2-3 principle of reversibility

In Figs. 2-5 & 2-6, the ray can be reversed changing its roles, the source and destination.

2-4 Reflection in plane mirrors

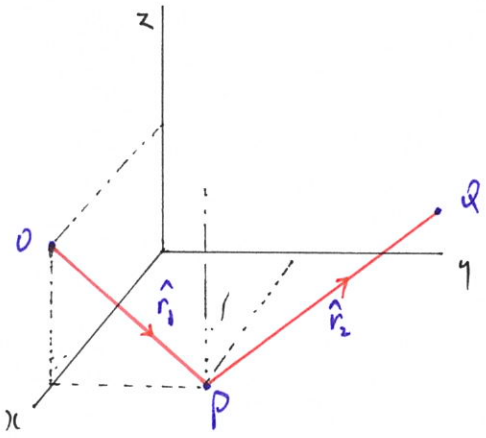


Fig. 2-7 (a)

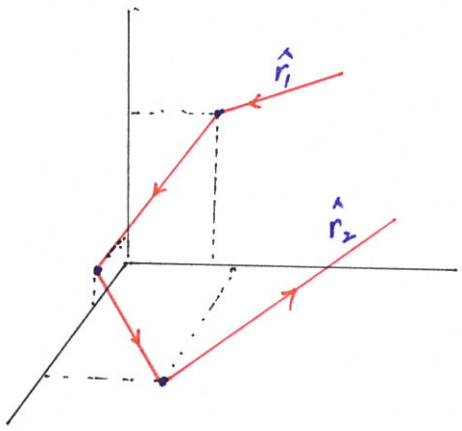


Fig. 2-7. (b)

- Reflection of a ray $\bar{OP}$ on xy plane.
  - vector change (reversal) along $\hat{z}$.

→ $\hat{r}_1(x, y, z) \rightarrow \hat{r}_2(x, y, -\hat{z})$

- Serial reflection (Fig. 2-7 (b)) : corner reflection
  - zy plane → xz plane → zy plane
    (-x) (-y) (-z)

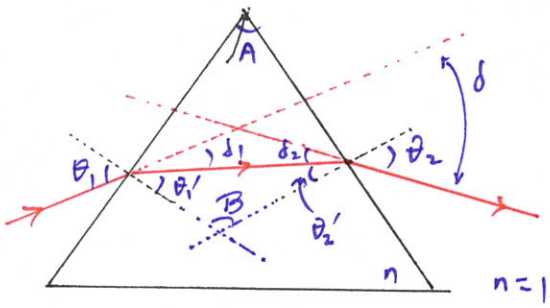
→ $\hat{r}_1(x, y, z) \rightarrow \hat{r}_2(-x, -y, -z) \Rightarrow \hat{r}_1 // \hat{r}_2$

- parallel but reversed!

ex) highway reflector (corner reflector), bead contained paint.
cat eye, phase conjugate mirror

Ch. 3 Optical instrumentation

3-3 Prisms



- Dispersion — wavelength depent light speed
- Snell's law
- Angular deviation : δ, $(=\delta_1+\delta_2)$

— For a monochromatic light,

$$\begin{cases} \sin\theta_1 = n\sin\theta_1' & \text{——— ①} \\ n\sin\theta_2' = \sin\theta_2 & \text{——— ③} \end{cases}$$

— Angle relation

$$\delta_1 = \theta_1 - \theta_1' \quad ; \quad \delta_2 = \theta_2 - \theta_2' \quad ; \quad \delta = \theta_1 + \theta_2 - \theta_1' - \theta_2'$$

$$B = 180 - \theta_1' - \theta_2' = 180 - A \quad ; \quad A = \theta_1' + \theta_2' \quad \text{——— ②}$$

— For given A & n,

From ①, $\theta_1' = \sin^{-1}\left(\frac{\sin\theta_1}{n}\right)$

$\delta_1 = \theta_1 - \theta_1'$

From ②, $\theta_2' = A - \theta_1'$

$\theta_2 = \sin^{-1}(n\sin\theta_2')$, From ③

∴ Total angular deviation δ :

$$\delta = \theta_1 + \theta_2 - \theta_1' - \theta_2'.$$

ex) $A = 30^\circ$ & $n = 1.5$

minimum deviation angle $\theta_1 = 23^\circ$ (see Fig. 3-10).