



SUPER POWER: Refraction!

WATER MAGNIFYING GLASS AND CHANGING DIRECTIONS

WHAT IS REFRACTION?

Light is made up of invisible waves which travel through the air and into our eyes. This is how we see things. When light waves pass through something see-through like water, they can change direction slightly and also change speed. This means our eyes see the light differently than if it hadn't travelled through both air and water. We call this 'Refraction' which means the light has been bent a bit on its way to our eyes. Sometimes, when we look at objects which are underwater, the refraction of light coming through the water makes the object look bigger. This is how your water magnifying glass works. Real magnifying glasses are made from curved glass which refracts light in the same way as your curved puddle of water magnifying glass. Both make tiny things look bigger!

When you looked at the arrow through the water in the glass it should have appeared to be facing the opposite way to the one above it even though you know they are both facing the same direction.



Every time the light passes through a different see-through material like air, water and glass, it refracts or bends a little bit. The arrow appears to be facing a different direction because the light refracts or bends so much that the light waves which bounced off the left of the paper going into the glass end up bouncing off the right hand side of the glass when they come back out! This makes our eyes see the arrow facing the opposite direction.

WATER MAGNIFYING GLASS...

1. Watch the video of Nanogirl making her water magnifying glass
2. Place your glass on your paper, and draw around the base to make a circle.
3. Inside that circle, draw a small picture - anything you like!
4. Cut out the picture and place it in the centre of the bottom of the glass, facing upwards.
5. Cover the top of the glass tightly with clear plastic and use the elastic band to hold in place.
6. Carefully pour a few drops of water on top of the clear plastic.
7. Look at your picture through the water - does it look different?

BUILD TIME
10 MINS

CHANGING DIRECTIONS...

1. Half-fill your glass with water.
2. On a sheet of paper, draw two arrows, both facing the same direction, one above the other.
3. Keep the length of the arrows less than width of your glass.
4. Hold the piece of paper behind but above the glass of water so you can see both arrows.
5. Move your head so that your eyes are at the same height as the top of the water.
6. Slowly lower the paper until you can see the bottom arrow through the water, and the top arrow above the water.
7. You might have to move the paper closer or farther away from the glass to watch it seem to change direction!

CAN YOU WRITE A SECRET CODE WITH ARROW WRITING THAT CAN ONLY BE CRACKED WHEN VIEWED THROUGH A GLASS OF WATER?

YOU WILL NEED

- Plain paper.....
- Pen or pencil.....
- Colouring supplies.....
- Clear glass or cup.....
- Water.....
- Ruler.....
- Scissors.....
- 1 x Elastic band.....
- Towels.....
- e.g. tea towels, paper towels (in case of spills!)
- Thin, clear plastic.....
- e.g. cling wrap, clear sandwich bag

Glass is see-through, so light should refract when it passes through a glass. If you take the water out of the glass, does the bottom arrow look any different?

How far away from the glass does the arrow have to be before it looks upside down?

Can you find any other see-through surfaces which make light refract?

The glass we use in windows has to be very flat so that there is hardly any refraction when we look through it. Why do you think this is important?

Can you use your water magnifying glass to look at other tiny things? What details can you see which you don't normally notice?