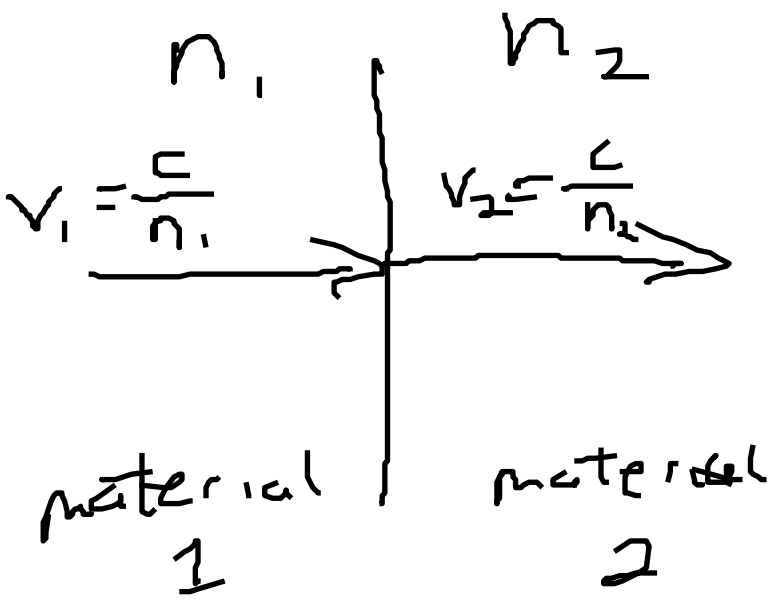
Transmission of Light

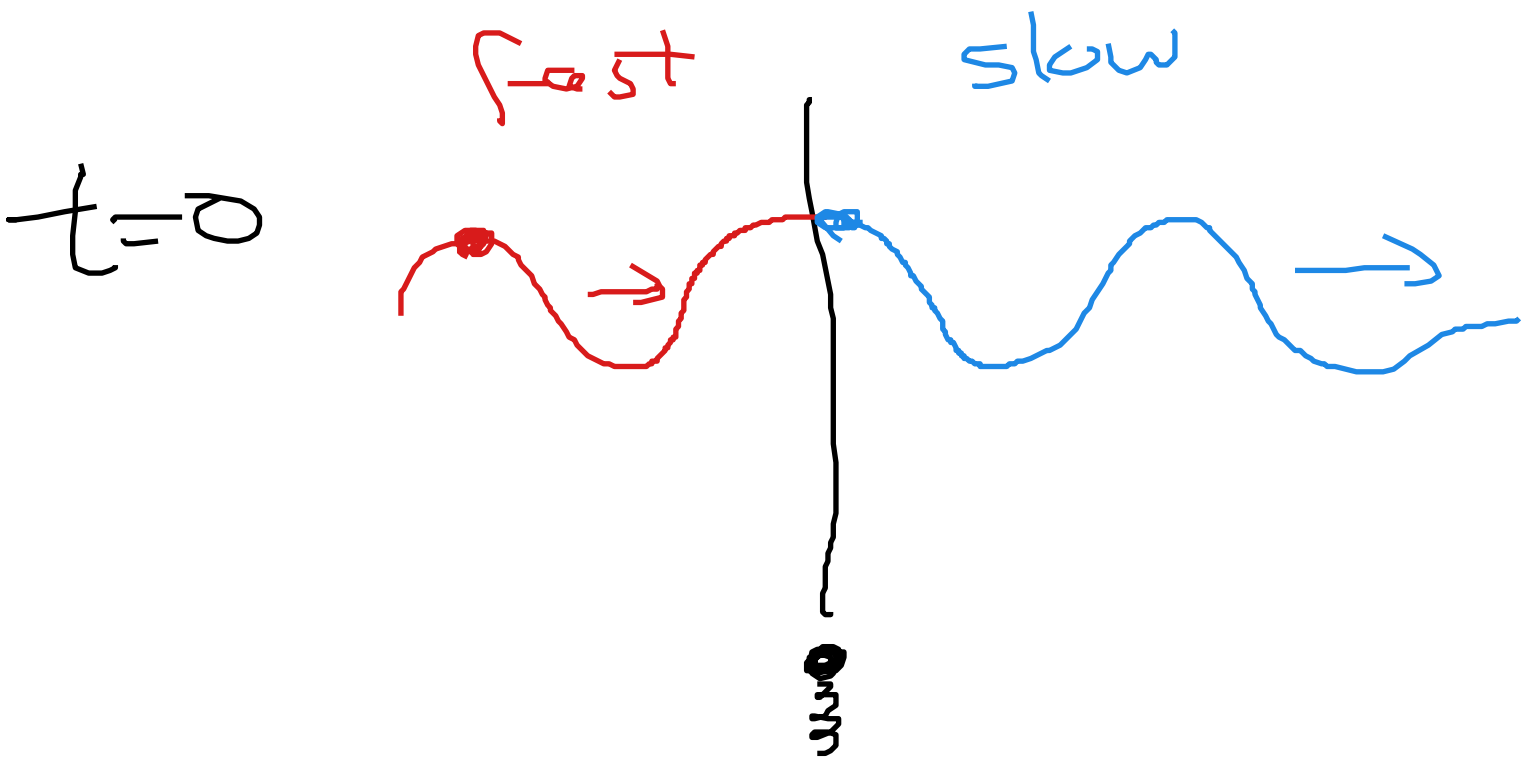


changes speed

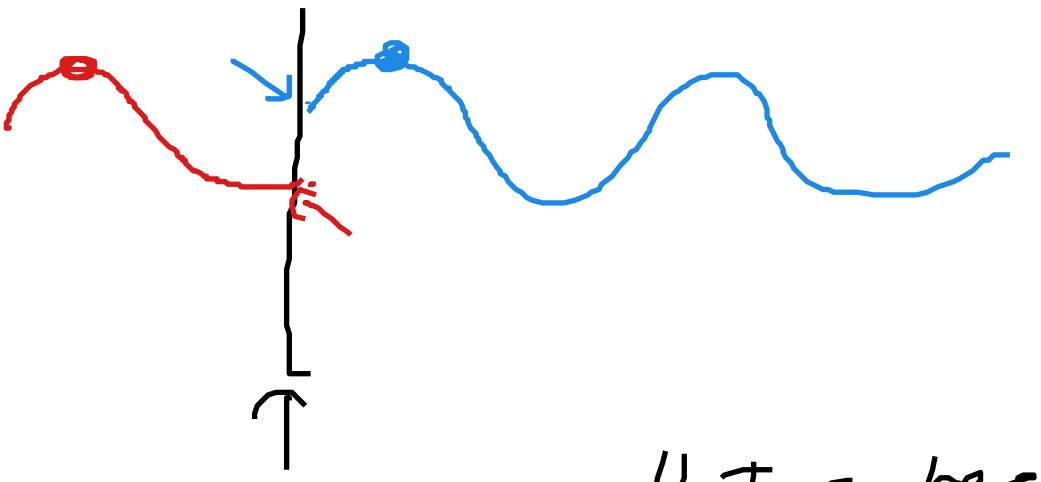
$$v = \lambda f$$

Because v changes, either λ or f changes, or both.

if λ were constant



a little later

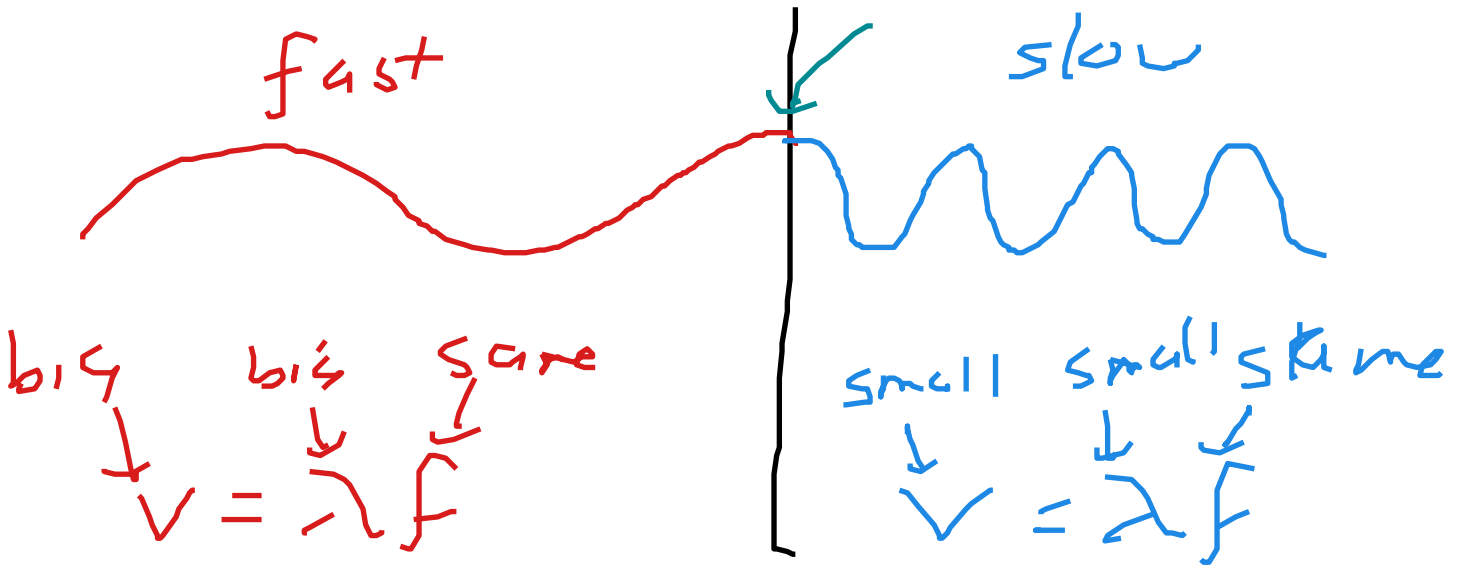


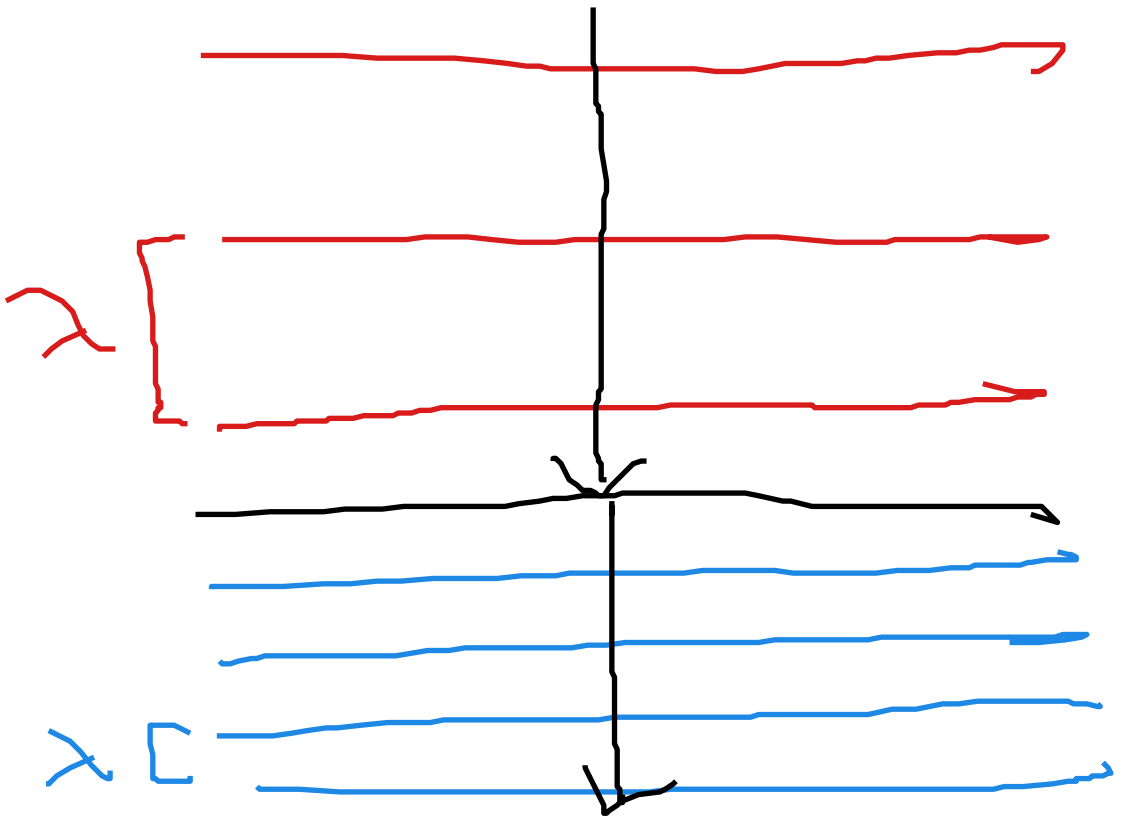
What is oscillator here doing? It has to be in two places at once. Impossible!

Interface is part of both materials & must match both.

Therefore the wave must have same Frequency in both materials

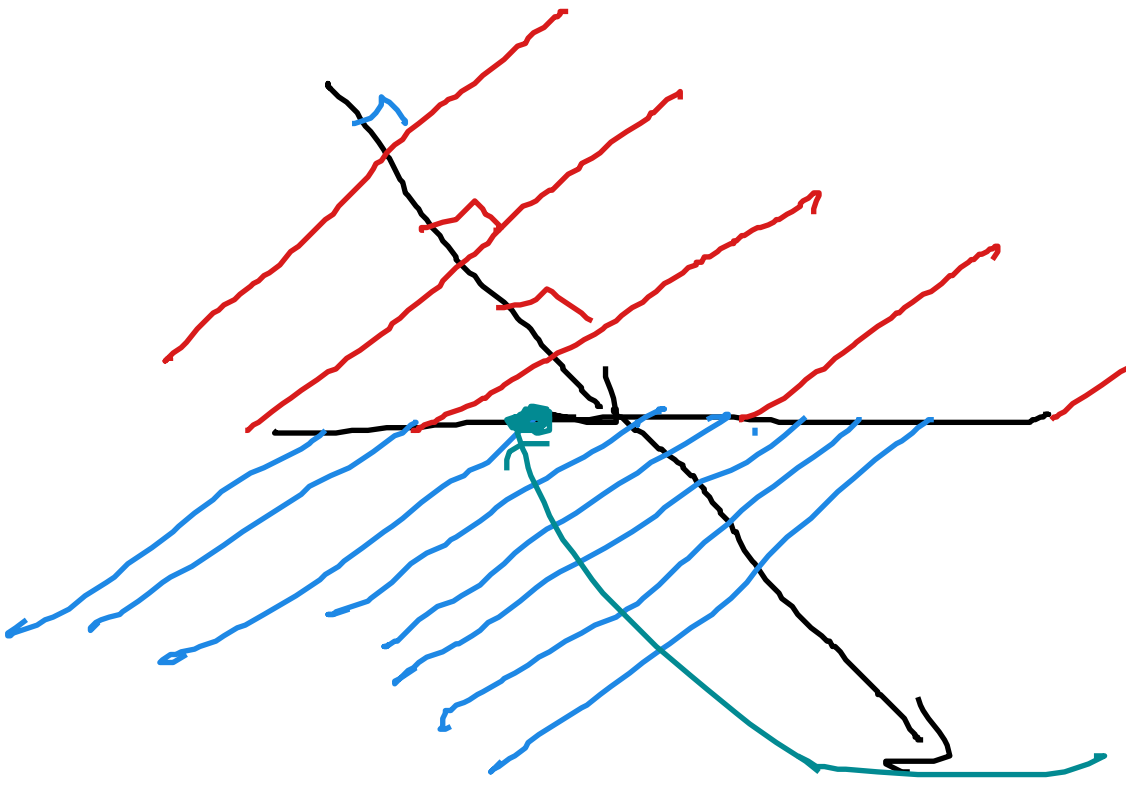
two waves match here





wavefronts

If ray keeps going at an angle...

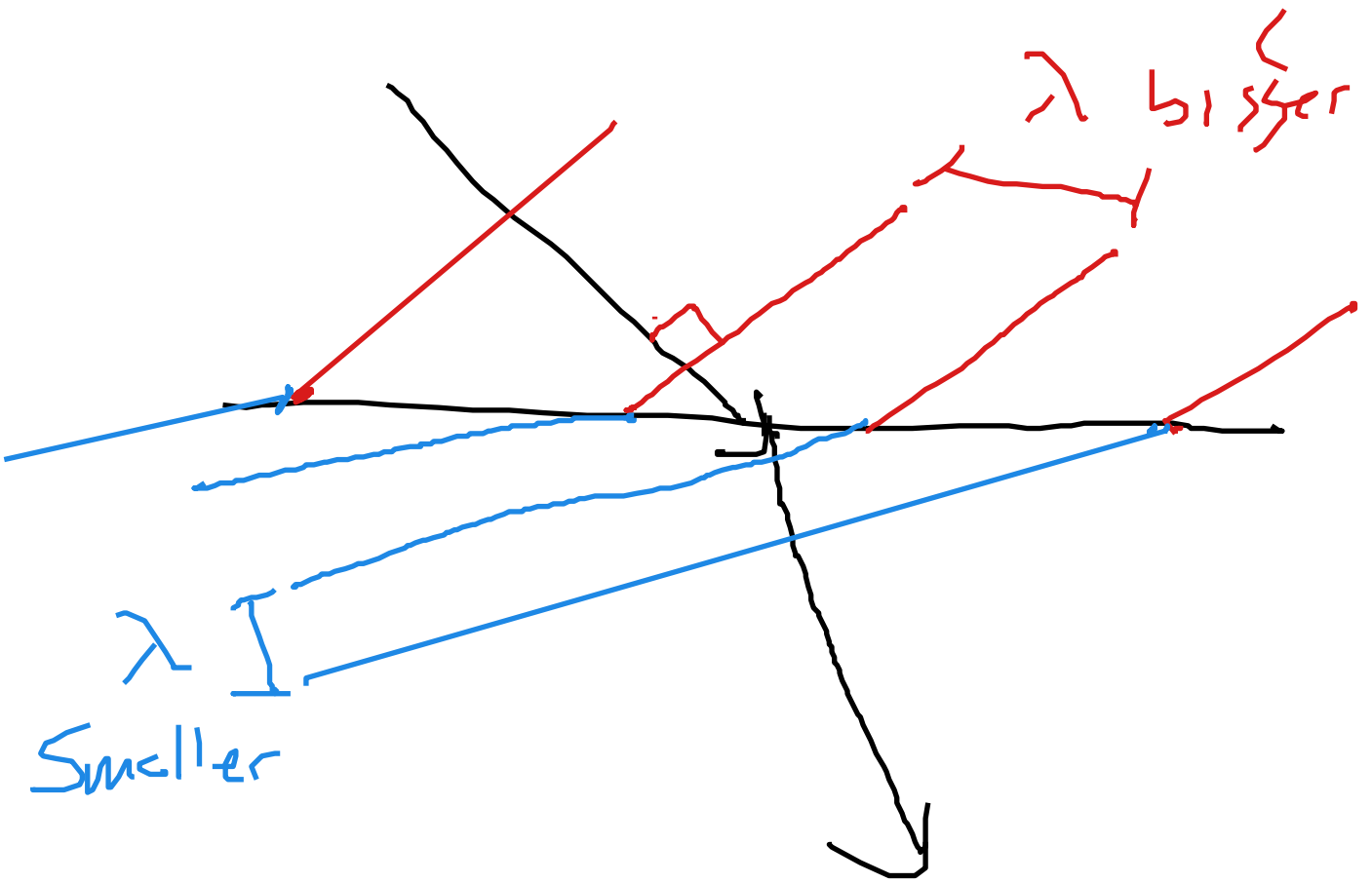


NO GOOD!

what is this point doing?

trough or crest?

What Really happens



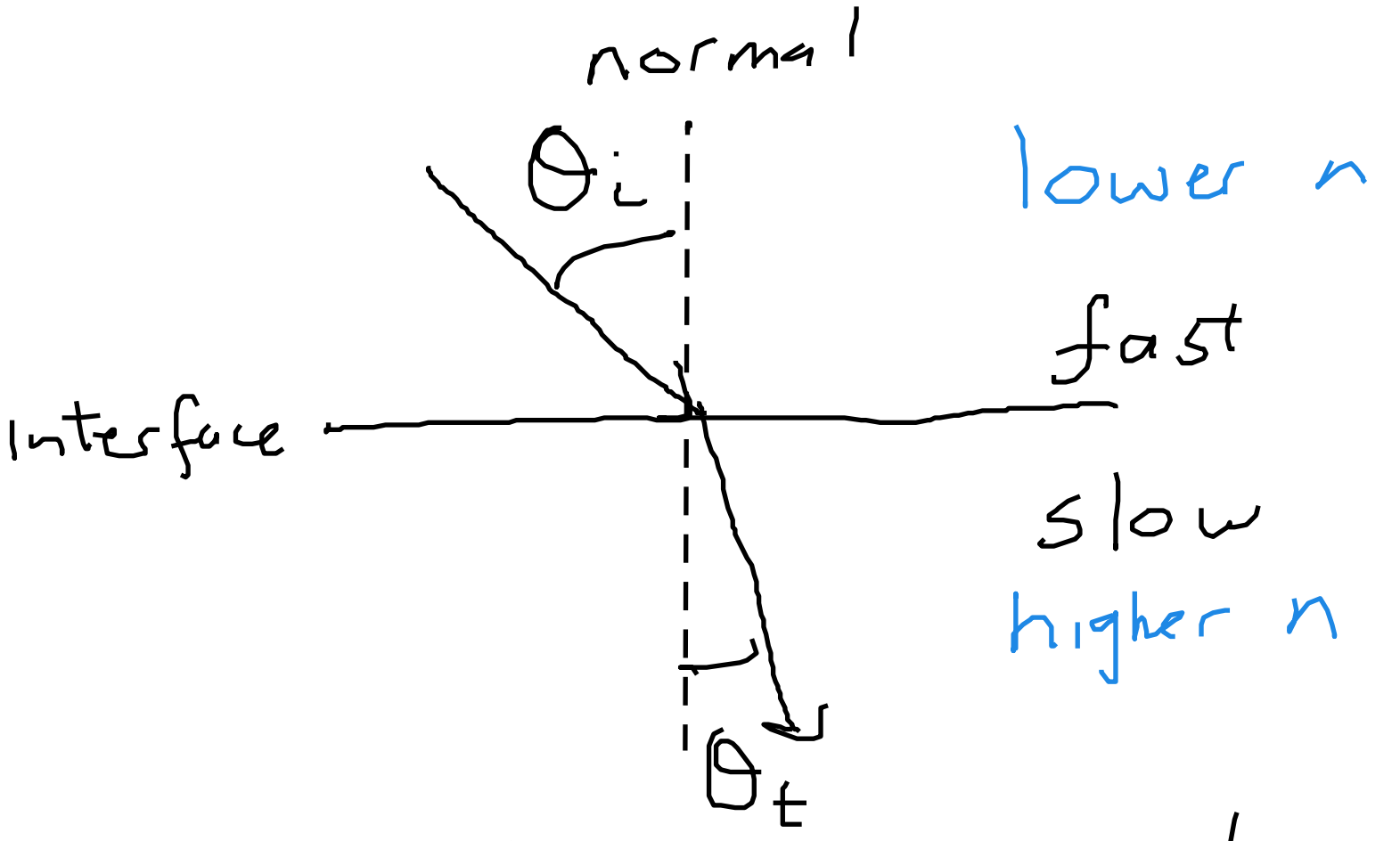
When light changes speed, it often changes direction

Refraction

high

$n = \frac{c}{v}$

low



lower n

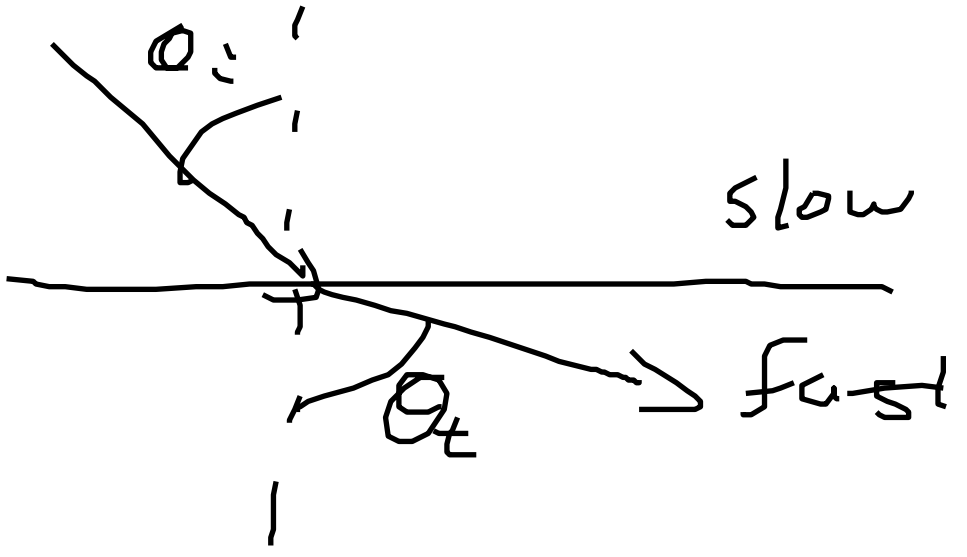
fast

slow

higher n

When light slows down, it bends towards the normal.

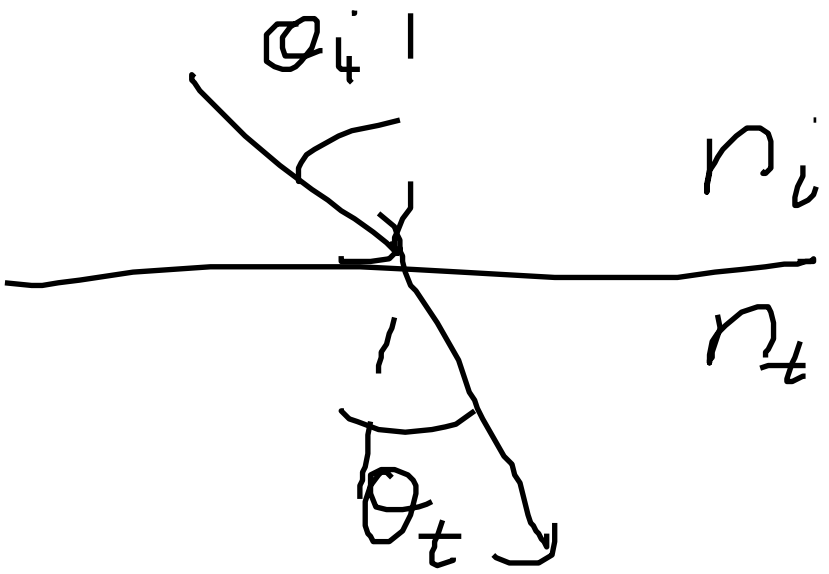
When index increases, bends towards normal



Light speeds up
Index decreases

} bends away from normal

Snell's Law



small n
big v

big n
small v

$$n_i \sin\theta_i = n_t \sin\theta_t$$

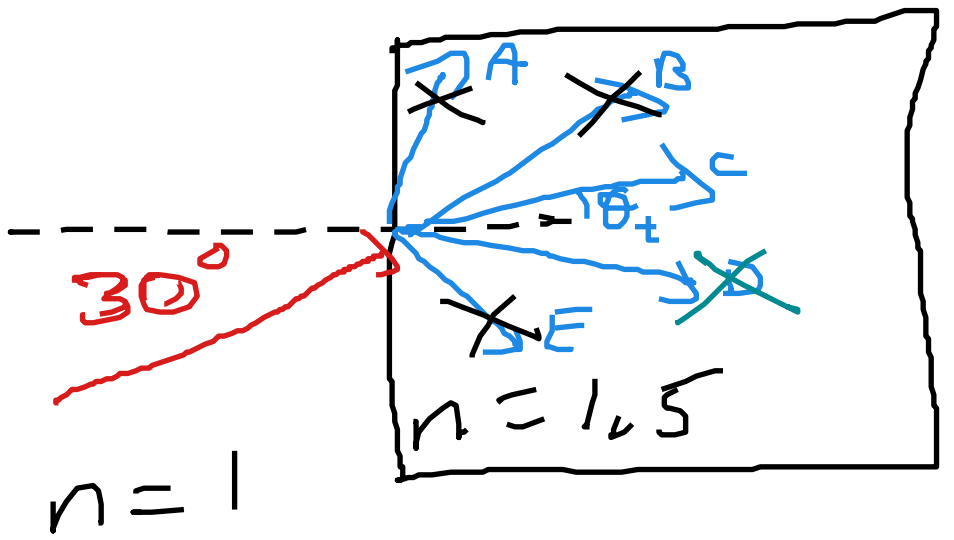
↑ bigger

$$n \sin\theta = \text{constant}$$

↓ smaller

↓ smaller

glass cube



ray always crosses the normal

slowing down → bends towards normal

$n_i \sin\theta_i = n_t \sin\theta_t$

$1 \sin 30^\circ = 1.5 \sin\theta_t$

$\frac{1}{1.5} \sin 30^\circ = \sin\theta_t$

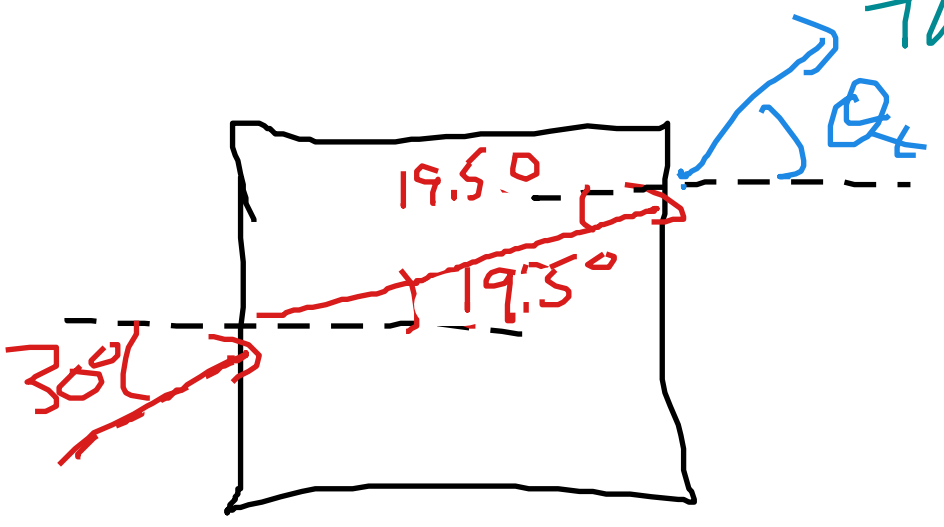
$0.333 = \sin\theta_t$

$\theta = \sin^{-1} 0.333$ or $\arcsin 0.333$

$\theta_t = 19.5^\circ$

Check it?

Got 0.339?
that's radians.



$n_i \sin\theta_i = n_t \sin\theta_t$

$1.5 \sin 19.5 = 1 \sin\theta_t$

$\rightarrow \theta_t = 30^\circ$