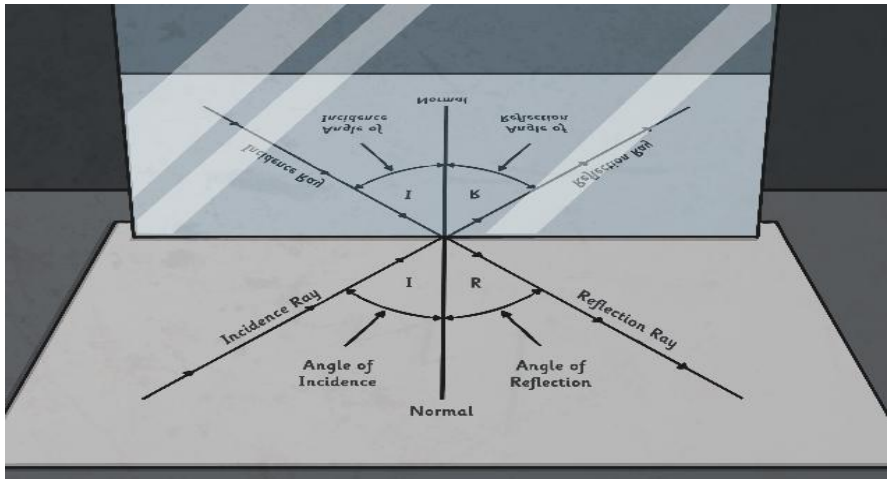
The angle of reflection is the angle between the normal line and the reflected ray of light.

Angles of Incidence and Reflection

Try this challenge to prove the law of reflection!



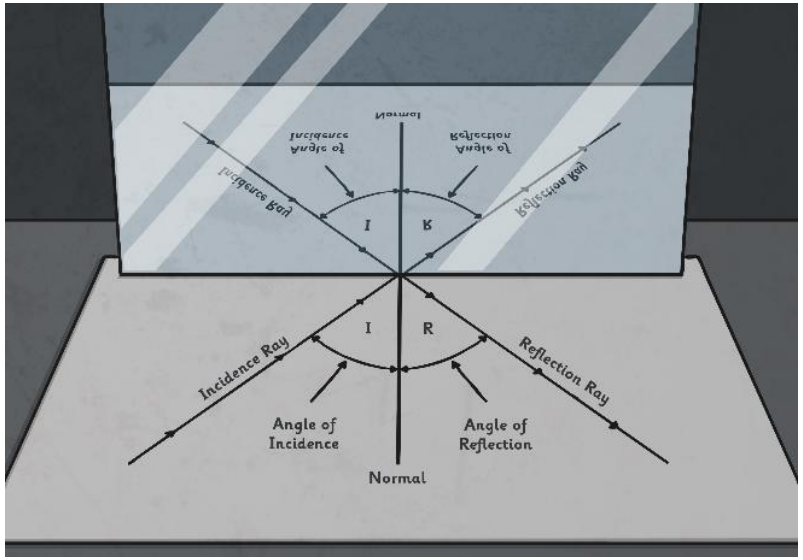
Use modelling clay to stand a mirror up on a piece of white paper.
Make a very narrow slit in a piece of card.
Dim the lights and shine a torch through the slit towards the mirror.



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.

Angles of Incidence and Reflection

Use a pencil and ruler to draw the incident and reflected rays on the paper.
Draw a dashed line perpendicular to the mirror, from the point where the incident and reflected rays meet. This is the normal line.
Use a protractor to measure the angle formed between the incident ray and the normal line.



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.

They should be equal.
Whenever light is reflected from a surface, it obeys this law.

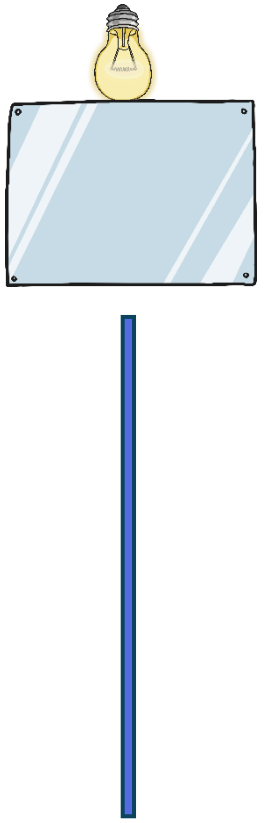
Seeing Reflections

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

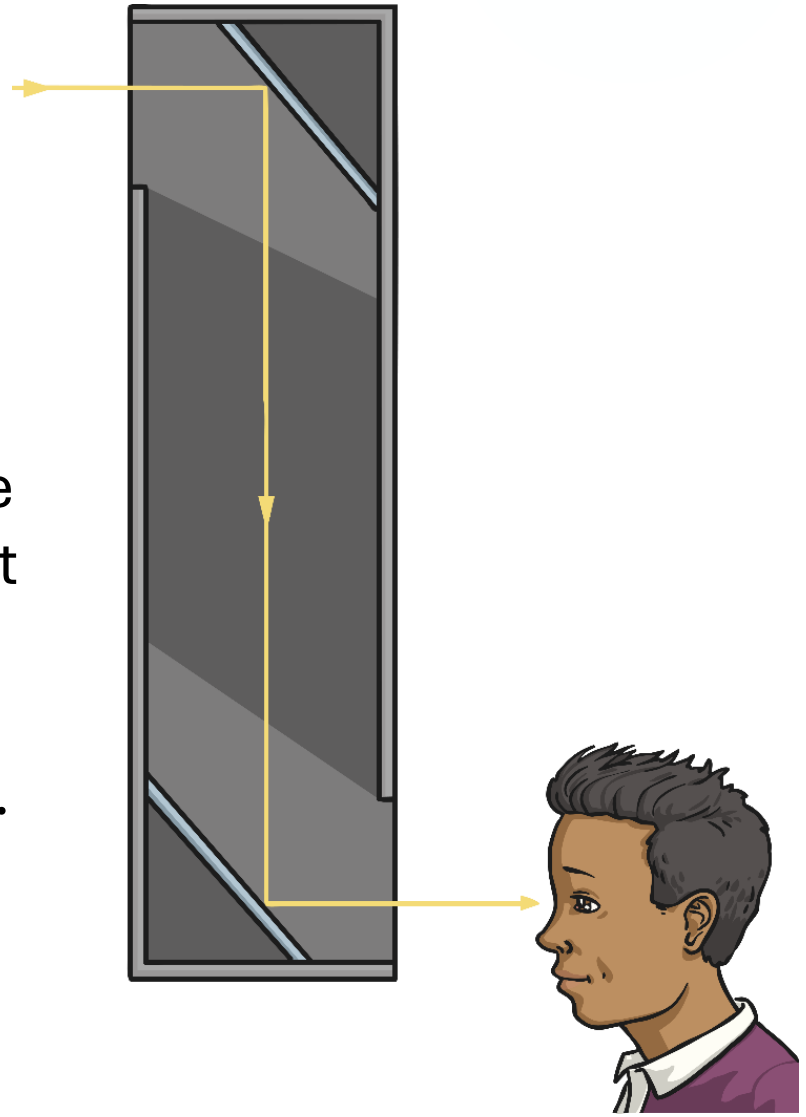
How is light travelling to enable the boy to see the computer behind the wall?



wall

Make a periscope

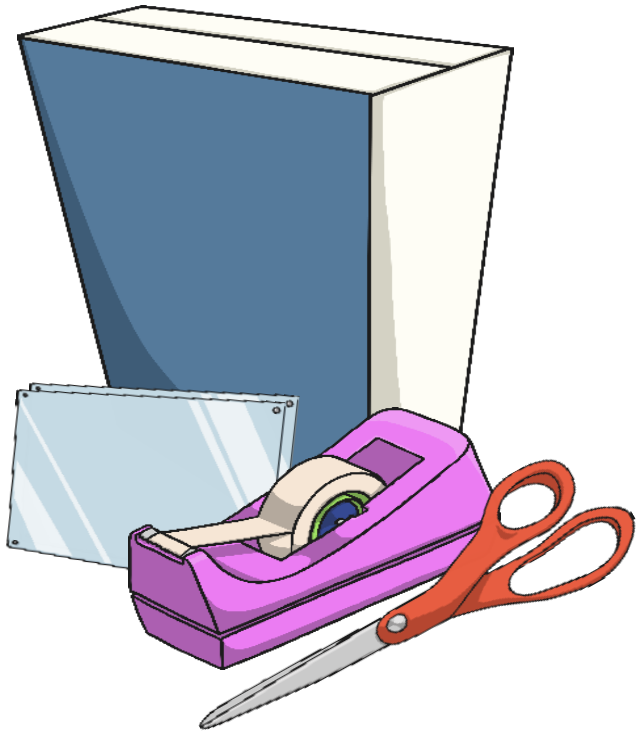
You are going to use your understanding of reflection and the angles of incidence and reflection to make a periscope.
A periscope is a device for seeing over or around something.
Periscopes were first used by sailors in around 1860, who used them in submarines to see above the surface of the water. They 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.



Making a periscope

Materials needed:

- Two small mirrors (flat and the same size)
- Cardboard (e.g. cereal box or milk cartons)
- Scissors
- Tape
- Ruler
- Pencil



How to make a periscope

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1. Prepare the Cardboard

Cut two pieces of cardboard to create a long rectangular box. Each piece should be about 10cm wide and 30cm long, but you can adjust the size based on your preference.

Mark four parallel lines on the cardboard, 10cm apart, and draw diagonal lines at 45-degree angles where the mirrors will be placed.

2. Cut the Cardboard

Use scissors to cut out the walls and ends of the periscope. Score the fold lines gently to make it easier to fold later.

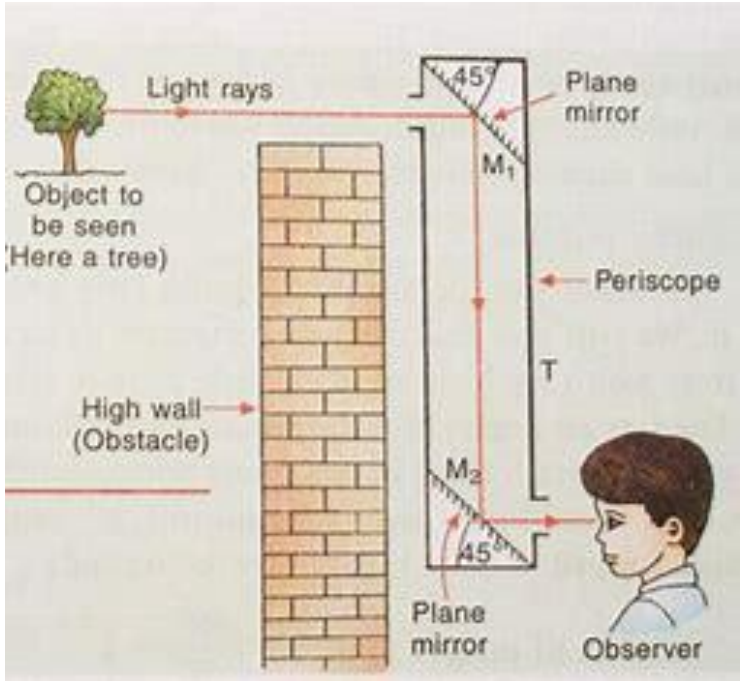
3. Attach the Mirrors

Use double-sided tape or glue to attach one mirror to end of the cardboard box, ensuring they are positioned at a 45-degree angle to the sides of the box. This angle is crucial for the periscope to function correctly.

How to make a periscope

4. Assemble the Periscope
Fold the cardboard along the scored lines to form a box shape. Secure the corners with tape to hold everything in place.

5. Test your Periscope
Look through one end of the periscope while positioning the other end over an obstacle, you should be able to see objects that are not directly in your line of sight.



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?