

## Can you see me? (Light)

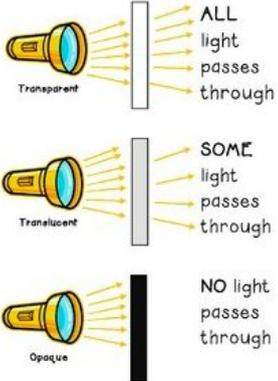
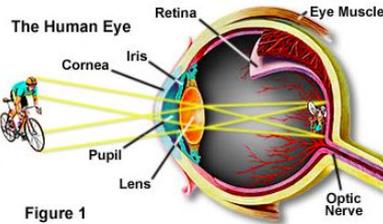


Year 3 - Spring 2

Name: \_\_\_\_\_

Class: \_\_\_\_\_

## Year 3 Science Knowledge Organiser - Spring 2 - Light

1	<b>Light Source</b>	A light source is something that makes its own light.	 <p>Above: Light travels directly from the light source (candle flame) to the eye.</p>
2	<b>Light</b>	Light travels in straight lines. Light travels very, very fast - 186,282 miles per second.	
3	<b>Darkness</b>	Darkness is presented as the absence of light and shadows as examples of where an opaque object blocks light.	
4	<b>Bright</b>	When something is giving off or is filled with much light.	
5	<b>Dim</b>	To become less bright or harder to see.	 <p>Here the light goes from the light source, bounces off the object and into your eyes, so that you see the object.</p>
6	<b>Reflection</b>	When light bounces off a surface.	
7	<b>Reflective</b>	Light bounces off some materials better than others. Shiny objects reflect light well.	
8	<b>Reflector</b>	A shiny surface for reflecting light.	 <p>Transparent: ALL light passes through</p> <p>Translucent: SOME light passes through</p> <p>Opaque: NO light passes through</p>
9	<b>Mirror</b>	A smooth surface that reflects light to show images of objects.	
10	<b>Opaque</b>	Opaque means that light can not pass through a material and will cause a shadow.	
11	<b>Transparent</b>	Transparent means that light passes through a material and images on the other side of that material can be seen clearly.	
12	<b>Translucent</b>	Translucent means that light may pass through a material but images on the other side of that material are not clearly visible.	 <p>LARGE SHADOW when the toy is close to the light</p> <p>SMALLER SHADOW when the toy is further from the light</p> <p>TINY SHADOW when the toy is a long way from the light</p>
13	<b>Shadow</b>	If something gets in the way of a light source, a shadow is formed.	
14	<b>Position - Closer.</b>	If an object is moved closer to the light source, the shadow gets bigger.	
15	<b>Position - Further away.</b>	If an object is moved further away from the light source, the shadow gets smaller.	 <p>The Human Eye</p> <p>Retina, Eye Muscle, Cornea, Iris, Pupil, Lens, Optic Nerve</p> <p>Figure 1</p>
16	<b>Eye</b>	The organ that allows us to see. Light travels into the eye to make things visible.	
17	<b>Iris</b>	Your iris controls the size of your pupil and how much light is let into your eye.	
18	<b>Pupil</b>	The pupil is the hole centered in the middle of the Iris that allows light to strike the retina.	
19	<b>Retina</b>	The retina is at the back of your eye and it has light-sensitive cells called rods and cones. When you look at something, light hits the retina.	
20	<b>Optic Nerve</b>	The optic nerve senses light and sends signals to the brain, which interprets them as images.	
<b>WARNING</b>		It is not safe to ever look directly at the sun, even when wearing sunglasses.	

# LESSON ONE: Light and Dark

## Retrieval Practice

What I already know about light.	Questions I still have about light.
•	•
•	•
•	•
•	•

Outcomes	Key Vocabulary
To recognise that we need light in order to see things and that dark is the absence of light by taking part in a 'feely bag' investigation.	light, source, dark, reflect, see, illuminate, visible
Knowledge needed	
It would be helpful if children are familiar with the vocabulary related to light and dark.	

### What is light?

- Can you name some things that give out light?
- How does light help us to see?
- What is dark?
- How do mirrors work?
- What is reflection?
- How are shadows made?

This unit of work is all about light. You will find the answers to all these questions, and more!

### Talk Task

Can you sort the set of cards?

Identify the cards that are sources of light, and which ones are not.

Can you explain your reasons?

## Everybody Reads

The tricky ones!

Some of the cards were tricky to sort - the moon, the window and the mirror are some examples.

These objects look like light sources, but they are not!



The moon is not a light source because it does not make its own light. We can see the moon because light from the sun reflects off it (bounces off it) back to the earth.

The window is not a light source. It is an opening that lets the light from the sun or other light source into the room.



The mirror is not a source of light because it does not make its own light. It reflects light from other sources.

### What is dark?

**Definition:** Dark is the absence of light.

If there is no light from a light source, it will be dark.

Think about the times it is dark, or places where it is dark.

Which sources of light are **absent**, or **switched off**?

Can we see in the dark?

### Independent task

What's in the bag?

Around the room you will find some feely bags.

It is dark inside the bags, so you can not see what is inside.

You will have to feel!

Visit each one and feel the object inside. Write a description or draw a picture of what you **predict** (think) is inside the bag in the squares below.

1.	2.	3.
4.	5.	6.

Open up the bags. The light can get inside now, and can illuminate the objects. Visit each bag again, and draw or write about what is really inside!

1.	2.	3.
4.	5.	6.

### Exit ticket

Complete the paragraph using the key words below to show what you have found out about light and dark.

A \_\_\_\_\_ source is something that makes light. Some examples of light sources are the \_\_\_\_\_, light bulbs, a \_\_\_\_\_ and fire.

\_\_\_\_\_ is the absence of light. It is dark at \_\_\_\_\_ time because light from the sun is not visible. When it is dark, there is no light to illuminate objects, so we can't see them. We need light to be able to see things.

In the feely bag activity, we could not \_\_\_\_\_ the objects when they were in the dark \_\_\_\_\_. When the bags were opened up so light could illuminate the objects, we could see them clearly. This shows that we need \_\_\_\_\_ to see.

#### Key words



light



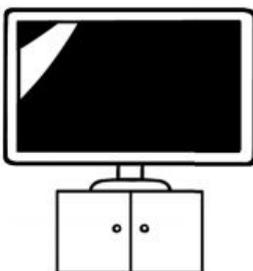
dark



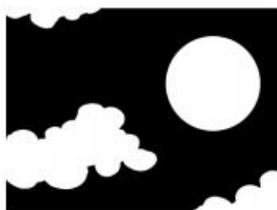
night



bags



television



sun



see



light

## LESSON TWO: Reflective Surfaces

### Retrieval practice

Name 3 light sources

\_\_\_\_\_

\_\_\_\_\_

Name a 3 reflective surfaces

\_\_\_\_\_

\_\_\_\_\_

Outcomes	Key Vocabulary
To notice that light is reflected from surfaces by choosing the most reflective material for a new book bag.	light, source, dark, reflect, see, illuminate, visible.
<b>Knowledge needed</b>	
Children will have learnt about light sources in lesson 1.	

### Everybody watches

We are going to watch a short film all about materials that reflect light.

<https://www.bbc.co.uk/bitesize/clips/ztcg9j6>

While you are watching, think about:

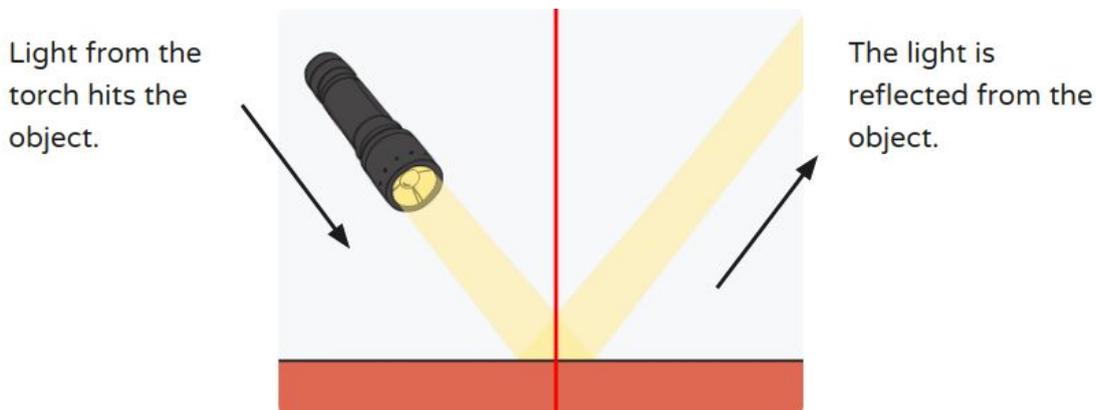
- What does it look like if a material reflects light well?
- Which colours do you think reflect most light?
- What are reflective materials useful for?

### Reflective light

Light travels in a straight line.

When light hits an object, it is **reflected (bounces off)**.

If the reflected light hits our eyes, we can see the object.



Some surfaces and materials reflect light well. Other materials do not reflect light well.

Reflective surfaces and materials can be very useful:

- Reflective strips on coats or bags mean you can be seen at night. They are also useful for fire-fighters or builders who may work in a dark and dangerous environment.
- 'Cat's Eyes' help drivers see the road by reflecting light from headlamps.

- Mirrors let us see ourselves, and are also useful in cars, to allow drivers to see behind them.
- Retro-reflectors are used for road signs so that drivers can see the signs from their car.

Can you think of any other uses?

**Group Task**

Design a reflective book bag!

The Brilliant Bags Company want to make a new book bag for children to use to carry their things to and from school.

They want to make sure the bag helps children stay safe while walking near roads on dark mornings or evenings.

They have decided to put a reflective strip on the book bag, so that drivers can see the book bag easily when their car headlights shine on it.



The Brilliant Bags Company want you to help them choose the best material for the reflective strip.

Look at the different materials.

The materials we are using are \_\_\_\_\_

\_\_\_\_\_

**Prediction**

Which material do you think will be best for the bag?

I think \_\_\_\_\_ will be the best because \_\_\_\_\_

\_\_\_\_\_

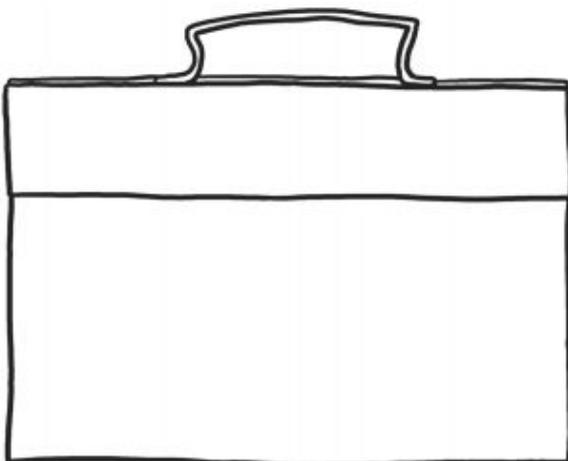
You will need to test the different materials to see how reflective they are.

**Results**

Most					Least

You should now know which material is best for the Brilliant Bag Company to use as the reflective strip on their new book bag.

Draw your chosen material where you think the reflective strip should be on the book bag below. Remember to label it to show which material you have chosen!

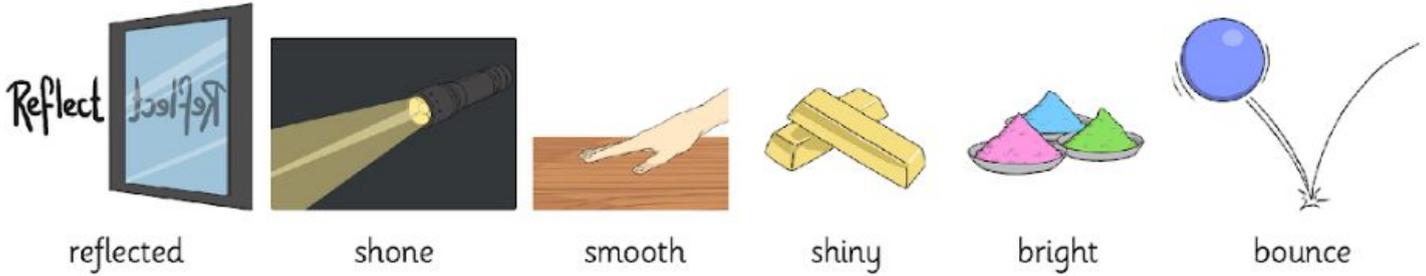


I chose this material because when I tested it, the light from the torch \_\_\_\_\_

This material feels \_\_\_\_\_

It looks \_\_\_\_\_

You may want to use the words below for ideas.



**Ext: Explain how reflective surfaces are similar.**

**Exit ticket- Talk Task**

Some of you have been thinking about the ways in which all reflective materials are similar.

How do they look similar?

How do they feel similar?

Share your thoughts with the class.

# LESSON THREE: Marvellous Mirrors

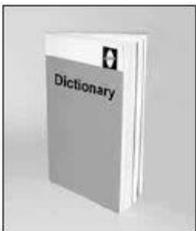
## Deliberate Practice - Exam Question

Torch light

- (a) Sanna is investigating which materials are good reflectors of light. She shines a torch on different objects from a distance of 20 cm.



She looks at the objects to see how well each reflects light. Tick TWO boxes to show which objects are the best reflectors.



Paper book



Metal spoon



Wooden spoon



Woolly hat



Glass jar



Compact disc

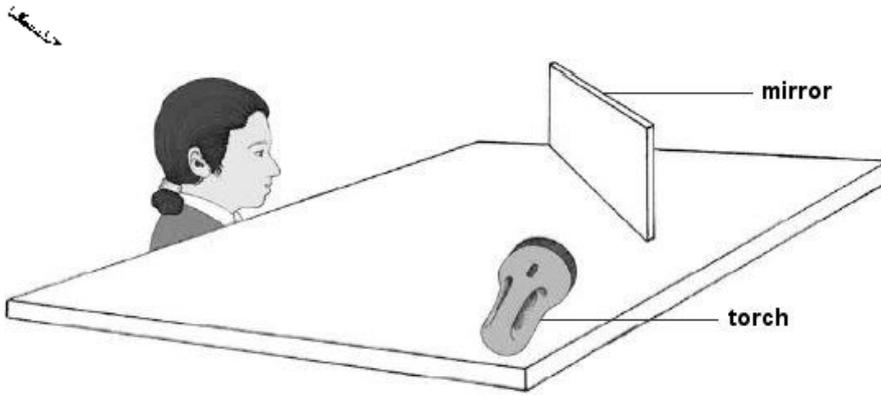
2 marks

- (b) Tick ONE box to show which of Sanna's objects does not make a dark shadow.

metal spoon	<input type="checkbox"/>	wooden spoon	<input type="checkbox"/>
woolly hat	<input type="checkbox"/>	glass jar	<input type="checkbox"/>

1 mark

- (c) The picture below shows Sanna looking at the torch light reflected in a mirror. Draw TWO arrows to show the direction the light must travel for Sanna to see light from the torch in the mirror.



2 marks

Outcomes	Key Vocabulary
To notice that light is reflected from surfaces by playing mirror games.	Reflect, mirror, light, smooth, shiny, rays, rough, scatter, reverse, beam.
<b>Knowledge needed</b>	
Children will have learnt about reflective surfaces in lesson 2.	

### Everybody Reads Reflective Surfaces

Some surfaces reflect light better than others.

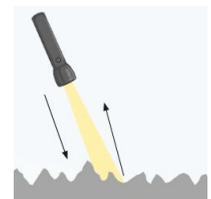
The surfaces that reflect light best are smooth, shiny and flat.

This is because the light rays bounce off these surfaces at the same angle.

If light hits a rough surface, the light rays all bounce off at different angles, meaning the light is scattered. It does not reflect well.



When the light rays hit the smooth mirror, they all bounce off at the same angle, creating a clear reflection.



When the light rays hit a rough surface, they scatter in all different directions, so it doesn't reflect well.

What is a mirror?

The most familiar type of mirror is a plain mirror, which has a flat surface.

Plain mirrors are commonly made of a flat, polished piece of glass with a shiny metal backing, such as silver or aluminium.

The light reflected by a mirror preserves most of the characteristics of the original light, so it creates a clear image.

An image in a mirror appears to be reversed. For example, if you look in a mirror and raise your right hand, the mirror image appears to raise its left hand.

### Paired Activity

Complete the 'How we see things' activity. Can you use the mirrors to reflect the beam of light onto the different objects?

## Mirror games

You are going to play two different mirror games.

While you are playing the games, think carefully about how the mirrors are reflecting light.

### Mirror Messages

In this game, you should use your mirror to write a mirror message to your partner.

1. Write a short message in normal writing (between one to three words is enough). Then hold a mirror at the right hand side of the page, so you can see your message reflected in the mirror.
2. Copy the message you see in the mirror onto another piece of paper, so that your writing is reversed.
3. Swap messages with your partner, and hold the mirror at the left hand side of the page. Can you read their message in the mirror?
4. Think about how the mirrors helped you read the messages.

### Mirror Maze

Outside or in the Hall you will find a wavy line on the floor.

Hold a mirror over your head so you can see the line and your feet reflected in it.

By looking only in the mirror, try to follow the wiggly line from one end to the other.

Take your time when carrying out this task and be very careful.

Why does only being able to look in the mirror make this hard?

### Results

Mirror Messages

Draw what you did in the box below.

What did you see in your mirror?

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## Mirror Maze

Draw what you did in the box below.



What did you see in your mirror?

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### Exit ticket

l	a	t	b	g	l	a	r	e	i	g	s
i	b	r	l	a	c	k	d	o	p	t	o
g	a	a	t	d	a	r	k	p	r	e	u
h	t	n	p	u	p	i	l	a	r	a	r
t	r	s	t	r	a	i	g	h	t	d	c
n	e	b	o	a	t	g	h	a	t	k	e
w	t	l	a	s	h	m	y	d	i	n	n
h	i	o	e	r	e	f	l	e	c	t	p
i	n	c	l	l	e	d	a	b	e	a	m
g	a	k	r	y	f	a	z	e	a	t	g
q	r	t	p	s	h	a	d	o	w	x	m
t	r	a	n	s	u	n	c	r	t	y	w

light  
dark  
source  
reflect  
beam  
straight

pupil  
retina  
glare  
sun  
block  
shadow

## LESSON FOUR: Sun Safety

### Do now: FEEDBACK

Look through what you have completed in your booklet so far and complete any blank pages. If you were absent, read the **Everybody reads** sections and write **ABSENT BUT READ** in **purple pen** and your sign your name.

If you **complete all** of your feedback, on your whiteboard write 3 questions about light for another person in the class to answer.

Outcomes	Key Vocabulary
To recognise that light from the sun can be dangerous and that there are ways to protect our eyes by designing and advertising a pair of sunglasses or a sun hat.	Light, sun, beneficial, dangerous, glare, bright, damage, UV light, UV rating, visible spectrum, pupil, retina, protect, direct, sunglasses, hat, brim.
<b>Knowledge needed</b>	
Children will have learned about light sources in lesson 1.	

### Talk Task - The Sun - Hero or Villain

Have you ever been told not to look at the sun?

Is the sun good or bad?

For each statement, choose to stand on the 'Hero' side of the classroom or the 'Villain' side of the classroom.

## Everybody Reads

### UV Light

The sun emits (gives out) rays of light.

We can't see all the types of light that come from the sun.

The visible spectrum is the name for the light that we can see, and is made up of the colours of the rainbow:



Another type of light that the sun emits is called UV light.

UV light is invisible to humans, but we can see and feel its effects.

Some UV rays are blocked by the ozone layer, but most of the UV light from the sun reaches us on earth.

The amount of UV light that reaches us depends on different things.

It is stronger at midday and in the summer.

If there are no clouds there is more UV light.

It also gets stronger nearer to the equator.

The location can make a difference too - water, sand and snow all reflect UV light, making it stronger.

UV light causes sun burn, wrinkles and skin cancer, damages the eyes and can change the colour of some materials.

### Group investigation - 'Seeing' UV Light

Work in a group to set up an investigation to see the effects of UV light.

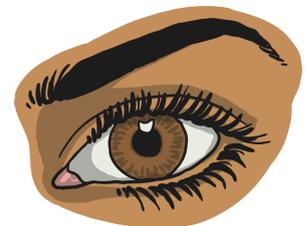
1. Cut out several shapes from black card.
2. Place them on a piece of coloured paper, and position them in a sunny spot for a week.
3. When you take the shapes off, you should see that the paper around the shapes has changed colour slightly.
4. The paper under the shapes will still look the same.
5. The UV light could not get to the paper under the shapes, so the paper under the shapes has not been damaged by the UV rays.

## Everybody Reads

The eye is made to let light in; this is how we see.

Look in the mirror. Can you identify your pupil? It looks like a black circle.

Light enters the eye through the pupil.



Look closely at your pupil in the mirror. Close your eyes for 30 seconds, then open them and look at your pupil. What do you notice?

The pupil grows bigger in the dark to allow more light to enter the eye, and gets smaller in bright light.

## **The Eye**

If too much light comes through the pupil, it can damage the retina.

It causes pain, so that you instantly close your eyes, or turn away from a bright light.

It is very important that you never look directly at the sun, as the light can damage your eyes very quickly.

Bright lights indoors can also damage your eyes, so you should never look at them, or shine lights into anyone's eyes.

## **Protecting your eyes**

To protect your skin from UV rays, you can cover up or wear sun cream.

But what can you do to protect your eyes?

There are several things you should do to protect your eyes from the sun or other bright lights.

- You should wear sunglasses when out in the sun. Sunglasses have a UV rating to show how well they block UV rays. Make sure you get sunglasses with a high UV rating.
- Some sunglasses don't have a UV rating - these are really just toy sunglasses and don't protect your eyes. In fact, because they have dark lenses but no UV filter, the pupil opens wider, actually letting in more UV rays!
- Wrap around sunglasses are best, as they cover more of the eye.
- You can also wear a hat with a wide brim to shade you eyes.
- Make sure you have regular eye tests to check your eyes.
- Even if you are wearing sunglasses and a hat, you should still never look directly at the sun.

## **Independent Task**

Now you know how the sun can damage your eyes, and how to protect your eyes.

Your task is to design a pair of sunglasses or a hat that will protect someone's eyes from the harmful effects of the sun.

You should also advertise your sun protection item!

Tell your customers why they need to buy your sunglasses or hat.

Explain about the effects of the sun, and how your sunglasses or hat can help protect against them.

My sun hat or pair of sunglasses design



Make a poster to advertise your sunglasses or sun hat. Tell your customers how the sun can be dangerous and how your item helps. Make sure your poster is bold and bright so it catches people's attention!

What is your item called?	
Why is the sun dangerous?	Add a picture here.
Extra pictures or information about your item.	How will your item protect someone's eyes in the sun?

### Exit Ticket

Discuss your design with your partner. Give one another a **WWW** (**W**hat **W**ent **W**ell) comment and an **EBI** (**E**ven **B**etter **I**f) comment.

## LESSON FIVE: Making shadows

### Retrieval practice

Why is it dangerous to look at the Sun? \_\_\_\_\_

What is the black part of the eye called that changes size in the light? \_\_\_\_\_

Name a way you can protect your eyes from the Sun. \_\_\_\_\_

Outcomes	Key Vocabulary
To recognise that shadows are formed when the light from a light source is blocked by a solid object by investigating the best material for curtains for a baby's bedroom.	Light, energy, beam, ray, travel, straight, opaque, translucent, transparent, block, shadow.
Knowledge needed	
Children will have learnt about light sources and reflections in lessons 1, 2 and 3.	

### Everybody Reads

#### Light

Light is a beam of energy that travels in a wave from a source.

A wave of light can only travel in a straight line.

Waves of light are called light rays.

Try this activity to demonstrate how light travels:

- Punch holes in the centre of three equal-sized pieces of card.
- Hold the pieces of card so that the holes line up.
- Shine a torch so that the beam of light can travel straight through the holes.

What happens if you move one of the pieces of card so the holes don't line up?

When you moved one of your pieces of card so the holes did not line up, the card blocked the ray of light. This is because light can only travel in a straight line, so it can not travel around the card.

Some objects, like the card, block light well and don't let any get through. These objects are called opaque.

Other things let some light through, but scatter the light so we can't see through them properly. These things are called translucent.

Transparent objects let light travel through them easily.

Can you think of some items that are opaque, translucent and transparent?

Look around your classroom for ideas!

### Talk Task

Opaque, translucent and transparent materials are all useful for different things. Look at the items below and decide which type of material would be best for each one:

Bathroom window: \_\_\_\_\_

Living room curtains: \_\_\_\_\_

Car windscreen: \_\_\_\_\_

Sun hat \_\_\_\_\_

Window with a lovely view: \_\_\_\_\_

Shower curtain: \_\_\_\_\_

### Everybody Reads

Opaque objects do not let any light through.

They completely block the light and stop it travelling any further.

These objects create shadows.

Shadows are areas of darkness where light has been blocked.

### Group Task

Isaac has a new baby sister.

She is a very good baby, but she keeps crying early in the morning because too much light is getting into her bedroom and waking her up.

Isaac wants to choose the best material to make some new curtains for her bedroom.

He wants to make sure that her new curtains block as much light as possible.

Can you help him?

Look at the different materials on your table.

You will test how well each one blocks light by shining a torch onto it and seeing if it makes a dark shadow. If it does, it is opaque and may be a good choice for the new curtains.

Decide whether each material you test is **opaque**, **translucent** or **transparent**.

What materials are you testing? Draw or list them below.



Shine the torch through each material to see what sort of shadow it makes. Put each material in the correct column below.

Opaque Blocks all light and makes a dark shadow.	Translucent Lets some light through and makes a faint shadow.	Transparent Lets all the light through and does not make a shadow.

### Results

Now you have tested all the materials, you need to choose which material is best for Isaac to make the curtains out of.

Draw curtains on the window, and label them to show which material they are made out of.



### Exit Ticket

Write a message to Isaac to explain to him why you chose this material.

Think about how you could tell it blocked light and why this would be useful.

Dear Isaac,

I chose \_\_\_\_\_ for the new curtains.

I think it will be good for the new curtains because \_\_\_\_\_

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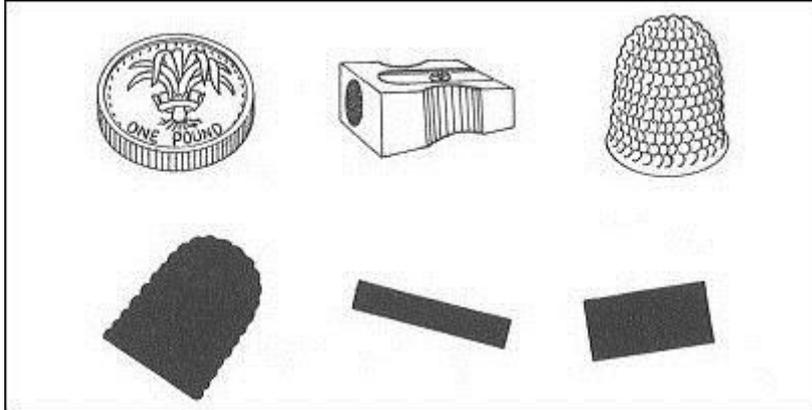
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## LESSON SIX: Changing Shadows

### Retrieval practice

- (a) The things below all make shadows in light.  
Draw ONE line from each object to the shadow it could make. Use each shadow ONCE.



1 mark

- (b) Jenny investigates which materials allow light to pass through. She holds different materials out in the sun.



Complete the table below to predict Jenny's results.  
Tick ONE box in each row. One has been done for you.

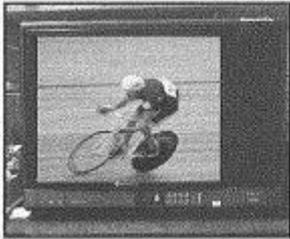
Material	Some light passes through	No light passes through
tissue paper	<input checked="" type="checkbox"/>	<input type="checkbox"/>
glass	<input type="checkbox"/>	<input type="checkbox"/>
mirror	<input type="checkbox"/>	<input type="checkbox"/>
clear plastic	<input type="checkbox"/>	<input type="checkbox"/>
cardboard	<input type="checkbox"/>	<input type="checkbox"/>
foil	<input type="checkbox"/>	<input type="checkbox"/>

2 marks

(c) Jenny sits by a lamp.  
A shadow forms.



She wants to see if any other objects will cause a shadow in a dark room. She turns the lamp off. She sits in front of these objects instead of the lamp:



television



mirror



plant



night safety  
jacket

(i) Which ONE of these four objects will cause a shadow of Jenny in a dark room?

.....

1 mark

(ii) Why does a shadow form when Jenny sits in front of this object?

Tick ONE box.

Because the object...

is translucent.	<input type="checkbox"/>	reflects light.	<input type="checkbox"/>
is a light source.	<input type="checkbox"/>	is transparent.	<input type="checkbox"/>

1 mark

Outcomes	Key Vocabulary
To find patterns in the way that the size of shadows change by investigating what happens when you change the distance between the object and the light source.	Shadow, light, source, observe, pattern, opaque, size, distance, change.
<b>Knowledge needed</b>	
.Children will have learnt about opaque, transparent and translucent objects in lesson 5.	

## Talk Task

These children are talking about shadows and reflections.  
Talk to your partner about the children's ideas.  
Do you agree or disagree with any of their thoughts?



Our shadows are reflections from the sun.

The stronger the source of light the bigger a shadow will be.

I think shadows are made by something blocking the light.

## Everybody Reads

Shadows are created when an opaque object blocks light.

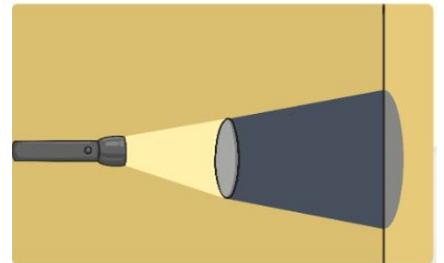
The light cannot go through or around the object, so a darker patch of less light is created behind the object.

Shadows are not reflections! Reflection is when light bounces off an object. A shadow is caused by light being blocked.

How do shadows change?

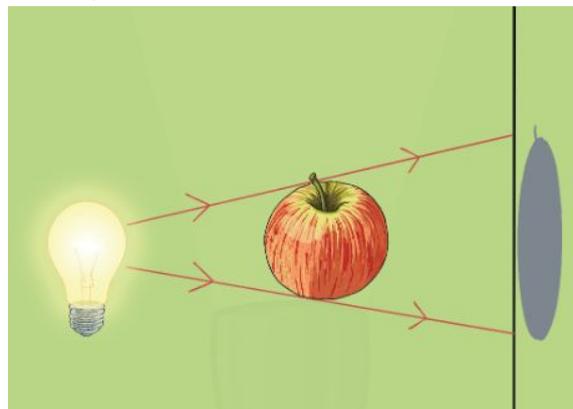
Think about how and when they change size, or direction.

You will be investigating how shadows change when the distance between the light source and object changes.



## Talk Task

Look at the picture below. What do you notice about the shadows?



## Group Task

You will set up an investigation to find an answer to how shadows change when the distance between the light source and object changes.

You will set up an investigation to find an answer to this question.

You will use a torch, a ruler or metre stick, and an object.

You will measure the shadow of the object at different distances from the torch (the light source). Think about what you will do to answer the question, and what you think you will find out. Use the Comic Strip Planner to plan your investigation and make your prediction.

How do shadows change when the distance between the light source and the object changes?  
Use the comic strip below to draw and write about what you will do to carry out your investigation.

Equipment: Draw the things you will use to carry out your investigation.	Step 1 - How will you make a shadow using your equipment?	Step 2 - How will you measure the distance of the object from the light source, and the size of the shadow?
Step 3 - How will you measure what happens to the shadow when you move the object away from the light source?	Step 4 - How will you record your results?	Prediction: What do you think will happen? How

Complete this table with your results as you carry out your investigation.  
How do shadows change when the distance between the light source and the object changes?

Distance between the light source and the object.	Size of the object's shadow
10cm	
20cm	
30cm	
40cm	
50cm	

### Exit Ticket

#### Patterns

Look at the results you have collected. Do you notice a pattern? Does the size of the shadow change when the distance between the object and the light source changes?

Explain what you notice:

Are there any results that do not fit your pattern? \_\_\_\_\_

If there are, can you think why? \_\_\_\_\_

Make a concluding statement to explain what you have found out:

I have found out that \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_