

Exercice 1 B

$$\textcircled{3} \quad u = 30 \text{ m s}^{-1} \rightarrow \Rightarrow \underline{u} = \begin{pmatrix} 30 \\ 0 \end{pmatrix} \text{ m s}^{-1}$$
$$t = 2,4 \text{ s}$$

$$\rightarrow \textcircled{A}) \quad u_x = u = 30 \text{ m s}^{-1}$$

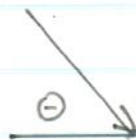
$$\uparrow \textcircled{A}) \quad v_y = (v_0)_y - gt$$

$$\therefore v_y = 0 - 10(2,4) \text{ s} = -24 \text{ m s}^{-1}$$

$$\therefore v = \sqrt{v_x^2 + v_y^2} = \sqrt{30^2 + (-24)^2} = 38,42 \text{ m s}^{-1}$$

$$\theta = \tan^{-1} \left(\frac{v_y}{v_x} \right)$$

$$= \tan^{-1} \left(\frac{24}{30} \right)$$



$$\therefore \theta = 38,7^\circ$$

$$\textcircled{3} \quad u = 35 \text{ m s}^{-1} \quad \theta = 40^\circ \quad \Delta, \quad t = 3 \text{ s}$$

$$\rightarrow \textcircled{A}) \quad x = u \cos \theta t = 35 \cos 40^\circ (3) = 80,4 \text{ m}$$

$$\uparrow \textcircled{A}) \quad y = u \sin \theta t - \frac{1}{2} 10 t^2 = 35 \sin 40^\circ (3) - 5 (3)^2$$

$$\therefore y = 22,5 \text{ m}$$

$$\rightarrow \textcircled{A}) \quad v_x = u \cos \theta = 35 \cos 40^\circ = 26,8 \text{ m s}^{-1}$$

$$\uparrow \textcircled{A}) \quad v_y = u \sin \theta - gt = 35 \sin 40^\circ - 10(3)$$

$$\therefore v_y = -7,5 \text{ m s}^{-1} \Rightarrow v_y = 7,5 \text{ m s}^{-1} \downarrow$$

$$\textcircled{7} \quad y_0 = 0,8 \text{ m}$$

$$\text{(a) \#)} \quad y = y_0 + u \sin \theta t - \frac{1}{2} g t^2$$

$$\therefore 0 = 0,8 + 0 - \frac{1}{2} 10 t^2$$

$$\therefore t = 0,4 \text{ s}$$

$$\text{(b) \#)} \quad v_y = u \sin \theta - g t$$
$$= 0 - 10(0,4)$$

$$\therefore v_y = -4 \text{ m s}^{-1} \Rightarrow v_y = 4 \text{ m s}^{-1} \downarrow$$

$$\text{(c)} \quad \tan(\theta) = \frac{4}{u}$$



$$\therefore u = \frac{4}{\tan 15^\circ} = 14,9 \text{ m s}^{-1}$$

$$\text{(d)} \quad x = u \cos \theta t = 14,9(0,4) = 5,97 \text{ m}$$

$$\textcircled{9} \quad u = 17 \text{ m s}^{-1}$$

$$\theta = ?$$

$$\text{At } y = 5 \text{ m: } v_y = 0$$

$$\text{\#)} \quad x = u \cos \theta t \Rightarrow x = 17 \cos \theta t \quad \text{--- (1)}$$

$$\text{\#)} \quad y = u \sin \theta t - \frac{1}{2} g t^2 \Rightarrow 5 = 17 \sin \theta t - 5 t^2 \quad \text{--- (2)}$$

$$\text{\#)} \quad v_y = u \sin \theta - g t \Rightarrow 0 = 17 \sin \theta - 10 t$$
$$\therefore t = \frac{17 \sin \theta}{10} \quad \text{--- (3)}$$

Sub (3) into (2)

$$\therefore 5 = 17 \sin \theta \frac{17 \sin \theta}{10} - 5 \left(\frac{17 \sin \theta}{10} \right)^2$$
$$\therefore \sin^2 \theta = 0,346 \Rightarrow \theta = 36^\circ$$

$$\textcircled{19} \quad u = 9,1 \text{ m s}^{-1} \quad \theta = 76^\circ \quad \uparrow \theta$$

$$\begin{aligned} \text{+A)} \quad x &= u \cos \theta t = 9,1 \cos 76^\circ t \\ \therefore x &= 2,2 t \Rightarrow t = \frac{x}{2,2} \quad \text{--- (1)} \end{aligned}$$

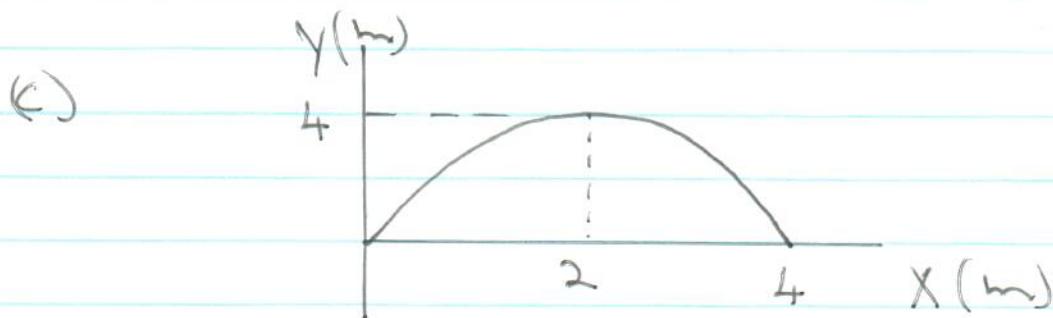
$$\begin{aligned} \text{+A)} \quad y &= u \sin \theta t - \frac{1}{2} g t^2 \\ \therefore y &= 9,1 \sin 76^\circ t - 5 t^2 \\ \therefore y &= 8,83 t - 5 t^2 \quad \text{--- (2)} \end{aligned}$$

$$\text{Sub (1) into (2): } y = 8,83 \left(\frac{x}{2,2} \right) - 5 \left(\frac{x}{2,2} \right)^2$$

$$\therefore y = 4x - x^2$$

(b) Range is where $y=0$

$$\therefore 0 = 4x - x^2 \Rightarrow R = x = 4 \text{ m}$$



$$\begin{aligned} \text{(d) If } x &= 3,5 \text{ m then (from } x = u \cos \theta t) \\ \text{+A)} \quad 3,5 &= 9,1 \cos \theta t \Rightarrow t = \frac{3,5}{9,1 \cos \theta} \quad \text{--- (3)} \end{aligned}$$

$$\begin{aligned} \text{+A)} \quad y &= u \sin \theta t - \frac{1}{2} g t^2 \\ \therefore 0 &= 9,1 \sin \theta t - 5 t^2 \quad \text{--- (4)} \end{aligned}$$

Sub (3) into (4):

$$0 = 9,1 \sin \theta \frac{3,5}{9,1 \cos \theta} - 5 \left(\frac{3,5}{9,1 \cos \theta} \right)^2$$

$$\therefore 0 = 3,5 \tan \theta - 0,7396 \left(\frac{1}{\cos^2 \theta} \right)$$

$$\text{But } 1 + \tan^2 \theta = \sec^2 \theta = \frac{1}{\cos^2 \theta}$$

$$\therefore 0 = 3,5 \tan \theta - 0,7396 (1 + \tan^2 \theta)$$

$$\therefore 0,7396 \tan^2 \theta - 3,5 \tan \theta + 0,7396 = 0$$

$$\therefore \tan^2 \theta - 4,732 \tan \theta + 1 = 0$$

$$\therefore \tan \theta = \frac{4,732 \pm \sqrt{(4,732)^2 - 4(1)(1)}}{2}$$

$$\therefore \tan \theta = 4,510 \quad \text{or} \quad \tan \theta = 0,2217$$

$$\therefore \theta_1 = 77,5^\circ \quad \theta_2 = 12,5^\circ$$

