



# Reflecting light

## Light

### time

60 minutes

### learning outcomes

To:

- know that light always travels in a straight line until it hits something else
- know that all objects reflect some or all of the light that hits them
- discover that light travels through glass
- learn the principles of how a periscope works

### end product

- a periscope for each child

### materials needed

- 48 small mirrors
- 24 sheets of thin card (at least 24 x 16 centimetres)
- 12 magnifying glasses
- torch
- book
- mirror
- squared paper
- sticky tape
- scissors

**Tip.** In this lesson every child makes their own periscope. If you prefer they can also work in pairs or small groups.

## Preparation

For the activity **Reflecting light** you will need the torch, the book, the mirror, and the small mirrors. These need to be small enough (around 5 x 7cm) to fit in the periscope.



## Reflecting light 10 min.

Sit in a circle with the children. Take the torch and shine it on various objects in the classroom, including the book. Ask the children what happens to the light. Does the book change the direction of the light? Can you see any of the light from the torch behind the book?

Shine the torch through a window or another clear glass object. Does the light change direction? Can you see the light from the torch behind the glass?

Take the mirror and shine the torch on it, making sure you hold the mirror at an angle so that the light is reflected from the mirror onto the wall. Ask the children what happens to the light now. Does the light change direction? Can you see the light from the torch behind the mirror?

Discuss why it is that you can't see the light from the torch behind 'ordinary' objects. This is because the light cannot pass through these objects. The book, for example, absorbs some of the light and reflects the rest in all directions.

When the light shines on glass it passes through it. It does not change direction (or only changes a very little) and you can see it behind the glass. Mirrors have a very special way of reflecting the light so that the whole bundle of rays changes direction together.

Together, look at the first drawing on the worksheet. The drawing shows how all objects reflect light. The surface of most objects is not completely smooth, so the rays of light reflect in every direction rather than being reflected somewhere else as a whole bundle. A mirror reflects the light as a whole bundle together. The children complete [Task 1](#) on the worksheet.



The children make a periscope.



### **Make a periscope** 30 min.

In the previous experiment a mirror was used to change the direction of the light. Because mirrors reflect light, you can also use them to look over or around an object. A periscope is a device that uses this principle. The children will make a periscope using the instructions at [Task 2](#) on the worksheet. Give assistance where needed.



The children use Step 5 to test their periscope. Can they see the pen on the table now?



### **Looking even further!** 10 min.

Discuss [Task 3](#). To be able to see even higher, the children can stick two periscopes together. To do this they need to remove the bottom mirror from the upper periscope and the top mirror from the lower periscope. If the children hold the magnifying glass near the upper mirror, they will see the object magnified in the lower mirror. This means they might only be able to see a part of the object. If they hold the magnifying glass near the bottom mirror they will see the whole object magnified.

### **How does a periscope work?** 10 min.

The children complete [Task 4](#). They answer the question of how you can see something using a periscope that you cannot see from that position with the naked eye. Discuss the answers with the children. Explain to the class that light always travels in a straight line until it hits something else. A mirror reflects the whole bundle of light together.

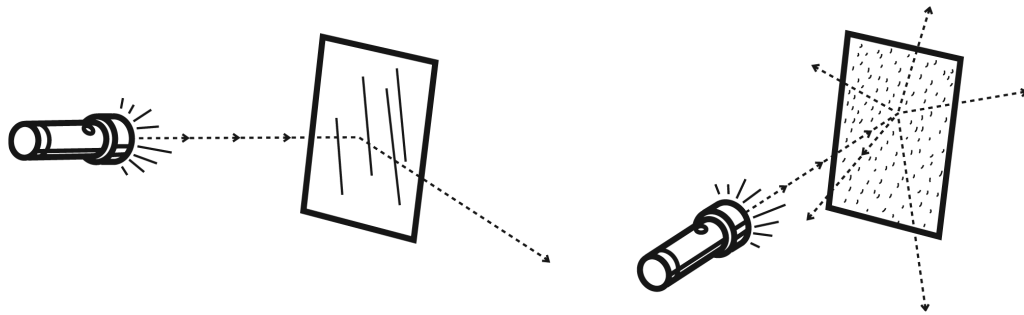
A periscope works as follows: the light falling on the object is reflected onto the upper mirror of the periscope. This upper mirror reflects the light to the lower mirror which then reflects the light to the eye. In this way the light in the periscope is reflected around a corner. So a periscope enables you to look around a corner!



# Reflecting light

1 *Light is reflected*

a Look at the drawings below. You can see the results of the experiment in the class. What have you learned from this experiment?



Circle the correct answers.

If light shines on a book, you

**can / cannot** see the light behind the book.

CIRCLE the correct answer

If light shines on a book,

**part of the light / the whole bundle of light rays**

is reflected.

CIRCLE the correct answer

If light shines on a glass, you

**can / cannot** see the light behind the glass.

CIRCLE the correct answer

If light shines on a mirror, you

**can / cannot** see the light behind the mirror.

CIRCLE the correct answer

If light shines on a mirror,

**part of the light / the whole bundle of light rays**

is reflected.

CIRCLE the correct answer



You are going to make a periscope.

2

Make a periscope



What do you need?

- squared paper
- thin card
- 2 small mirrors
- sticky tape
- scissors
- magnifying glass
- pen



What are you going to do?

You are going to make a periscope. You can use this to look around corners.

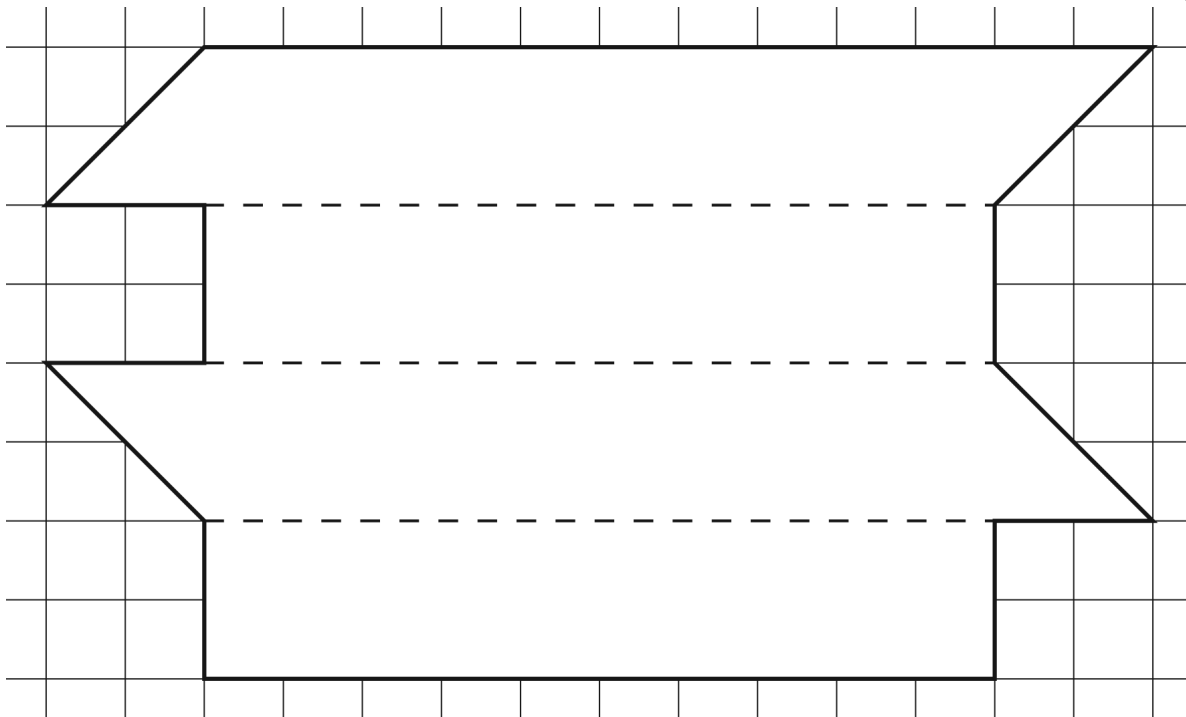
1 In the grid below you can see a figure with three dotted fold lines.

Copy the grid onto the card, but make the squares

2 x 2 centimetres.

**Tip.**

Draw the grid on squared paper and cut it out. Then you can draw round it on the card.



2 Cut out the figure on the card and fold along the dotted lines.

3 Use sticky tape to stick the periscope together.

4 Stick the mirrors on each end of the periscope, with the reflective surfaces pointing inwards.

Your periscope is ready!



5 Place the pen on a table. Crouch down on the ground next to the table. Make sure your eyes are below the level of the table so you can't see what is on it.

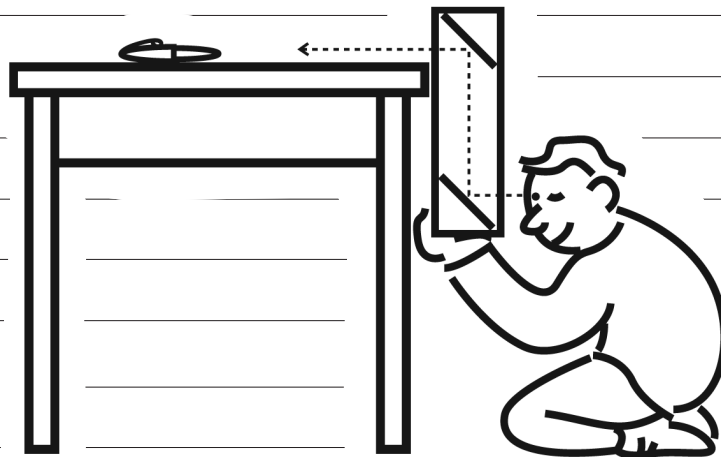
Can you see the pen on the table? **yes / no**

CIRCLE the correct answer

Now look in your periscope as shown in the drawing.

Can you see the pen now? **yes / no**

CIRCLE the correct answer



3 *Looking even further!*

a Your periscope enables you to see about 20 centimetres higher than normal.



Do you think you would be able to see even higher if your periscope was longer?  
**yes / no**

CIRCLE the correct answer

b	If you want a longer periscope you can stick two together.
	What will you need to do to make sure your longer periscope works?
c	Stick two periscopes together. Remove the two middle mirrors. Sit on the floor next to the table. Look through your long periscope. Does it still work?
	<b>yes / no</b>
d	You can see your pen in the mirror, but it is very small. Take the magnifying glass. Can you see the pen better if you hold the magnifying glass at the upper mirror?
	<b>yes / no</b>
e	Can you see the pen better if you hold the magnifying glass at the lower mirror?
	<b>yes / no</b>
4	How does a periscope work?
	How does a periscope help you to see an object from a position where you could not see it with your naked eye?

CIRCLE the correct answer



CIRCLE the correct answer

CIRCLE the correct answer