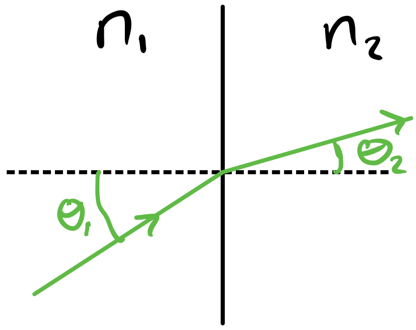
Snell's Law

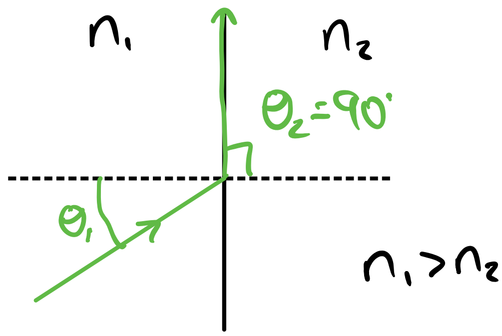
$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$



for reflection, $\theta_1 = \theta_2$:)

Critical Angle

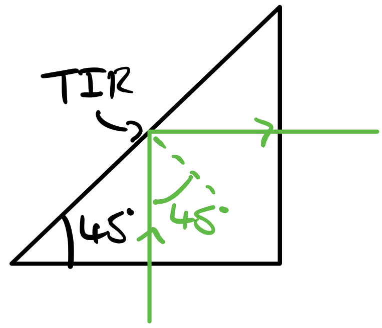
Occurs when going from a higher refractive index medium to a lower refractive index medium.



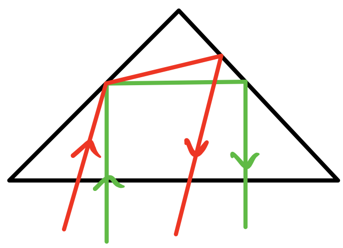
$$n_1 \sin\theta_1 = n_2 \sin\theta_2 \Rightarrow n_1 \sin\theta_1 = n_2 \Rightarrow \theta_c = \arcsin\left(\frac{n_2}{n_1}\right)$$

Total Internal Reflection

When $\theta_1 > \theta_c$, you get TIR, for an ideal surface 100% of the light is reflected.



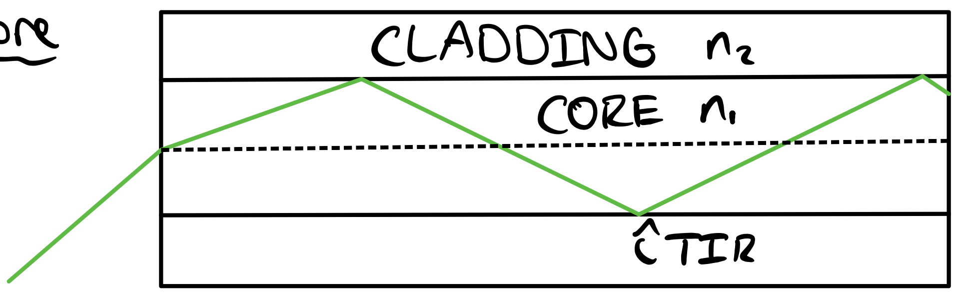
In a glass ($n = 1.5$) prism, the $\theta_c = \arcsin\left(\frac{1.5}{1}\right) \simeq 42°$. ∴ For light arriving at over the critical angle will undergo TIR.



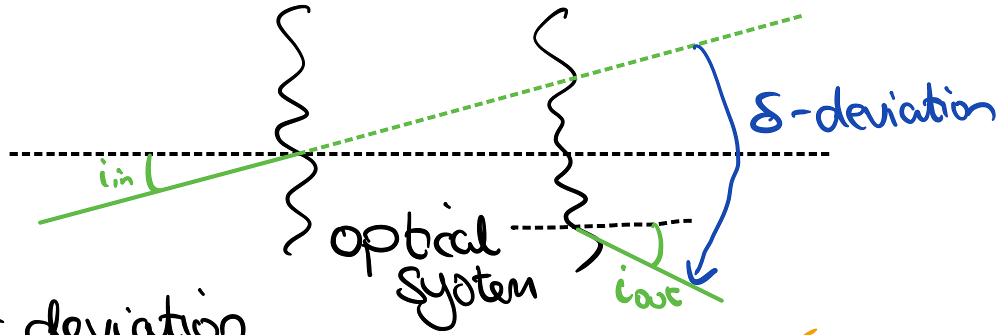
This prism acts as a retro-reflector.

Optical Fibre

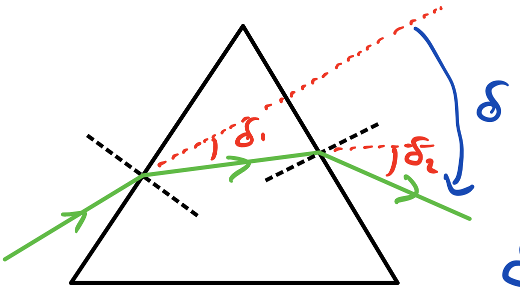
$n_1 > n_2$



Deviation

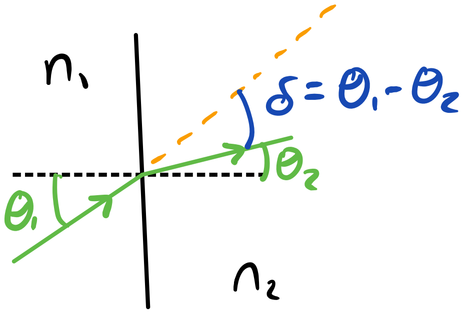


δ is the angle of deviation,



$$\delta = i_{in} - i_{out}$$

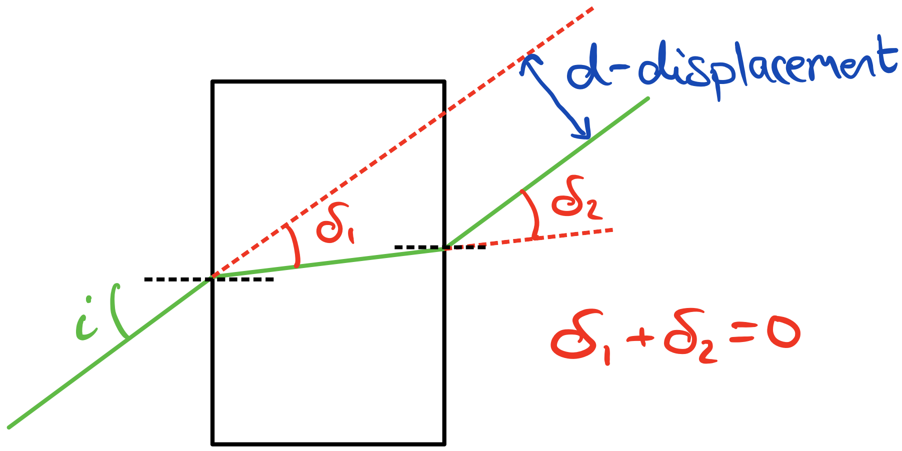
$$\delta = \delta_1 + \delta_2$$



In the prism, the output ray has been deviated twice, furthermore the deviation depends upon the input angle.

Displacement

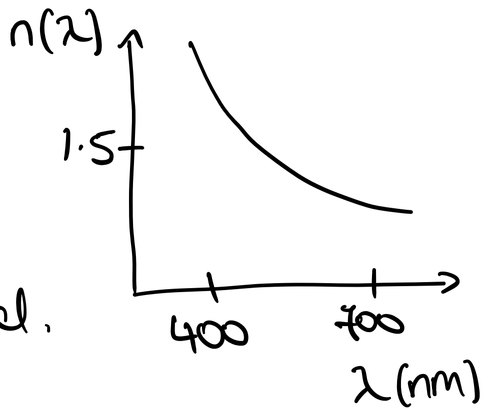
displacement $d(i)$, depends upon the input angle.

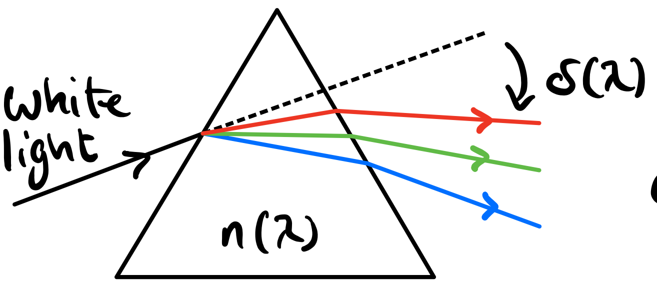


$$\delta_1 + \delta_2 = 0$$

Dispersion

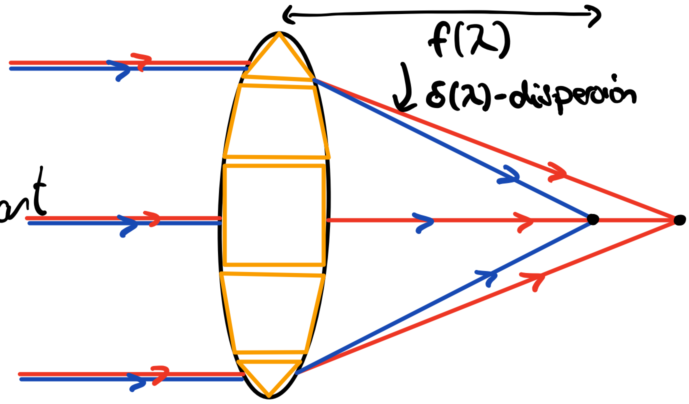
Dispersion is wavelength dependent deviation. Blue is deviated more than red.





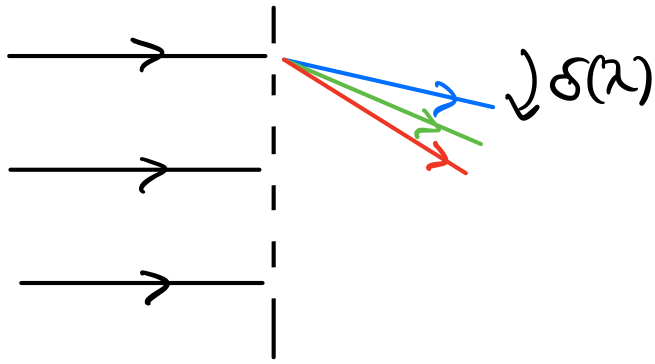
Prism dispersion is a good example of dispersion.

Chromatic Aberration



Due to the wavelength dependant dispersion, the colour image appears to be blurred.

Diffraction Grating



The colour order is reversed compared to refraction, see wave optics.

Diffraction can also give dispersion!