1)

ℓ en mm

41,53 mm , 41,49 mm, 41,48 mm, 41,51 mm , 41,47 mm

Valor medio

$$\bar{\ell} = \frac{41,53 + 41,49 + 41,48 + 41,51 + 41,47}{5} = 41,496 \, mm$$

Calculamos a desviación típica

$$\sigma = \sqrt{\sum_{i=1}^{5} \frac{(\ell_i - \bar{\ell})^2}{n(n-1)}}$$

$(\ell_1 - \bar{\ell})^2 = (41,53 - 41,496)^2 = 0,001156$

$(\ell_2 - \bar{\ell})^2 = (41,49 - 41,496)^2 = 0,000036$

$(\ell_3 - \bar{\ell})^2 = (41,48 - 41,496)^2 = 0,000256$

$(\ell_4 - \bar{\ell})^2 = (41,51 - 41,496)^2 = 0,000196$

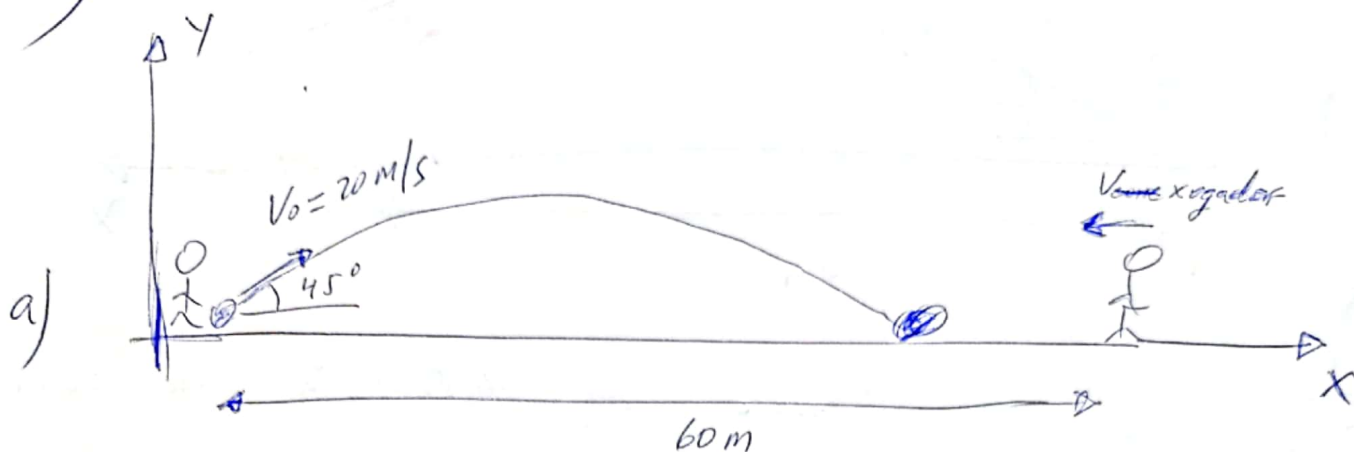$(\ell_5 - \bar{\ell})^2 = (41,47 - 41,496)^2 = 0,000676$

$$\sum_{i=1}^{5} (\ell_i - \bar{\ell})^2 = 0,00232$$

$$\sigma = \sqrt{\frac{0,00232}{5(5-1)}}$$

$\sigma = 0,011 \simeq 0,01$

$$41,50 \pm 0,05 \quad mm$$

2)

a)

$$V_{0x} = V_0 \cos 45° = \frac{20\sqrt{2}}{2} = 10\sqrt{2} \text{ m/s}$$

$$V_{0y} = V_0 \sin 45° = 20\frac{\sqrt{2}}{2} = 10\sqrt{2} \text{ m/s}$$

o tempo que tarda a pelota dende que se lanza ata tocar o chan é

$$y = V_{0y} t - \frac{1}{2} g t^2 = 0 \Rightarrow 10\sqrt{2} \cdot t - \frac{1}{2} 9,81 \cdot t^2 = 0$$
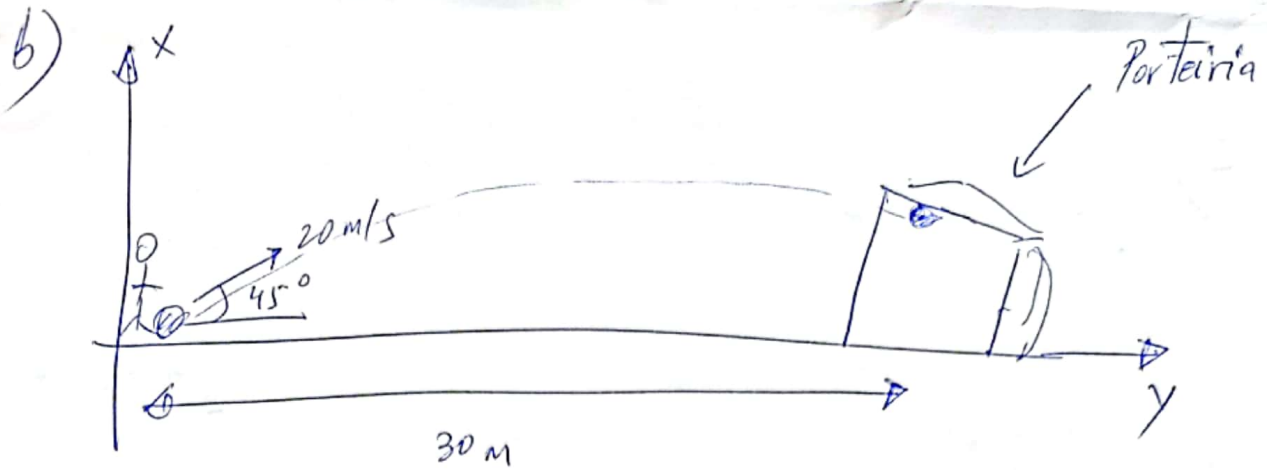
Solucións
$$\begin{cases} t = 0, \text{ Non vale} \\ t = \frac{2 \times 10 \times \sqrt{2}}{9,81} = 2,9 \text{ s} \end{cases}$$

Neste tempo recorre unha distancia no eixo X

$$x = V_{0x} \cdot t \Rightarrow x = 10\sqrt{2} \times 2,9 = 40,89 \text{ m}$$

O xogador no mesmo tempo $t = 2,9$ s debe recorrer $60 \text{ m} - 40,9 \text{ m} = 19,1 \text{ m}$

$$V_{xogador} = \frac{19,1 \text{ m}}{2,9 \text{ s}} = 6,6 \text{ m/s}$$

b)

A unha distancia do futbolista de 30 m a posición da pelota debe ser menor de 2 m de altura $(y < 2\,m)$

$$X = V_{ox} \cdot t \quad \Rightarrow \quad t = \frac{X}{V_{ox}}$$

$$y = V_{oy}\, t - \frac{1}{2} g t^2$$

$$y = V_{oy} \frac{X}{V_{ox}} - \frac{1}{2} g \left(\frac{X}{V_{ox}}\right)^2 \quad \Bigg| \begin{array}{l} X = 30\,m \\ V_{ox} = V_{oy} = 10\sqrt{2} \end{array}$$

$$y = 30 - \frac{1}{2}\, 9,81 \left(\frac{30}{10\sqrt{2}}\right)^2$$

$$y = 30 - 22,1 = \underline{7,9\,m} \quad \rightarrow \quad \underline{\text{Non é gol}}$$

3)

a)

$V_0 = 0$

$a = 4 \, m/s^2$ perante $4S$

$V = cte$ " $10 S$

$a = -8 \, m/s^2$ ata $V_F = 0$

ɑ Traxecto 1) $V_F = V_0 + a t \implies V_F = 0 + 4 \cdot 4 = 16 \, m/s$

$S = \frac{1}{2} a t^2 = \frac{1}{2} \cdot 4 \cdot 4^2 = \underline{32 m}$

Traxecto 2) $V = 16 \, m/s = cte$ $S = 16 \cdot 10 = \underline{160 m}$

Traxecto 3) $V_F = 0$ $S = \dfrac{V_F^2 - V_0^2}{2 \cdot a}$

$V_0 = 16 \, m/s$

$a = -8 \, m/s^2$ $S = \dfrac{-16^2}{-2 \times 8} = \underline{16 \, m}$

$S_{Total} = 32 + 160 + 16 = \underline{208 \, m}$

b)
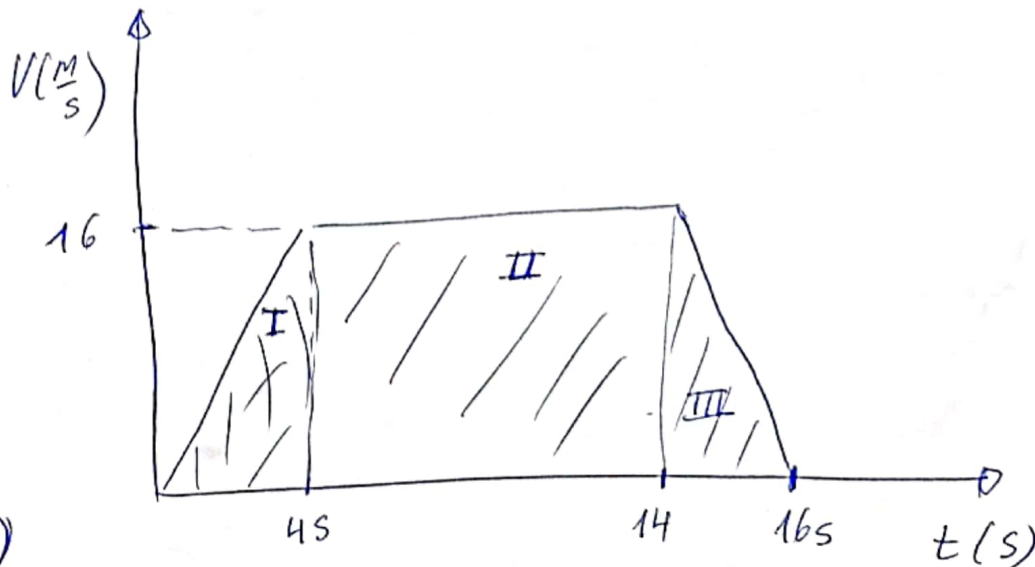
c)

$I \rightarrow \dfrac{16 \times 4}{2} = \underline{32 M}$ $II \rightarrow \dfrac{16 \times (14-4)}{"} = 160 M$ $III \rightarrow \dfrac{16(16-14)}{" \quad 2} = 16 M$

4)

$R = 30\,cm$
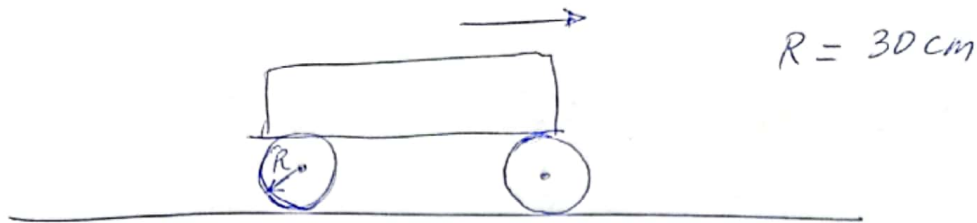
$$\left.\begin{array}{l} V_0 = 0 \\ V_F = 30\dfrac{m}{s} \\ t = 5\,s \end{array}\right\} \Rightarrow \quad a = \dfrac{30-0}{5} = 6\dfrac{m}{s^2} \; /\!/\!/$$

$$a_t = \alpha \cdot R \Rightarrow \alpha = \dfrac{6\,m/s^2}{0,15}$$

$$\alpha = 40\dfrac{rd}{s^2} \; /\!/\!/$$

$$\theta = W_0 t + \dfrac{1}{2}\alpha t^2 = \text{ángulo descrito}$$

$$\theta = \dfrac{1}{2} \times 40 \times 5^2 = 500\,rd$$

$$\dfrac{500\;rd}{2\pi\;rd} = 79,62 \approx 80\;\text{vueltas}$$