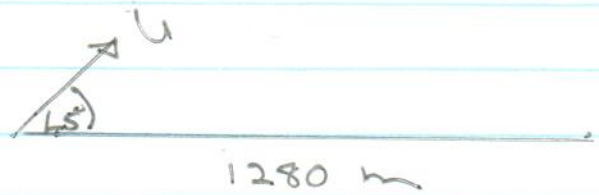


Exercise 1 (

(2)

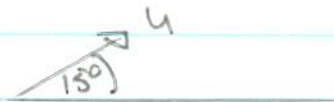


$$R = \frac{u^2 \sin 2\theta}{g}$$

$$\therefore u^2 = \frac{1280 (10)}{\sin(2(45^\circ))} = 12800$$

$$\therefore u = \underline{113 \text{ m s}^{-1}}$$

(4) $t = 0,6 \text{ s}$



$$t = \frac{2u \sin \theta}{g}$$

$$\therefore 0,6 = \frac{2u \sin(15^\circ)}{10}$$

$$\therefore u = \underline{11,6 \text{ m s}^{-1}}$$

$$\textcircled{5} \quad u = 75 \text{ m s}^{-1}$$

$$t = 14 \text{ s}$$


$$\theta = ?$$

$$\therefore t = \frac{2u \sin \theta}{g}$$

$$\therefore \sin \theta = \frac{14(10)}{2(75)} = 0,933$$

$$\therefore \theta = 68,96^\circ \approx 69^\circ$$

$$\textcircled{7} \quad u = 70 \text{ m s}^{-1}$$

$$\theta = 25^\circ$$


$$\text{(a) } R = \frac{u^2 \sin 2\theta}{g} = \frac{70^2 \sin(2(25))}{10} = 375,4 \text{ m}$$

$$\text{(b) } y = x \tan \theta - \frac{g x^2}{2 u^2 \cos^2 \theta}$$

$$= 50 \tan 25 - \frac{10(50)^2}{2(70)^2 \cos^2 25}$$

$$\therefore y = 20,2 \text{ m}$$

$$\text{(c) } y = x \tan \theta - \frac{g x^2}{2 u^2 \cos^2 \theta}$$

$$\therefore 20,2 = x \tan 25 - \frac{10 x^2}{2(70)^2 \cos^2 25}$$

$$\therefore 20,2 = 0,4663x - 0,00124x^2$$

$$\therefore x^2 - 375,356x + 16260,3 = 0$$

$$\therefore x = \frac{375,356 \pm \sqrt{(375,356)^2 - 4(1)(16260,3)}}{2}$$

$$= \frac{375,356 \pm 275,41}{2}$$

$$x = 50 \text{ m} \quad \text{or} \quad x = 325,4 \text{ m}$$

(9) $u = 12,5 \text{ m s}^{-1}$

$$x = 10 \text{ m}$$

$$y = 1,8 \text{ m}$$

$$y = x \tan \theta - \frac{g x^2}{2 u^2 \cos^2 \theta}$$

$$\therefore 1,8 = 10 \tan \theta - \frac{10(10)^2}{2(12,5)^2} (1 + \tan^2 \theta)$$

$$\therefore 1,8 = 10 \tan \theta - 3,2(1 + \tan^2 \theta)$$

$$\therefore 3,2 \tan^2 \theta - 10 \tan \theta + 5 = 0$$

$$\tan \theta = \frac{10 \pm \sqrt{10^2 - 4(3,2)(5)}}{2(3,2)}$$

$$\therefore \tan \theta = 2,5 \quad \text{or} \quad \tan \theta = 0,625$$
$$\theta = 68,2^\circ \quad \theta = 32^\circ$$

$$(11) \Rightarrow x = u \cos \theta t \Rightarrow t = \frac{x}{u \cos \theta} \quad \text{--- (1)}$$

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

$$\text{Sub. (1) into (2): } y = y_0 + x \tan \theta - \frac{g x^2}{2 u^2 \cos^2 \theta} \quad \text{--- (3)}$$

If $x = 10 \text{ m}$; $y = 4 \text{ m}$, thus from (3)

$$\therefore 4 = 0,5 + 10 \tan \theta - \frac{5(10)^2 (1 + \tan^2 \theta)}{u^2}$$

$$\therefore 3,5 = 10 \tan \theta - \frac{500}{u^2} (1 + \tan^2 \theta) \quad \text{--- (4)}$$

Furthermore: $x = 20 \text{ m}$, $y = 0$; from (3):

$$0 = 0,5 + 20 \tan \theta - \frac{5(20)^2 (1 + \tan^2 \theta)}{u^2} \quad \text{--- (5)}$$

$$\text{(5)} \times \frac{10^2}{20^2} \Rightarrow 0 = 0,5 \left(\frac{10}{20}\right)^2 + 20 \left(\frac{10}{20}\right)^2 \tan \theta - \frac{5(10)^2 (1 + \tan^2 \theta)}{u^2} \quad \text{--- (6)}$$

$$\text{(6)} - \text{(4)}: -3,5 = 0,125 + \left(20 \left(\frac{10}{20}\right)^2 - 10\right) \tan \theta$$

$$\therefore \tan \theta = 0,725$$

$$\therefore \theta = 35,9^\circ$$

$$\textcircled{13} \quad H = \frac{1}{10} R$$

$$R = \frac{u^2 \sin 2\theta}{g} \quad - \textcircled{1}$$

$$H = \frac{u^2 \sin^2 \theta}{2g} \quad - \textcircled{2}$$

$$\therefore \frac{1}{10} R = \frac{u^2 \sin^2 \theta}{2g}$$

$$\therefore R = \frac{10 u^2 \sin^2 \theta}{2g} \quad - \textcircled{3}$$

$$\text{From } \textcircled{1}: R = \frac{u^2 2 \sin \theta \cos \theta}{g} \quad - \textcircled{4}$$

$$\textcircled{3} \div \textcircled{4}: 1 = \frac{10 u^2 \sin^2 \theta}{2g} \cdot \frac{g}{u^2 2 \sin \theta \cos \theta}$$

$$\therefore \tan \theta = \frac{2}{5}$$

$$\therefore \theta = 21,8^\circ$$