TEACHER BACKGROUND INFORMATION

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**This information can be presented by the teacher as notes to students at the teacher's discretion.*

Have you ever seen on a show or movie a person using a magnifying glass with sunlight to start some leaves or sticks on fire? What was going on there?

We need to first keep in mind that light travels in straight line paths, called rays, and is made up of photons. That means the light from the sun entering the magnifying glass is really like a bunch of streams of photons—not all that unlike the water that comes out of a shower head.

In starting a fire with a magnifying glass and sunlight, the light from the sun was being concentrated on a certain area using the lens of the magnifying glass. This affected the **light intensity**, a measure of how concentrated light is shining on an area. You can think of it as how many photons reach an area.

But light intensity is separate from the light being emitted from the light source, known as **luminosity**—it's the amount of photons emanating from a light source, such as the sun.

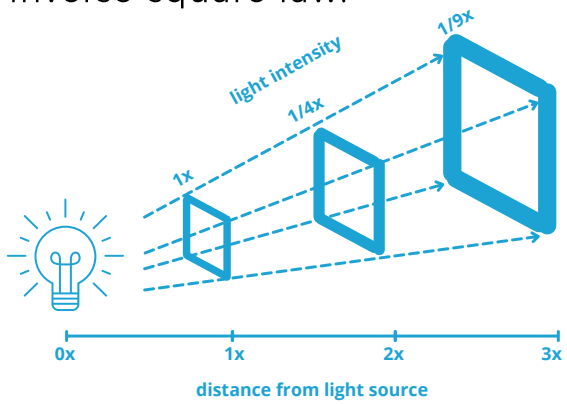
And though it appears brighter in the lens, **brightness** is actually a perception term dealing with how an observer describes the light they are seeing.

Concentrating light using a lens is the basic technique behind how lighthouses generate a light beam that ships or boats can see from a distance.

A magnifying glass near a candle can help to focus more of the light rays (e.g., photons) onto a particular surface, concentrating the light on a smaller area, thus increasing its intensity there. All the meanwhile, the candle is still giving off the same amount of light.

Early lighthouses used special candles or oil lamps to provide a light source, and then used powerful lenses to focus the light in certain directions to create an intense light beam for boats to see. Fire was eventually replaced by incandescent or vapor bulbs and eventually LED lights in modern times.

But light intensity decreases with distance. That's why lighthouses have a certain range at which they can be seen, and it's also why they appear brighter as ships approach them. In fact, that distance-light intensity relationship changes exponentially as we will see in this lesson—it's known as the inverse-square law.



Light Intensity vs. Distance, Image Credit: Gary G. Abud, Jr.