



## Lots to Learn About Lenses

A lens is a transparent piece of glass or plastic with curved sides for concentrating or spreading apart light rays. A lens works by refraction- the bending of light as it passes through a transparent object. A lens is often used to form an image of an object by focusing rays of light that come from the object.

There are two main types of lenses. **Convex** (or converging) lenses make light rays converge (come together) at the focal (focus) point. Convex lenses are thicker in the center than they are at edges. **Concave** (or diverging) lenses make light rays spread out. They are thicker at the edges and thinner in the middle.

Lenses can be used by themselves or in combination with other lenses. Single lenses are used in eyeglasses, contact lenses, magnifying glasses, and viewfinders. Often, lenses are combined together to make a compound lens. Compound lenses are used in instruments like cameras, binoculars, microscopes, and telescopes.



In many cases, a combination of lenses and mirrors are used to produce clear images of small objects (microscopes) or faraway objects (telescopes). As might be expected, some lenses magnify the apparent size of an object much more than others. The measurement that tells you how powerful a lens is called the focal length. The shorter the focal length, the more powerful the lens.

While there are lots of cool man-made lenses, our eyes contain what many consider to be the most amazing lenses of all. Unlike most lenses, our lenses are flexible and can change shape instantly thanks to tiny, but powerful, muscles that can contract and relax in a moment. This means you can go from focusing on the book you're reading to searching for shooting stars in the sky in a flash.

In this STEM Challenge, your job is to create a homemade projector that will use a simple magnifying glass to project a cartoon from your Smart Phone. A simple diagram of your task is shown below.

