International Day of Light: Physical Sciences Worksheets

Our physical sciences worksheets are a fun, engaging and easy way to teach your class about light. Included are two hands-on activities to guide you through making a periscope and a spectrometer that can be used in and out of the classroom!

Australian Curriculum Science Descriptors:

Science Understanding: identify sources of light, recognise that light travels in a straight path and describe how shadows are formed and light can be reflected and refracted **(AC9S5U03)**
Science Inquiry Skills: With guidance, pose clarifying questions and make predictions about scientific investigations **(ACSIS231)**

- drawing ray diagrams to show how the path of light from a source reflects off surfaces into the eye
- exploring the use of reflection of light by mirrors such as in periscopes and mirror mazes
- Light and sound are produced by a range of sources and can be sensed **(ACSSU080)**

How to Get the Most Out of the DIY Spectrometer:

- Start by going through the worksheets as an **introduction to light and spectroscopy**, and exploring how white light can be broken down into its component colours
- **Get hands-on!** Build your own spectrometer and **start experimenting** by observing the spectrum of light emitted by different sources
- **Collect some data.** Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data **(ACSIS090)**

These activities are a great way to fulfill science curriculum descriptors while fostering your students' curiosity, creativity and scientific inquiry skills.

DIY Periscope

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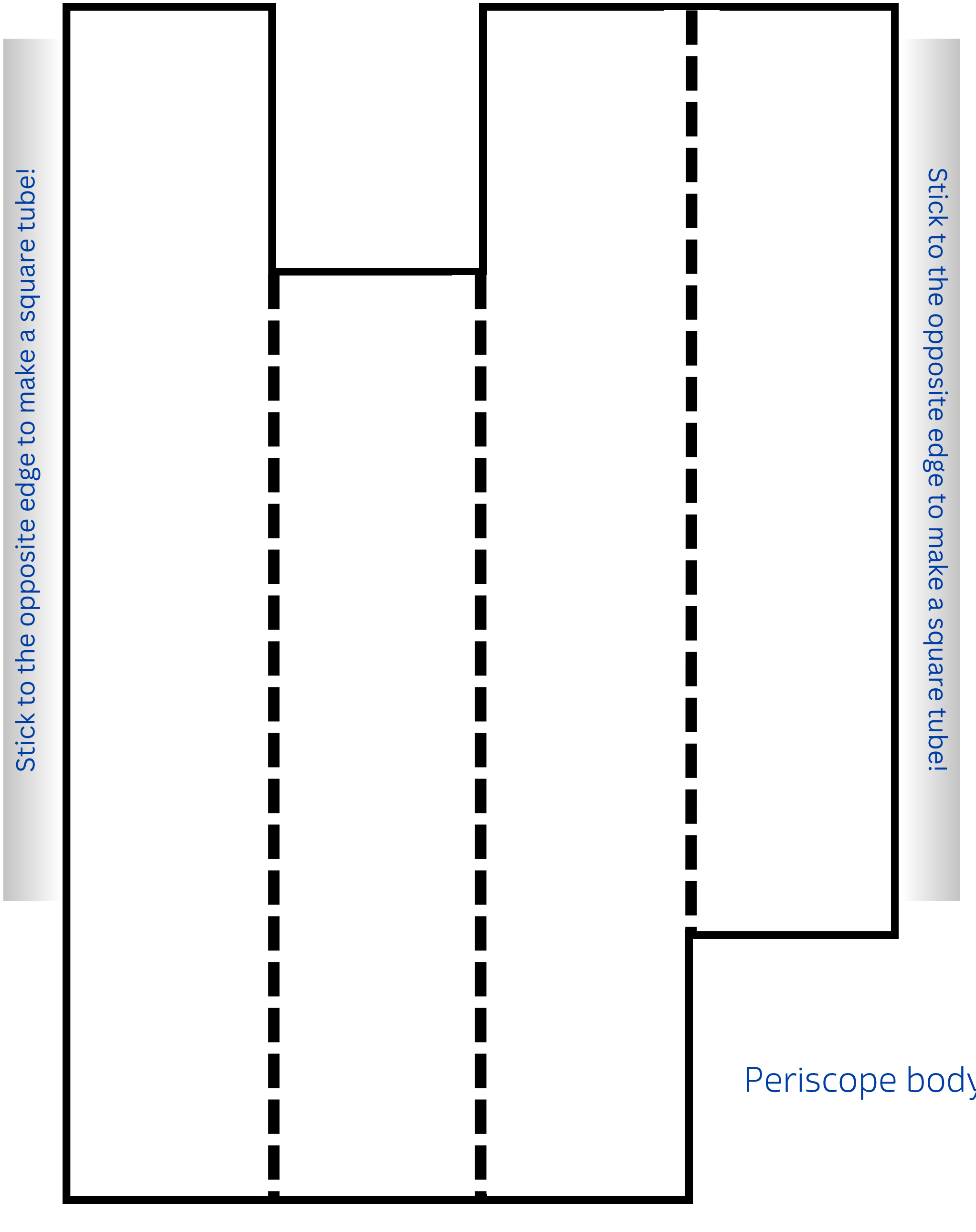

Periscope body

DIY Periscope

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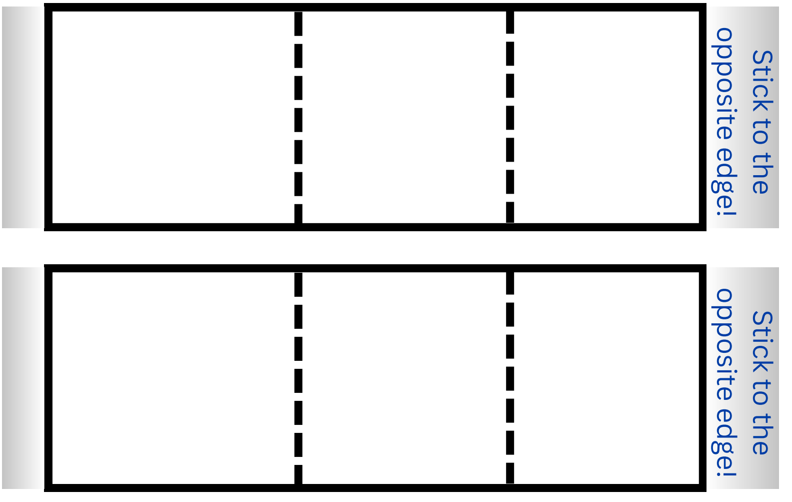
Triangle mounts (for mirrors)

Cut around the solid lines

Fold along the dotted lines

To make your periscope extra sturdy, try sticking the template to cardboard!



Materials

- This template
- Scissors
- Glue or tape
- 2x small mirrors (can use a cut up CD/DVD for this)
- Cardboard (optional)

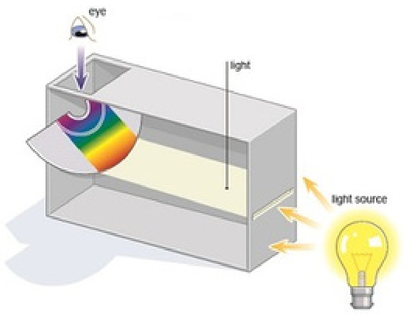
Construction Instructions

1. Print out the templates (body and triangle mounts)
2. Cut around the solid lines and grey boxes. Do this for the body of the periscope and the triangle mounts.
3. Fold along the dotted lines to make a rectangular tube and two triangle mounts. Use the grey boxes to help stick the edges together.
4. Tape/glue mirrors (or another shiny surface like a cut up CD) to the long edge of the triangle mounts.
5. Secure the mirrored triangles into the cut-out sections of the periscope body, so that the mirrors line up. Use some extra tape to secure the mirror mounts to the body of the periscope.
6. Try it out! Try looking over the top of a table (from underneath) or around a corner using your periscope.

DIY Spectrometer

Materials

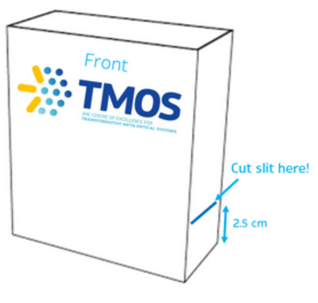
- Compact disc (CD)
- Cereal box
- Protractor
- Utility knife or scissors
- Fluorescent light source (light bulb)



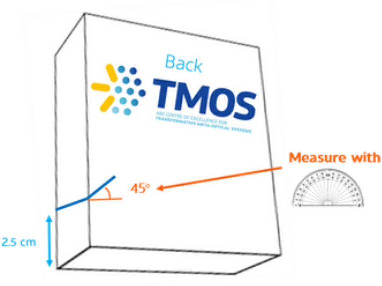
Instructions

1. Cut a 2.5 cm wide slit on the side of the cereal box below the nutrition information
2. Cut a slit on the opposite side of the box and extend it by 2.5 cm on either side at an angle of 45 ° above the horizontal. Use the provided protractor to measure the angle.
3. Insert the CD into this slit
4. Use the utility knife or scissors to make an eye hole on the bottom of the box, below the CD.
5. Aim your spectrometer at a light source and look through the eye hole!

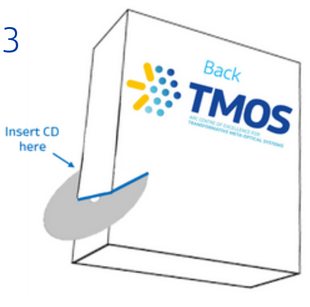
Step 1



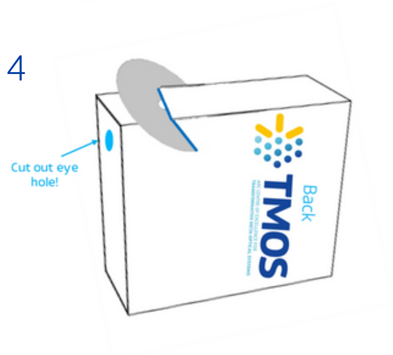
Step 2



Step 3



Step 4



Light Physical Sciences Worksheets

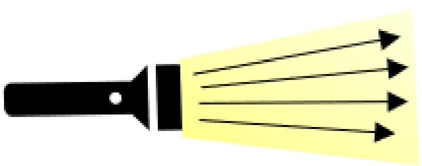
Identifying Sources of Light

Below is a list of different sources of light, some are *natural* sources and others are *unnatural* sources. Look through the list and choose which belong to each group. **Hint –** there are two which are *not* sources of light.

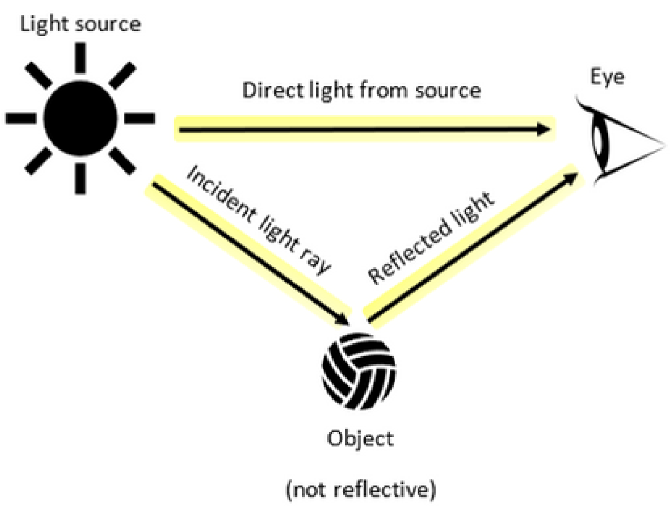
- Torches
- Bush fires
- Lasers
- The Sun (and other stars)
- Light bulbs
- Lightning
- Fire
- Glowsticks
- Mirrors
- Bioluminescent creatures
- Screens
- Fireworks
- Moon

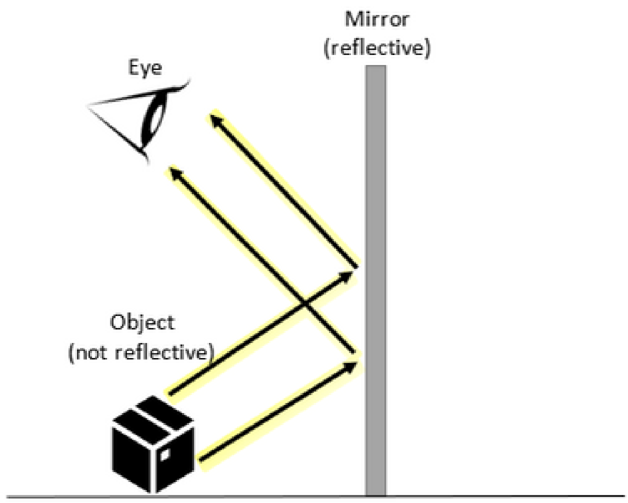
Light Travels in a Straight Path

Light travels in a straight line until it hits an object, or travels through one medium to another. We can use **ray diagrams** to show the path light travels.



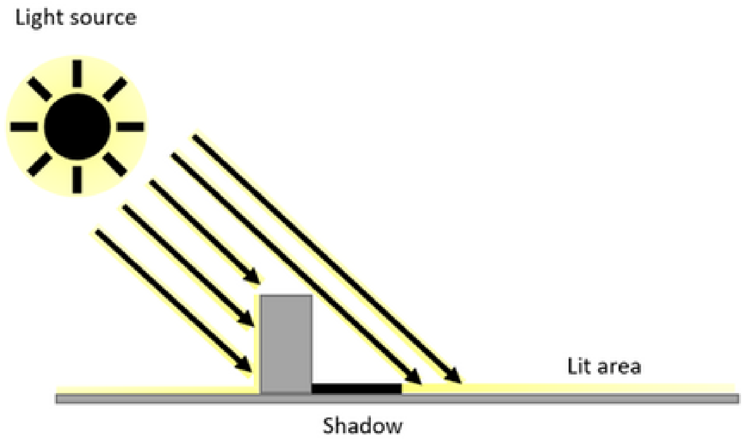
The light rays are represented by **arrows**. Even though they spread out in different directions, they all travel along **straight lines**.





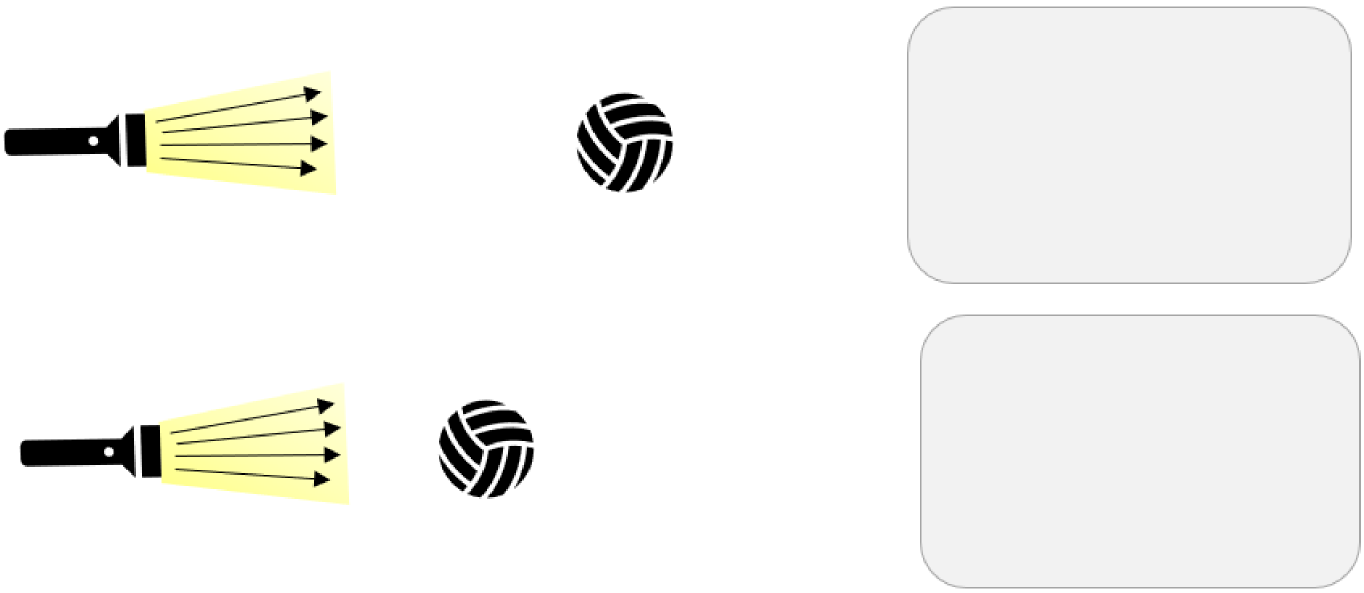
How are Shadows Formed?

Shadows are formed when an object blocks light rays, forming a dark shape of the object behind it. To make shadows, two things are necessary: **light** and an **opaque object**. When something is opaque, it means no light can pass through it.



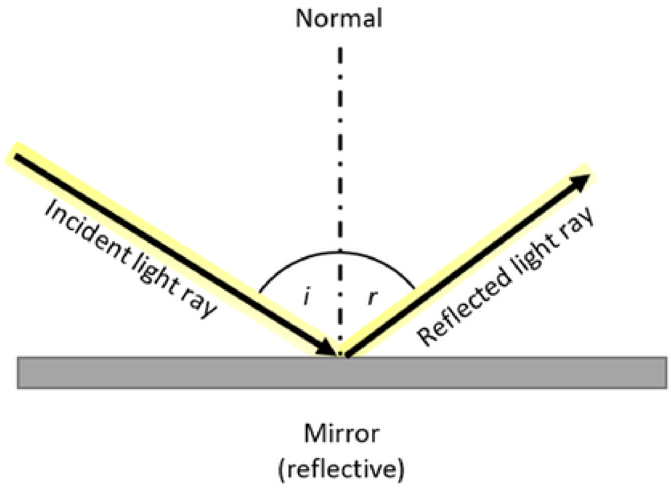
The **size of the shadow** depends on the **size of the object**, the **distance** from the **light to the object** and the **distance** from the **light to the surface** the shadow is formed on.

If we have two light sources which are exactly the same, two of the same objects, but **change the distance** between the light and the object, what will happen to the size of the shadow? Which shadow will be larger? Draw the shadows in the grey boxes.



Reflection of Light

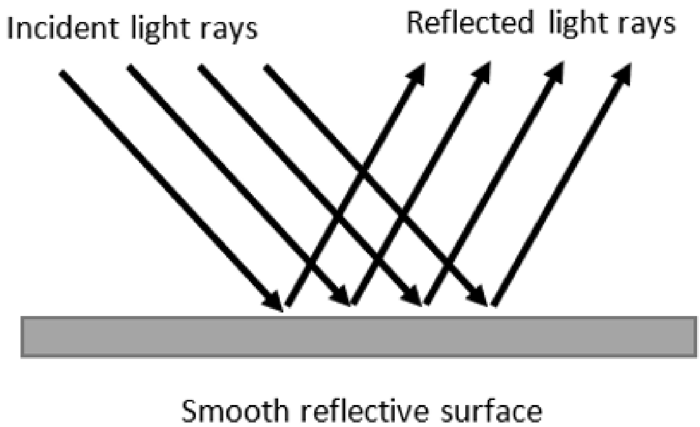
When a ray of light approaches a smooth, **reflective** surface, the light ray will bounce back at the **same angle**.



Types of Reflection

Regular or **Specular Reflection**

The surface reflecting the light is smooth, the light is reflected at the same angle. This gives you a sharp or clear reflection.



Can you think of two examples of **specular reflection**?

1.

2.

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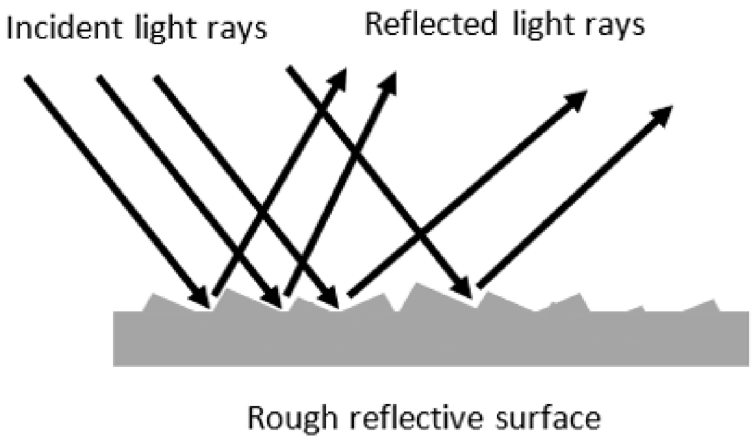
Diffuse Reflection

The surface reflecting the light is rough, causing the light to be reflected at different angles. This gives a blurry reflection.



Can you think of two examples of **diffuse reflection**?

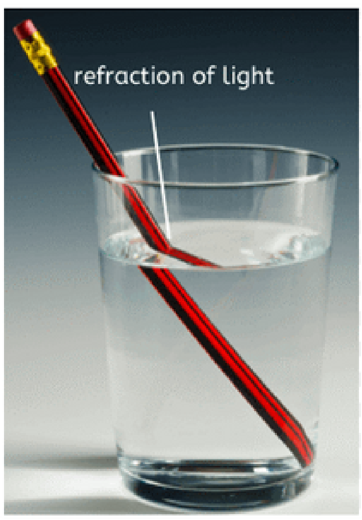
1.

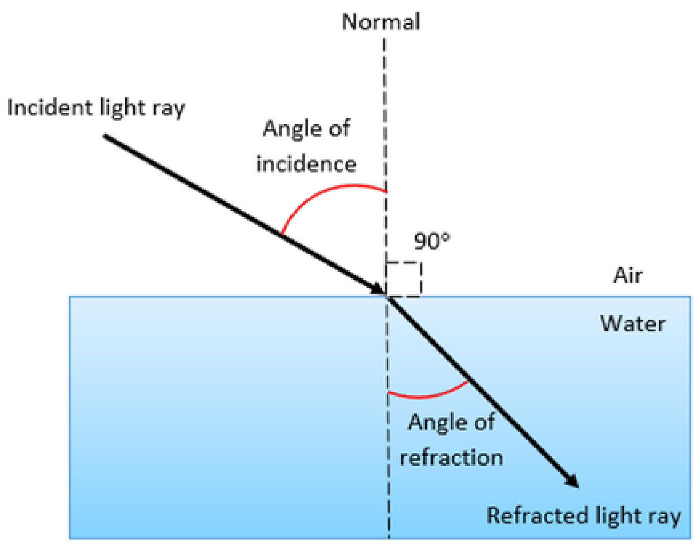
2.

Refraction of Light

Refraction is the **change in direction of light** when it **passes from one medium to another**. When this happens, the speed of the light rays can also change, making things look a little strange.

For example, the pencil below looks ‘broken’, or like the pieces inside and outside of the water don’t match up. That’s because the speed of light in air is *faster* than the speed of light in water. That means that the light both *slows down* and *bends* when it gets to the water.





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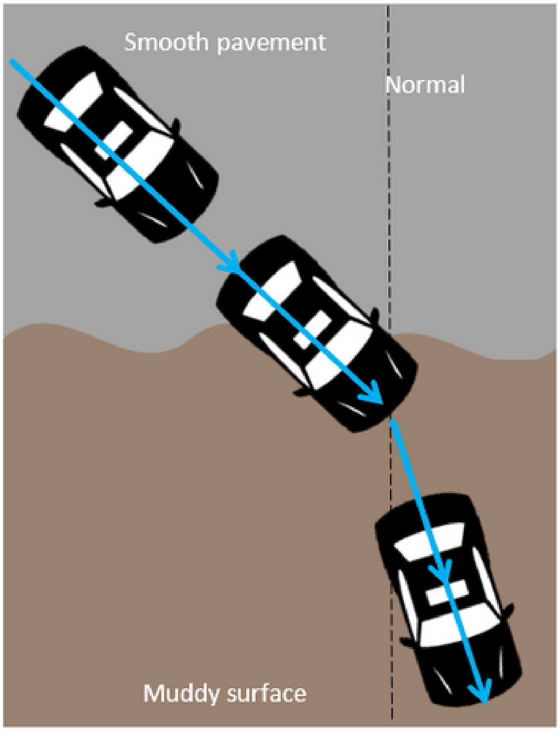
Refraction – A Car in Mud

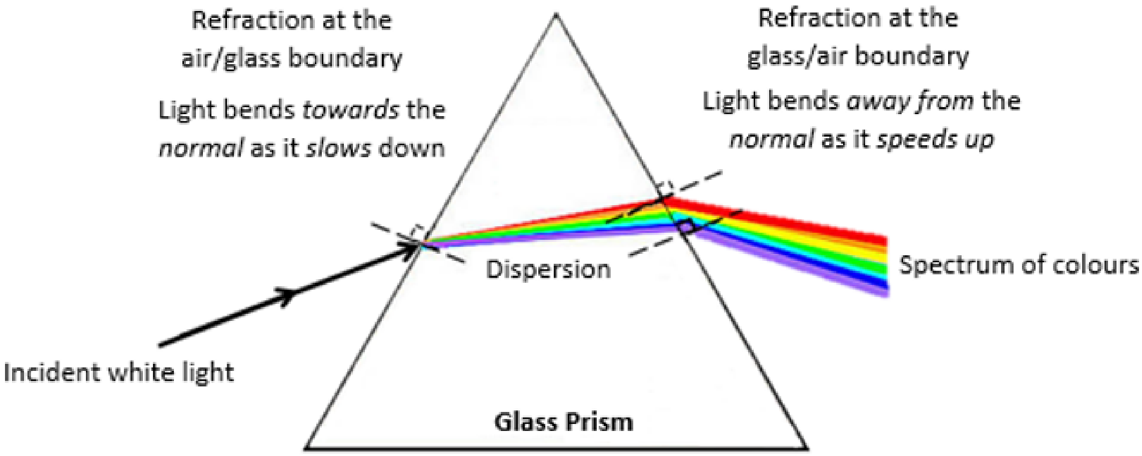
You can think of refraction like a car in mud. Car moves at different speeds on the different surfaces (the smooth pavement and muddy surface). The mud slows the wheels on one side of the car, *bending* the path of the car. **The more it is slowed, the more it bends.**



(White) Light is a Spectrum

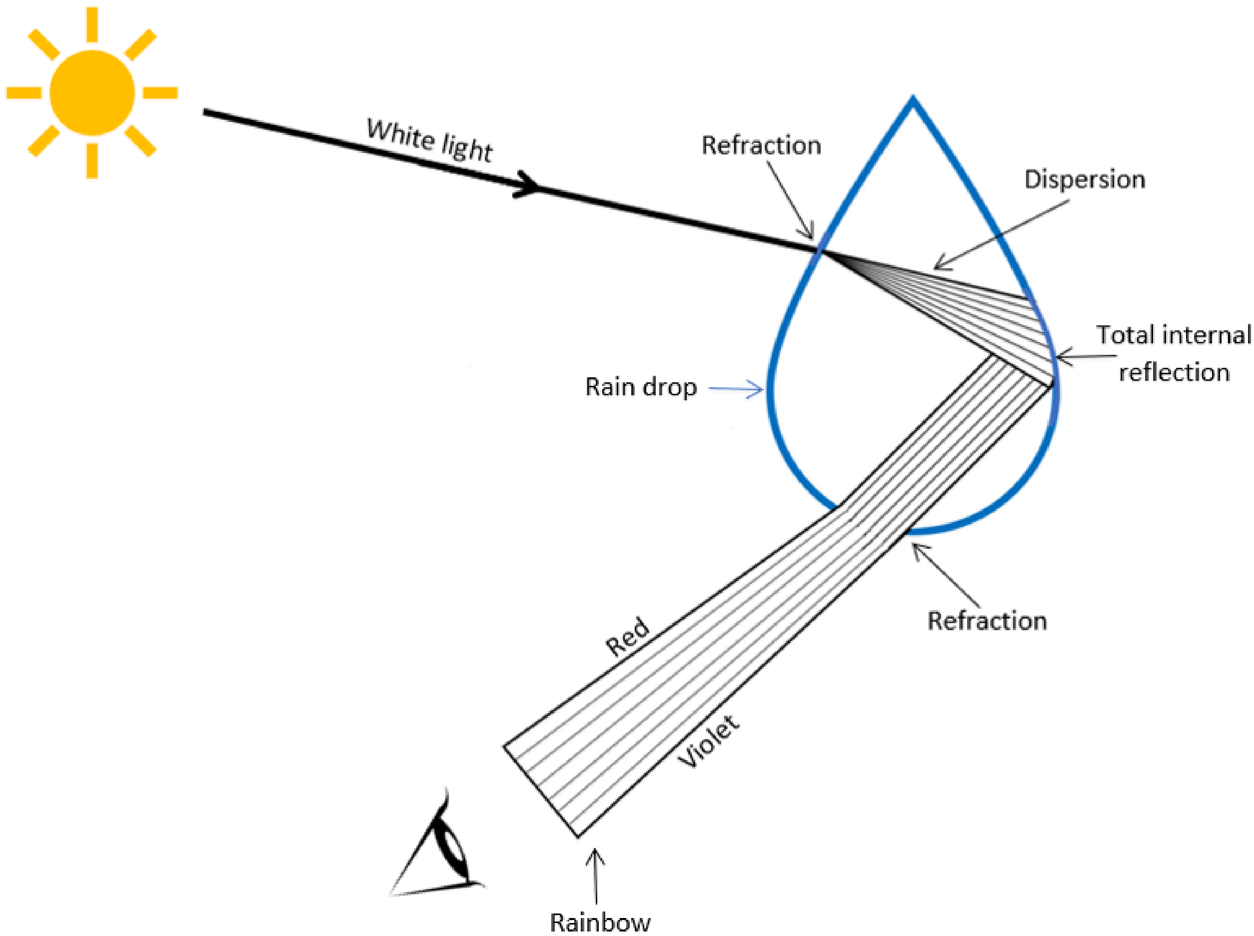
Dispersion is the separation of white light into the spectrum of colours by refraction. Visible, or *white light*, is made up of a spectrum of colours, each with their own *wavelength*.

If we have a glass prism, and shine white light through it, we can see both *refraction* and *dispersion*.



This is how we get rainbows! The main difference is that light is being refracted and dispersed in water droplets (and we have an extra point of reflection inside the raindrop).

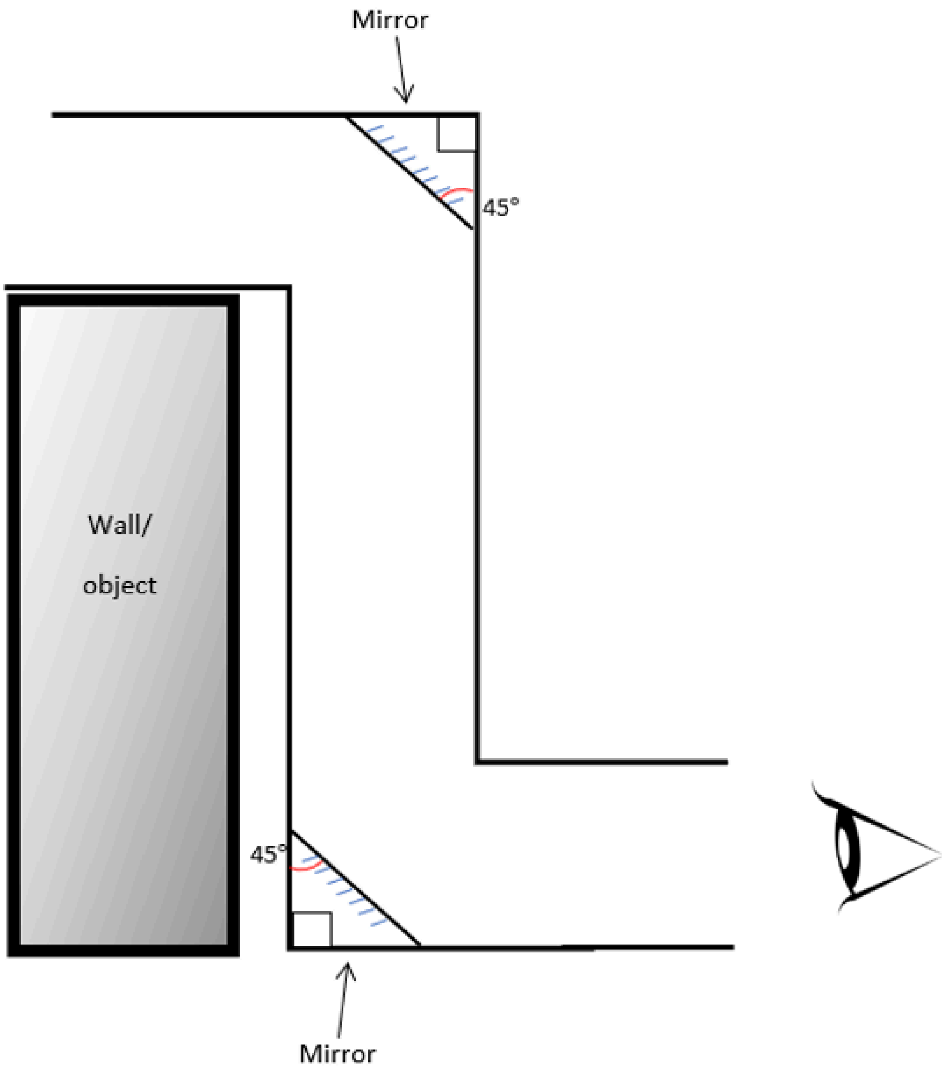
Using the diagram below, fill in the blanks (using colours) to show how a rainbow is formed through the refraction, dispersion, and reflection of light in water droplets.



Periscopes – Seeing Around Corners

What is a periscope? It is an instrument that can be used for observation over, around, or through something that prevents you from seeing something directly from your position. The most simple form of a periscope is made up of an outer case, with mirrors at each end, at 45^0 and parallel to the surface.

Using the diagram below, draw a ray diagram to show how the periscope allows you to see around corners or over walls.



Try building your own periscope using the template provided! If you don't have any mirrors to use, you can try using a CD or DVD and cutting it up to use instead of a traditional mirror.