

Arkulari olinpikoa

Arkulari batek 20 m/s-ko abiadura duen gezi bat jaurtitzen du, horizontalaren gainean 45°-ko angelua osatuz. Airearekiko marruskadura eta Lurraren biraketa-abiadura gutxietsiz, kalkulatu:

- Geziaren ibilbidea $y(x)$.
- Haren gehieneko altuera.
- Lurzorua zein distantziatarra ukituko duen (irismena).

Datuak

$$v_0 = 20 \text{ m/s}$$

$$\alpha = 45^\circ$$

$$\vec{F}_f = -mg \hat{j}$$

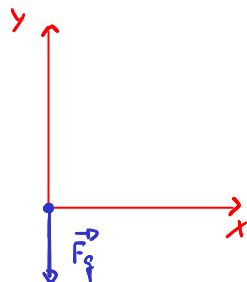
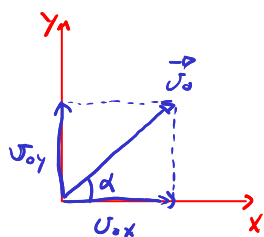
Galderak

$$? y(x)?$$

$$? y_{\max}?$$

$$? x_{\max}?$$

Diagramak



Ebazpena

$$\vec{F}_f = m\vec{a} = -mg \hat{j}$$

$$\begin{cases} a_y = -g \\ a_x = 0 \end{cases}$$

$$v_{0x} = v_0 \cos \alpha = \frac{v_0}{\sqrt{2}}$$

$$v_{0y} = v_0 \sin \alpha = \frac{v_0}{\sqrt{2}}$$

$$\begin{cases} v_x = v_{0x} \\ v_y = v_{0y} - gt \end{cases}$$

$$\begin{cases} x = v_{0x} t \\ y = v_{0y} t - \frac{1}{2} g t^2 \end{cases}$$

$$t = \frac{x}{v_{0x}}$$

$$y = v_{0y} \frac{x}{v_{0x}} - \frac{1}{2} g \frac{x^2}{v_{0x}^2}$$

$$y = x - \frac{g}{2v_{0x}^2} x^2$$

$$y = x - \frac{g}{v_0^2} x^2 \quad \text{a)}$$

$$v_y = 0 \Rightarrow y = y_{\max}$$

$$0 = v_{0y} - g t_{y_{\max}}$$

$$t_{y_{\max}} = \frac{v_{0y}}{g}$$

$$y_{\max} = v_{0y} t_{y_{\max}} - \frac{1}{2} g t_{y_{\max}}^2$$

$$\begin{aligned} y_{\max} &= \frac{v_{0y}^2}{g} - \frac{g}{2} \frac{v_{0y}^2}{g^2} \\ &= \frac{v_{0y}^2}{2g} = 10.2 \text{ m} \end{aligned}$$

$$y_{\max} = 10.2 \text{ m}$$

$$y=0 \quad x=x_{\max}$$

$$\text{a)} \quad y=0 = x - \frac{g}{2v_{0x}^2} x^2$$

$$\begin{cases} x=0 \\ 1 - \frac{g}{2v_{0x}^2} x = 0 \end{cases}$$

$$x_{\max} = \frac{v_0^2}{g} = 40.8 \text{ m}$$