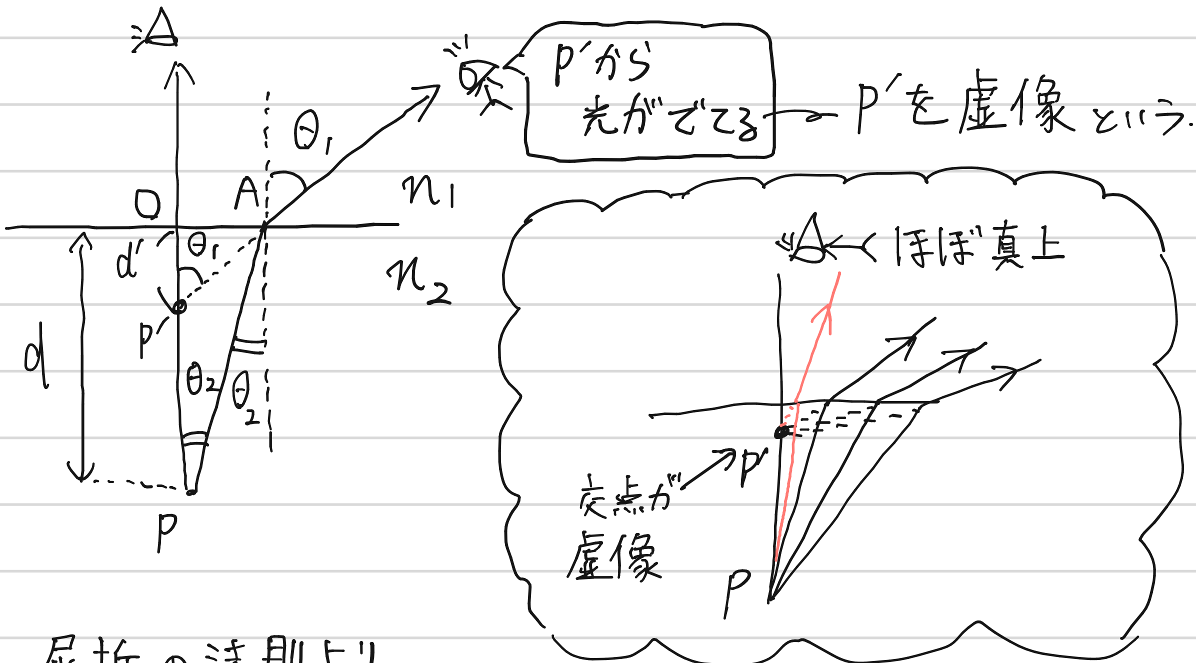
211



(1) 屈折の法則より

$$n_2 \sin\theta_2 = n_1 \sin\theta_1 \quad \cdots ①$$

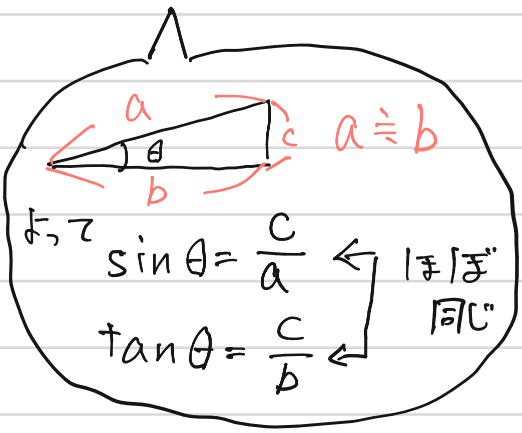
図形的な立式より

$$d' \tan\theta_1 = \overline{OA} \quad \cdots ②$$
$$d \tan\theta_2 = \overline{OA} \quad \cdots ③$$

②.③より

$$d' \tan\theta_1 = d \tan\theta_2 \quad \cdots ④$$

ここで θ が非常に小さければ $\sin\theta \fallingdotseq \tan\theta$ と近似できる



①より

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

④より

$$\frac{\tan\theta_1}{\tan\theta_2} = \frac{d}{d'}$$

よって

$$\frac{\sin\theta_1}{\sin\theta_2} \fallingdotseq \frac{\tan\theta_1}{\tan\theta_2} \iff \frac{n_2}{n_1} \fallingdotseq \frac{d}{d'}$$

211 (1) 続き

$$d' = \frac{n_1}{n_2} d$$

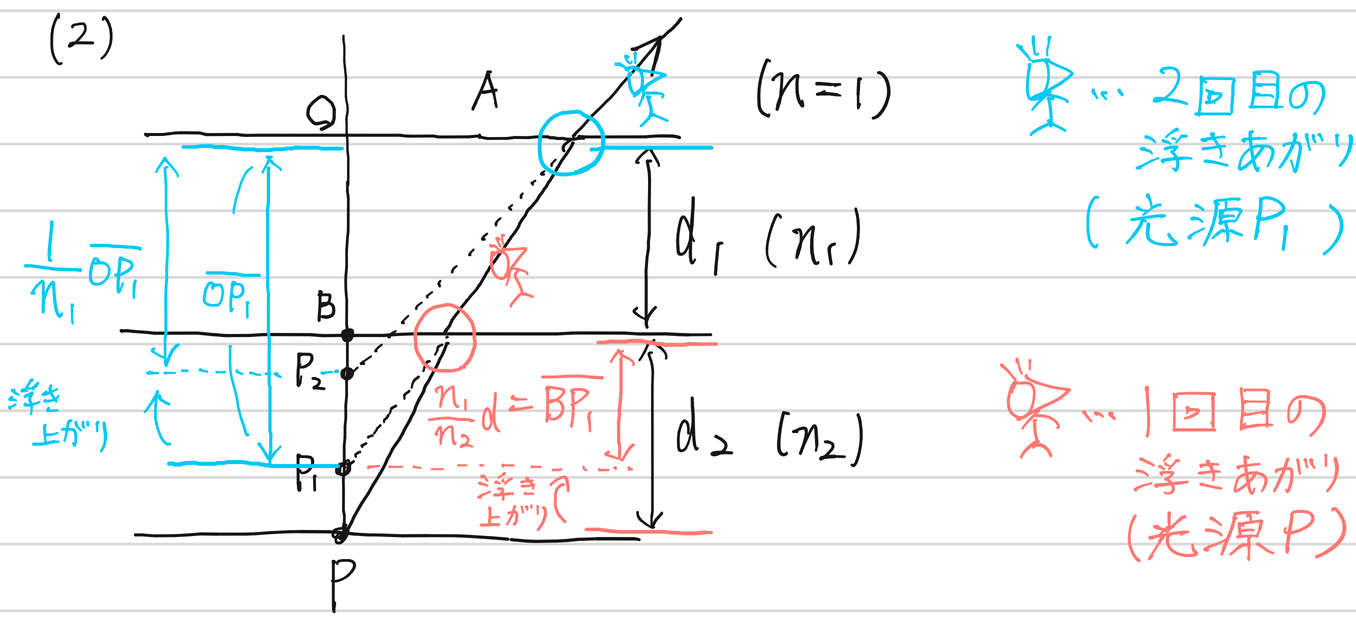
$$= \frac{d}{n_{12}} \quad \left(\because \frac{n_2}{n_1} = n_{12}\right)$$

浮き上がりの距離は $d-d'$ なので

$$d-d' = d - \frac{d}{n_{12}}$$

$$= d\left(1-\frac{1}{n_{12}}\right)$$

(2)



前問(1)で求めた虚像の位置の式 $d' = \frac{n_1}{n_2}d$ を利用

$$\overline{BP_1} = \frac{n_1}{n_2}d_2 \quad \text{(ア)}$$
(1回目の浮きあがり)

$$\overline{OP_1} = d_1 + \frac{n_1}{n_2}d_2 \quad \text{(イ)}$$
(図形的な関係)

$$\overline{OP_2} = \frac{1}{n_1}\cdot\overline{OP_1} = \frac{1}{n_1}\left(d_1 + \frac{n_1}{n_2}d_2\right)$$

(2回目の浮きあがり)

$$= \frac{d_1}{n_1} + \frac{d_2}{n_2} \quad \text{(ウ)}$$