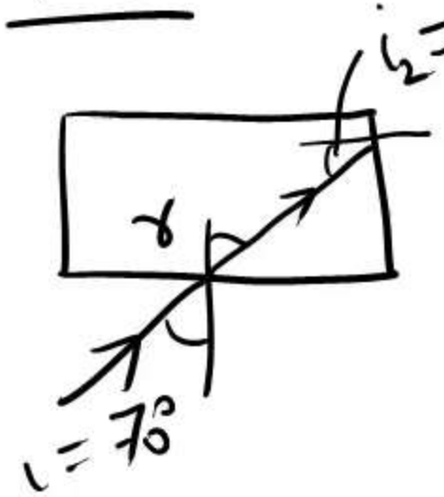
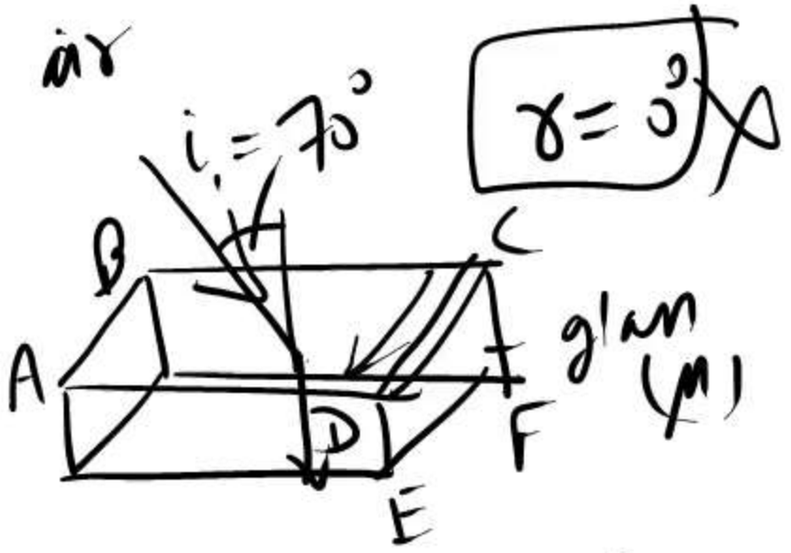
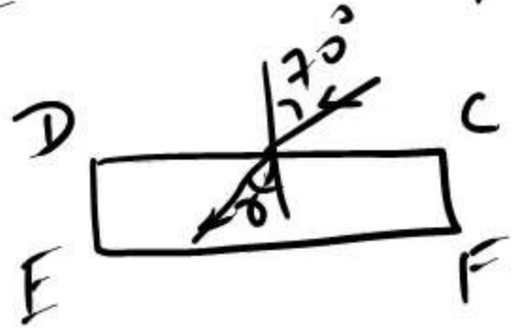
Recap - TIR

Ex.







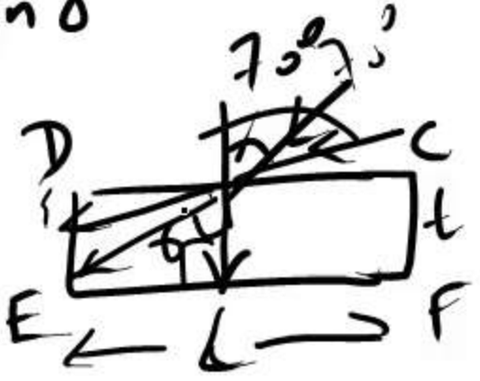
$ABCD \rightarrow$ horizontal surface

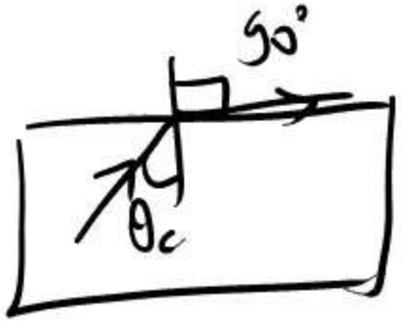
$CDEF \rightarrow$ vertical surface

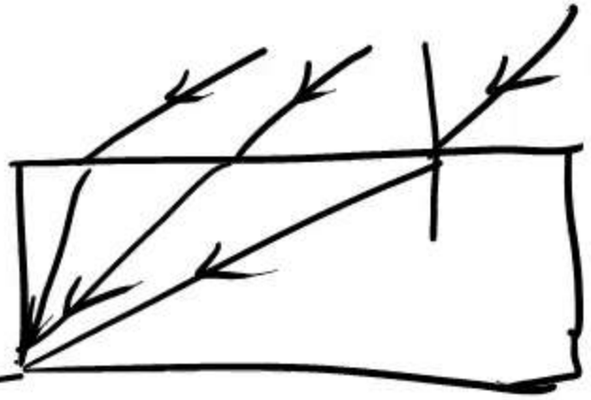
$1 \times \sin 70° = \mu \times \sin r$

$1 \sin 70° = \mu \sin r$

$\mu = \frac{\sin 70°}{\sin r}$







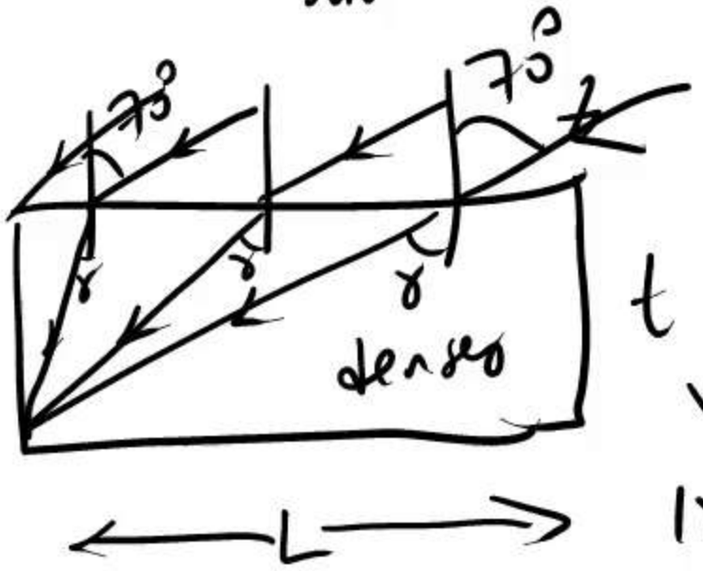
$\mu \sin\theta_c = 1 \times \sin 90°$

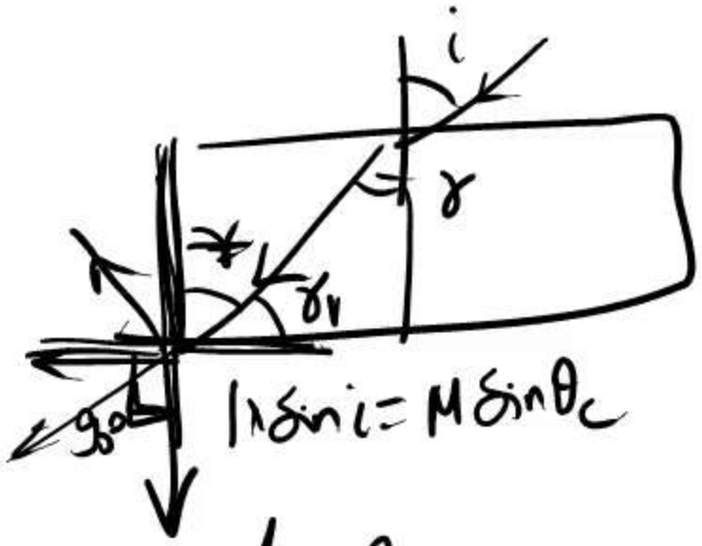
$\sin\theta_c = 1/\mu$

air

$\gamma_{max} \to \theta_c$

$\sin\gamma = \sin\theta_c = 1/\mu$





$1 \times \sin i = \mu \sin\theta_c$

max value of angle of refi; γ

$1 \times \sin i = \mu \sin\gamma$

$\sin\gamma = \frac{\sin i}{\mu}$

$1 \times \sin 75° = \mu \sin\gamma$

$= \mu \cos\gamma_1$

$= \frac{\sqrt{\mu^2 - 1}}{\mu}$

$(\sin^2 75°) = \mu^2 - 1$ μ

$\Rightarrow \boxed{\mu = \sqrt{1 + \sin^2 75°}}$

$1 \times \sin i = \mu \sin\gamma = 1 \times \sin 90°$

$\sin\gamma = 1/\mu$

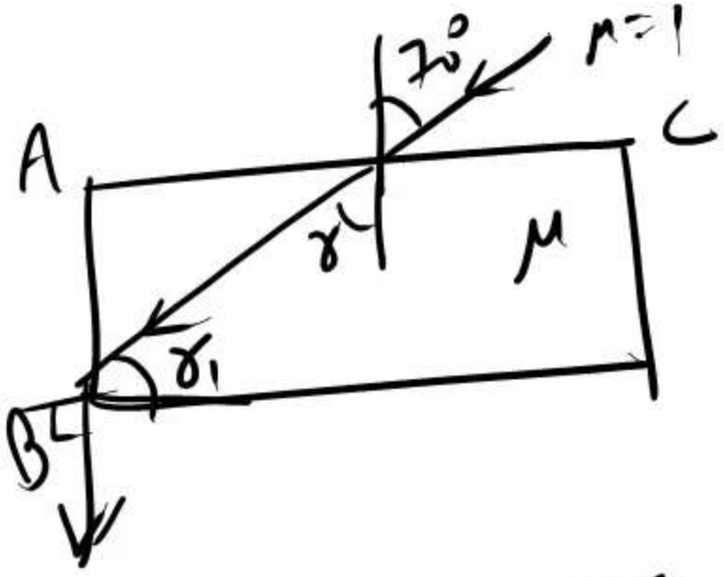
$\gamma_1 + \gamma = 90°$

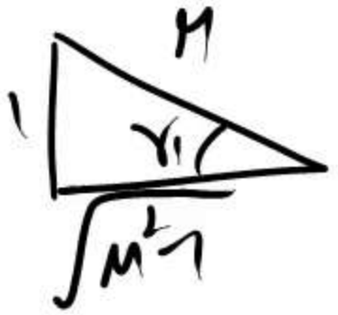
$\gamma = \pi/2 - \gamma_1$

$\mu \sin\gamma_1 = 1 \times \sin 90°$

$\sin\gamma_1 = 1/\mu$

$\sin\gamma = \cos\gamma_1$





$\cos\gamma_1 = \frac{\sqrt{\mu^2-1}}{\mu}$

AC

$1 \times \sin 70^\circ = \mu \sin\gamma$

$\gamma + \gamma_1 = 90^\circ$

$\gamma = 90^\circ - \gamma_1$

$\sin\gamma = \sin(90^\circ - \gamma_1)$

$= \cos\gamma_1 = \frac{\sqrt{\mu^2-1}}{\mu}$

AB

$\mu \sin\gamma_1 = 1 \times \sin 90^\circ$

$\sin\gamma_1 = 1/\mu$

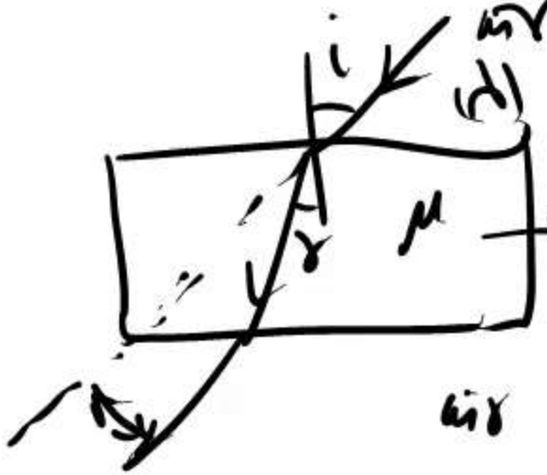
$\sin 70^\circ = \mu \times \frac{\sqrt{\mu^2-1}}{\mu}$

μ ? $\sin(\frac{1}{\mu}) \cdot (\theta_c)$?

Refraction thru a Prism (Dispersion)

Monochromatic source

$v = c$ (λ)



v_{med}

$v' = c/\mu$

λ' ?

$v' = f\lambda'$

$\Rightarrow \lambda' = v'/f$

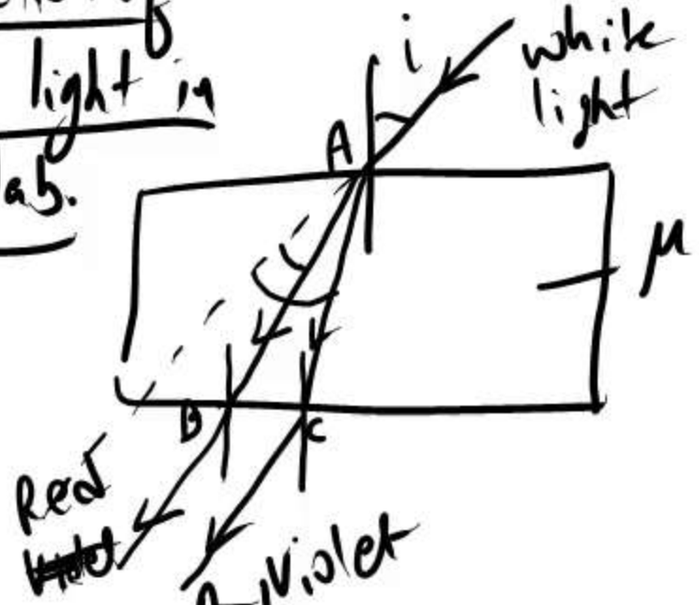
$= \frac{c}{\mu f}$

$= \lambda/\mu$

$\lambda' = \lambda/\mu$

wavelength of light in the medium reduces by factor μ.

Refraction of white light in glass slab.



$d_{AB} > d_{AC}$

t_{AB} by all λ's is same

$$t = \frac{d_{AB}}{v_R} = \frac{d_{AC}}{v_V}$$

$\mu_R < \mu_V$

$\Rightarrow v_R > v_V$

$\Rightarrow \mu = c/v \Rightarrow \boxed{\mu_R < \mu_V}$

Cauchy's criteria for ref. index

ABLES KOTA

$$\mu(\lambda) = A + \frac{B}{\lambda^2}$$

$$\lambda' = \lambda/\mu$$

As $\lambda \uparrow$ $\mu \downarrow$

Two kinds of refractive mediums

Dispersive medium & non dispersive medium

Normal dispersion $\rightarrow \frac{d\mu}{d\lambda} < 0$ $\rightarrow$ Cauchy's criteria.

Anomalous dispersion $\rightarrow \frac{d\mu}{d\lambda} > 0$