Brechung an einer Kugelfläche

$$\frac{\overline{OC}}{\overline{OA}} = \frac{\sin(180° - \varepsilon)}{\sin\varphi}$$

$$\Rightarrow \frac{-s+r}{-\ell} = \frac{\sin\varepsilon}{\sin\varphi} \qquad (\mathrm{I})$$

$$\frac{\overline{CO'}}{\overline{AO'}} = \frac{\sin\varepsilon'}{\sin(180°-\varphi)}$$

$$\Rightarrow \frac{s'-r}{\ell'} = \frac{\sin\varepsilon'}{\sin\varphi} \qquad (\mathrm{II})$$

$$\frac{(\mathrm{I})}{(\mathrm{II})} \Rightarrow \frac{\frac{-s+r}{-\ell}}{\frac{s'-r}{\ell'}} = \frac{\frac{\sin\varepsilon}{\sin\varphi}}{\frac{\sin\varepsilon'}{\sin\varphi}} = *$$

$$\Rightarrow * = \frac{\sin\varepsilon}{\sin\varepsilon'} = \frac{n'}{n}$$

$$\Rightarrow n\,\frac{s-r}{\ell} = n'\,\frac{s'-r}{\ell'}$$

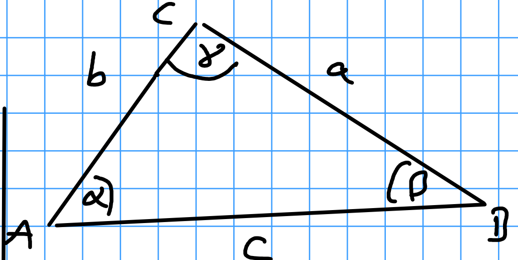
paraxiale Näherung:

$\ell \approx s\,, \quad \ell' \approx s'$

$$\Rightarrow n\,\frac{s-r}{s} \approx n'\,\frac{s'-r}{s'}$$

$$\Rightarrow n\left(1-\frac{r}{s}\right) = n'\left(1-\frac{r}{s'}\right) \quad \Big|\cdot\frac{1}{r}$$

$$\Rightarrow n\left(\frac{1}{r}-\frac{1}{s}\right) = n'\left(\frac{1}{r}-\frac{1}{s'}\right)$$



Sinussatz:

$$\frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$$

Kosinussatz

$$c^2 = a^2 + b^2 - 2ab\cos\gamma$$