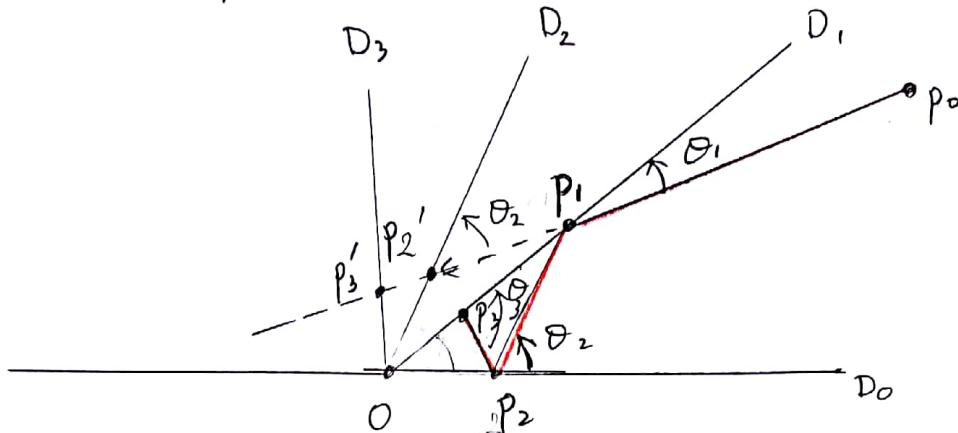


Billard angulaire | Solution

On suppose $0 < \alpha < \pi$ et $0 < \theta_1 < \pi$



$$\textcircled{1} \quad \alpha = (\overrightarrow{D_0}, \overrightarrow{D_1}) = (\overrightarrow{D_1}, \overrightarrow{D_2}) = \dots = (\overrightarrow{D_m}, \overrightarrow{D_{m+1}})$$

$$\theta_1 = (\overrightarrow{P_1 P_0}, \overrightarrow{D_1})$$

$$\theta_2 = (\overrightarrow{D_0}, \overrightarrow{P_2 P_1}) = (\overrightarrow{P_2' P_1}, \overrightarrow{D_2})$$

↑ d'après symétrie / D₁

$$\text{or } (\overrightarrow{P_2' P_1}) = (\overrightarrow{P_1 P_0}) \text{ donc :}$$

$$\theta_2 = (\overrightarrow{P_1 P_0}, \overrightarrow{D_2}) = (\overrightarrow{P_1 P_0}, \overrightarrow{D_1}) + (\overrightarrow{D_1}, \overrightarrow{D_2}) = \theta_1 + \alpha$$

$$\textcircled{2} \quad \theta_3 = (\overrightarrow{P_3 P_2}, \overrightarrow{D_1}) = (\overrightarrow{P_3' P_2'}, \overrightarrow{D_3}) = (\overrightarrow{P_1 P_0}, \overrightarrow{D_3}) \\ = (\overrightarrow{P_1 P_0}, \overrightarrow{D_1}) + (\overrightarrow{D_1}, \overrightarrow{D_2}) + (\overrightarrow{D_2}, \overrightarrow{D_3}) \\ = \theta_1 + 2\alpha$$

$$\text{de même } \theta_m = \theta_1 + (m-1)\alpha$$

tant que $0 < \theta_m < \pi$

$$\textcircled{3} \quad \text{Il faut } 0 < \theta_N < \pi \text{ et } \theta_{N+1} \geq \pi$$

$$\Leftrightarrow \theta_1 + (N-1)\alpha < \pi \text{ et } \theta_1 + N\alpha \geq \pi$$

$$\Leftrightarrow N = \left[\frac{\pi - \theta_1}{\alpha} \right] \leftarrow \text{partie entière}$$

$$\textcircled{4} \quad N = \left[\frac{180 - 10}{30} \right] = 5 \text{ rebonds.}$$