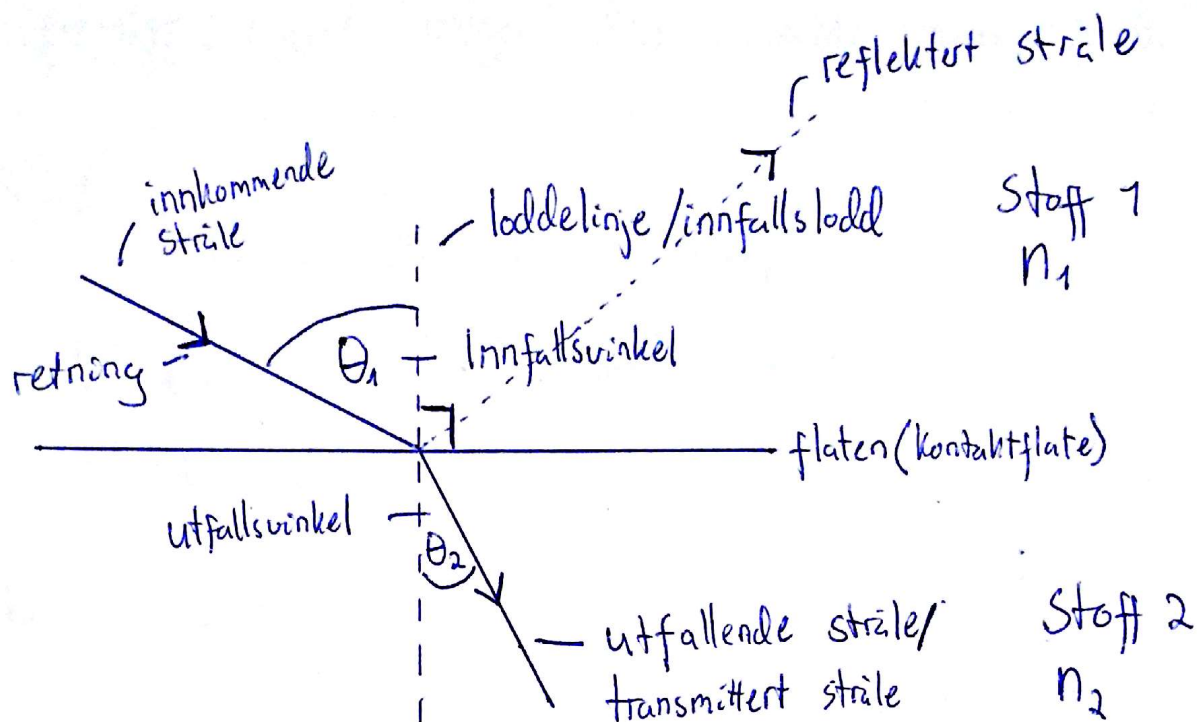
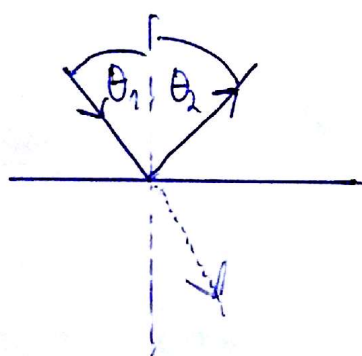


Lys



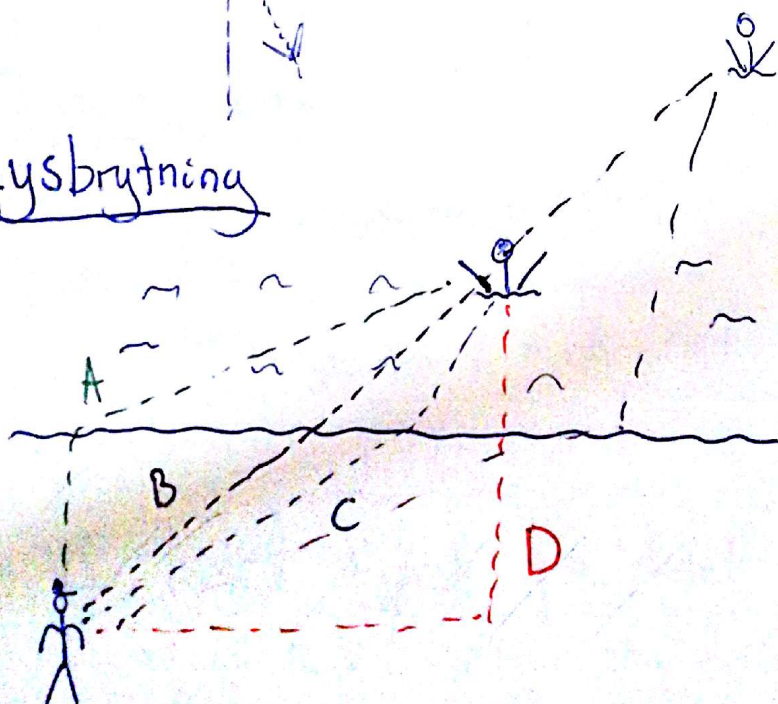
Refleksjon



$$\theta_1 = \theta_2 \quad \text{Refleksjonsloven}$$

Samme plan

Lysbrytning



Fermats prinsipp: Lyset "velger" den raskeste vegen (minst tid)

Snells lov:

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

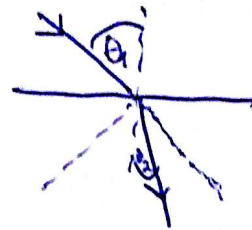
brytningsindeks i stoff 1 innfallsvinkel brytningsindeks i stoff 2 utfallsvinkel

$$\sin \theta_2 = \frac{n_1}{n_2} \sin \theta_1$$

Hvis $n_2 > n_1$:

$$\sin \theta_2 < \sin \theta_1$$

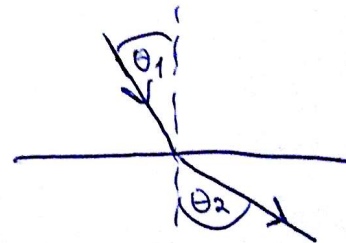
Strålen brytes INN mot innfallsloddet



Hvis $n_1 > n_2$:

$$\sin \theta_2 > \sin \theta_1$$

Strålen brytes Vekk fra innfallsloddet



Brytningsindeks

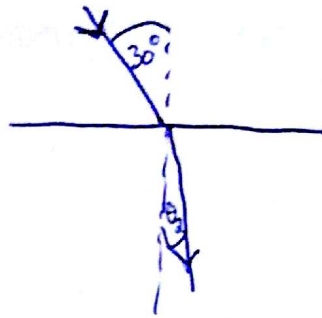
$$n = \frac{c_0}{c}$$

c_0 - lysfarten i vakuum
 c - lysfarten i mediet

n leses typisk fra tabell

Eksempel

En lyser fra luft ned i vann med vinkelen 30° . Hva blir utgangsvinkelen?



$$n_1 = 1.00$$

$$n_2 = 1.33$$

$$(\sin \theta)^{-1}$$

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

$$\arcsin = \sin^{-1} \neq \frac{1}{\sin}$$

$$\sin \theta_2 = \frac{n_1}{n_2} \sin \theta_1$$

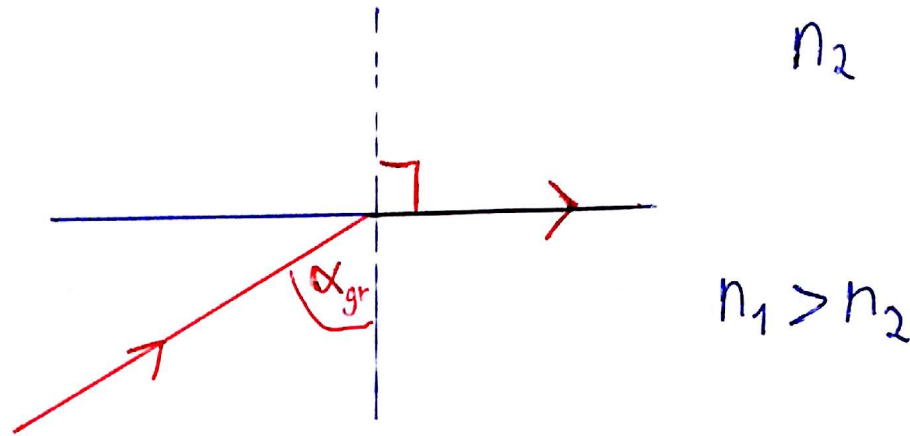
$$\Rightarrow \theta_2 = \arcsin(\sin \theta_2) = \arcsin \left[\frac{n_1}{n_2} \sin \theta_1 \right]$$

$$= \arcsin \left[\frac{1.00}{1.33} \sin(30^\circ) \right]$$

$$= 22.08241319^\circ \approx \underline{\underline{22.1^\circ}}$$

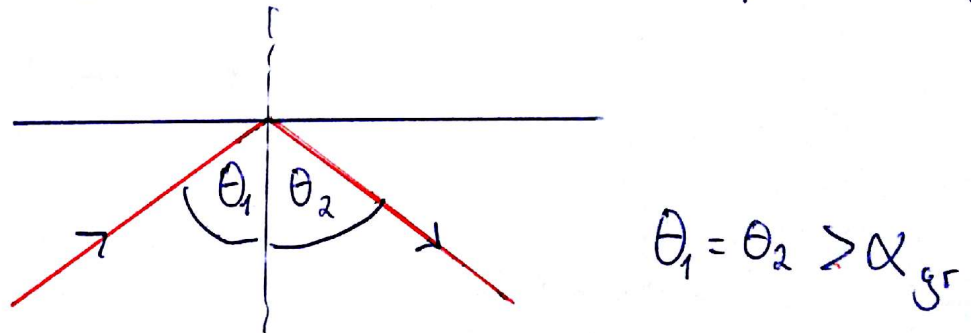
Totalrefleksjon

Hvis lys kommer fra et område med $n_1 > n_2$ kan vi oppnå totalrefleksjon. Grensetilfellet er når utgangsvinkelen er 90° :



Inngangsvinkelen kaller vi da for grensevinkelen, α_{gr} .

Alle vinkler (inngangs-) større enn denne vil skape totalrefleksjon.



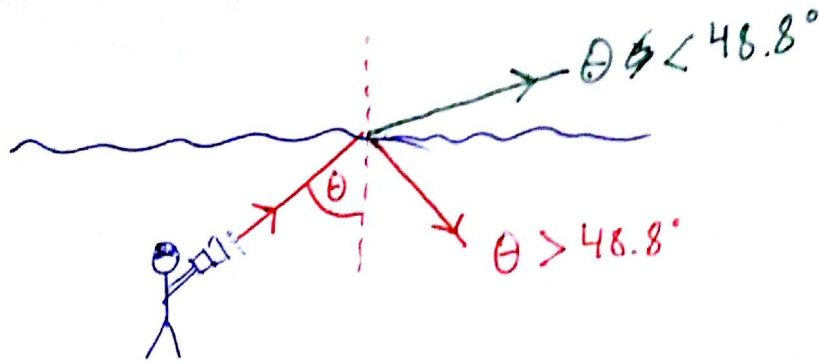
Finne grensevinkel:

$$n_1 \sin \theta_1 = n_2 \sin \theta_2 = 90^\circ$$

$$n_1 \sin \alpha_{gr} = n_2 \cdot \sin 90^\circ = 1$$

$$\sin \alpha_{gr} = \frac{n_2}{n_1}$$

F.eks for vann-luft: $\alpha_{gr} = \arcsin\left(\frac{1}{1.33}\right) \approx \underline{48.8^\circ}$



Farger

lysfart i et medium er som regel afhængig af bølglængden.
 Synlig lys $\sim 400-800 \text{ nm}$

