Hands On Learning
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LENSES AND PRISMS S4/A

Wooden lens holders

Place the lenses described below into the wooden holders. This will make them easier to use.

Biconvex and biconcave lens



Biconvex simply means that the object is convex (curves out) on both sides - like a lentil (see picture on the right). In fact, the word lens comes from the Latin name for lentil. So biconcave means the opposite - both sides curve in.

If a straight beam of light passes through a biconvex lens it will focus on a particular point on the other side (known as the focal point), but a biconcave lens will spread the light.



Mystery camera lens

Look at this lens - is it convex or concave? It comes from a camera, but the museum has no further records on its history.



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Bifocal glasses



Bifocals are corrective lens that have a large lens for normal, everyday vision and a smaller lens set into it for reading. For the wearer, this means that there is no need to constantly swap glasses for different purposes. But the draw back is that they can lead to headaches and nausea as the lens divides the field of vision.

Hand lens

This is a very useful set of lenses to keep in your pocket. The lenses are of varying magnifying strengths. Are they concave or convex? Or perhaps biconcave or biconvex?



Pocket binoculars



Unlike normal binoculars, these pocket binoculars don't have mirrors inside. They are more like two little telescopes. They provide 2.5 times the magnification.



Binocular part

The pocket binoculars mentioned above have two straight-forward lens at either end of each eye piece. The further the distance between the two the lenses the more the view is magnified. If you want really strong binoculars, the lenses would need to really far apart and then the casing would be really long (and therefore very heavy). However, the binoculars this part belonged to had mirrors inside, which fold the light and bounce it from one mirror to the next. This makes the whole thing smaller and more portable.

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Teleidoscope



The large teleidoscope has a ball-shaped lens at the end, which allows the user to view objects in front of them and transform them into a colourful design. This is different to a kaleidoscope, which has a sealed end and a picture, coloured glass or an object inside.

There are mirrors inside the cylinder, which create the fragmented illusion you see when you look into it.

The teleidoscope was invented by John Burnside, who was from The United States of America.

The pictures on the right show the way objects can appear through a teleidoscope. Can you guess what the person was looking at when they took these pictures?



Pocket teleidoscopes

These are smaller versions of the teleidoscope described above. But notice they have flat lenses, rather than ball-shaped.



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Telescope and case



A telescope works by magnifying things that are far away in the distance. Perhaps you would like to take a closer look at the stars at night or want to examine the surface of the moon. You'd need a telescope to do this.

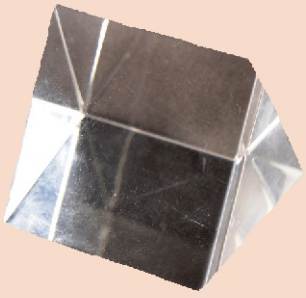
Telescopes use either glass lenses or mirrors to collect light from a distant object and bring it to focus. The reason you can't see something far away with the naked eye is because the retina is so small that it can't take in enough light. The telescope basically acts like a bigger eye.

A Dutchman called Hans Lippershey (1570 - 1619) is often named as the 'inventor' of the telescope, but it is thought that people were using telescope-like devices much earlier. Lippershey was the first to patent the idea in 1608 and make the invention widely known. In 1609 the famous Italian scientist, Galileo, used a telescope in astronomy to look at the craters of the moon. He used an arrangement of glass lenses to magnify objects.

Prism

A prism is an object with flat, polished sides, which is able to refract light. This means that when the light enters the glass side of the prism it changes speed, which in turn makes its direction change.

A prism can be used to break up light into its spectral colours - the colours of the rainbow. See if you can do this by holding the prism up to the light and looking into it.



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Piece of quartz

Quartz is a hard mineral, which occurs abundantly in the Earth's crust. It is a crystalline mineral, meaning that its atoms and molecules are arranged in an orderly, repetitive pattern. Look through the piece of quartz and it does the same thing to the light as the prism.



Bicycle reflector

You probably have one of these on your bike. A reflector helps cyclists to be more visible, although proper lights should always be used as well at night. The reflector is covered in mini prisms, which bounce back any light that hits them.

