

## CHAPTER 1

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# Refraction

The refraction of light is a phenomenon where light changes its direction when it passes from one medium to another. The change in direction is due to a change in the speed of light as it moves from one medium to another.

This phenomenon is explained by Snell's law, which states:

$$n_1 \cdot \sin(\theta_1) = n_2 \cdot \sin(\theta_2) \quad (1.1)$$

where:

- $n_1$  and  $n_2$  are the indices of refraction for the first and second media, respectively. The index of refraction is the ratio of,  $c$  the speed of light in a vacuum to,  $v$  the speed of light in the medium,  $n = \frac{c}{v}$ . It is a dimensionless quantity.  $n \geq 1$  for all materials, such that  $n_{\text{vacuum}} = 1$  and  $n_{\text{air}} \approx 1$ . See a list of all mediums here: [https://en.wikipedia.org/wiki/List\\_of\\_refractive\\_indices](https://en.wikipedia.org/wiki/List_of_refractive_indices)
- $\theta_1$  and  $\theta_2$  are the angles of incidence and refraction, respectively. These angles are measured from the normal (perpendicular line) to the surface at the point where light hits the boundary.

The angle of incidence ( $\theta_1$ ) is the angle between the incident ray and the normal to the interface at the point of incidence. Similarly, the angle of refraction ( $\theta_2$ ) is the angle between the refracted ray and the normal.

When light travels from a medium with a lower refractive index to a medium with a higher refractive index, it bends towards the normal. Conversely, when light travels from a medium with a higher refractive index to one with a lower refractive index, it bends away from the normal.

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*This is a draft chapter from the Kontinua Project. Please see our website (<https://kontinua.org/>) for more details.*

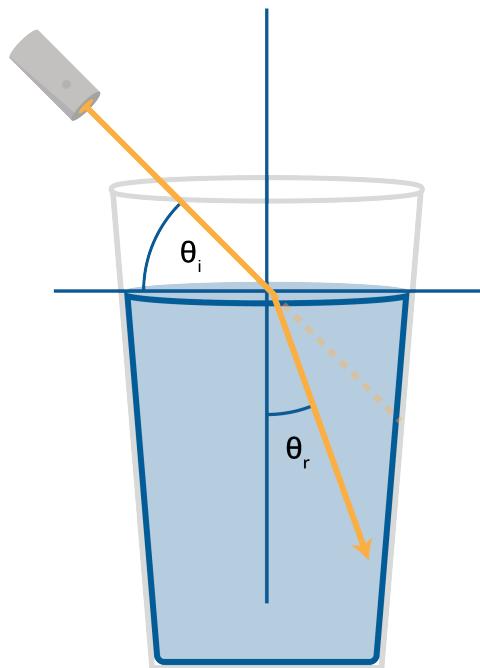


Figure 1.1: Refraction occurs when light changes the medium it is in.

## APPENDIX A

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# Answers to Exercises

