

## 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.

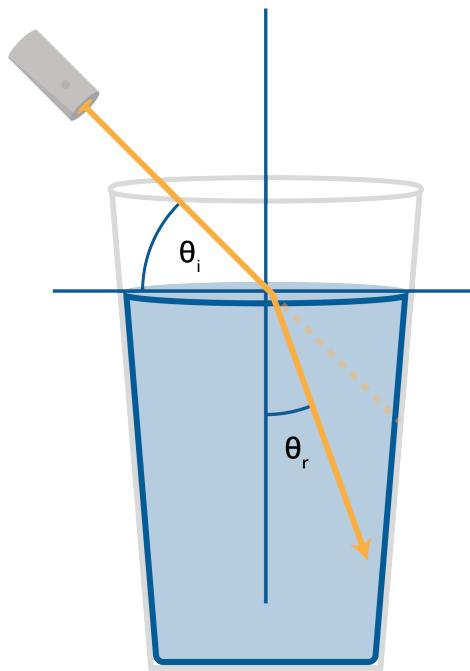


Figure 1.1: Refraction occurs when light changes the medium it is in.

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.*

## APPENDIX A

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# Answers to Exercises

