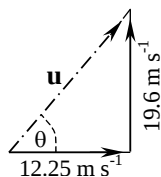
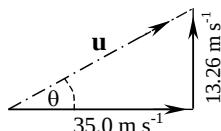


- Q1. a) HORIZONTAL:- $s_x = 49 \text{ m}$; $u_x = ?$ $v_x = u_x$ $a_x = 0 \text{ m s}^{-2}$; $t = 4.00 \text{ s}$.
 $s_x = u_x t [+ \frac{1}{2} a_x t^2]$ $\therefore 49 = 4.00 \times u_x$ $\therefore u_x = 12.25 \text{ m s}^{-1} \rightarrow$
 b) $v_x = u_x = 12.25 \text{ m s}^{-1} \rightarrow$
 c) VERTICAL:- $s_y = 0 \text{ m}$; $u_y = ?$ $v_y = ?$ $a_y = -9.8 \text{ m s}^{-2}$; $t = 4.00 \text{ s}$.
 $s_y = u_y t + \frac{1}{2} a_y t^2$ $\therefore 0 = 4.00 \times u_y - \frac{1}{2} \times 9.8 \times 4.00^2$ $\therefore u_y = 19.6 \text{ m s}^{-1} \uparrow$
 d) $v_y = u_y + a_y t$ $\therefore v_y = 19.6 - 9.8 \times 4.00 = -19.6 \text{ m s}^{-1} \downarrow$
 e) VERTICAL:- $s_y = ?$ $u_y = 19.6 \text{ m s}^{-1}$; $v_y = 0$; $a_y = -9.8 \text{ m s}^{-2}$; $t = t$.
 $v_y^2 = u_y^2 + 2 a_y s_y$ $\therefore 0 = 19.6^2 - 2 \times 9.8 s_y$ $\therefore s_y = 19.6 \text{ m} \uparrow$
 f) By Pythagoras, $u^2 = 12.25^2 + 19.6^2$ $\therefore u = 23.1 \text{ m s}^{-1}$.



g) $\tan \theta = \frac{19.6}{12.25} = 1.6$ $\therefore \theta = 58^\circ$

- Q2. a) HORIZONTAL:- $s_x = 84.0 \text{ m}$; $u_x = ?$ $v_x = u_x$ $a_x = 0 \text{ m s}^{-2}$; $t = 2.40 \text{ s}$.
 $s_x = u_x t [+ \frac{1}{2} a_x t^2]$ $\therefore 84.0 = 2.40 \times u_x$ $\therefore u_x = 35.0 \text{ m s}^{-1} \rightarrow$
 b) VERTICAL:- $s_y = 3.60 \text{ m}$; $u_y = ?$ $v_y = ?$ $a_y = -9.8 \text{ m s}^{-2}$; $t = 2.40 \text{ s}$.
 $s_y = u_y t + \frac{1}{2} a_y t^2$ $\therefore 3.60 = 2.40 \times u_y - \frac{1}{2} \times 9.8 \times 2.40^2$ $\therefore u_y = 13.26 \text{ m s}^{-1} \uparrow$
 c) By Pythagoras, $u^2 = 35.0^2 + 13.26^2$ $\therefore u = 37.4 \text{ m s}^{-1}$.
 $\tan \theta = \frac{13.26}{35.0} = 0.379$ $\therefore \theta = 21^\circ$



- Q3. a) $u_y = u \sin \alpha = 47.667 \sin 65.0^\circ = 43.2 \text{ m s}^{-1} \uparrow$
 b) VERTICAL:- $s_y = ?$ $u_y = 43.2 \text{ m s}^{-1}$; $v_y = 0$; $a_y = -9.8 \text{ m s}^{-2}$; $t = t$.
 $v_y^2 = u_y^2 + 2 a_y s_y$ $\therefore 0 = 43.2^2 - 2 \times 9.8 s_y$ $\therefore s_y = 95.2 \text{ m} \uparrow$
 c) $s_y = -8.1 \text{ m}$; $u_y = 43.2 \text{ m s}^{-1}$; $v_y = v_y$; $a_y = -9.8 \text{ m s}^{-2}$; $t = t$
 $s_y = u_y t + \frac{1}{2} a_y t^2$ $\therefore -8.1 = 43.2 t - 4.9 t^2$ $\therefore 4.9 t^2 - 43.2 t - 8.1 = 0$
 $\therefore t = \frac{43.2 + \sqrt{43.2^2 + (4 \times 4.9 \times 8.1)}}{9.8} = 9.0 \text{ s}$
 d) $s_x = ?$ $u_x = 47.667 \cos 65^\circ = 20.1 \text{ m s}^{-1}$; $v_x = u_x$; $a_x = 0 \text{ m s}^{-2}$; $t = 9.0 \text{ s}$
 $s_x = u_x t [+ \frac{1}{2} a_x t^2]$ $\therefore s_x = 20.1 \times 9.0 = 180.9 \text{ m}$ — i.e. 0.9 m beyond the hole.

- Q4. a) $u_x = u \cos \alpha = 24 \cos 49^\circ = 15.7 \text{ m s}^{-1} \rightarrow$.
 b) $u_y = u \sin \alpha = 24 \sin 49^\circ = 18.1 \text{ m s}^{-1} \uparrow$.
 c) $s_y = ?$ $u_y = 18.1 \text{ m s}^{-1}$; $v_y = 0$ $a_y = -9.8 \text{ m s}^{-2}$; $t = t$
 $v_y^2 = u_y^2 + 2 a_y s_y$ $\therefore 0 = 18.1^2 - 2 \times 9.8 s_y$ $\therefore s_y = 16.7 \text{ m}$ [above the thrower's hand. Hence maximum height above the ground is 18.7 m].
 d) $s_y = -2.0 \text{ m}$; $u_y = 18.1 \text{ m s}^{-1}$; $v_y = v_y$; $a_y = -9.8 \text{ m s}^{-2}$; $t = t$
 $s_y = u_y t + \frac{1}{2} a_y t^2$ $\therefore -2.0 = 18.1 t - 4.9 t^2$ $\therefore 4.9 t^2 - 18.1 t - 2 = 0$
 $\therefore t = \frac{18.1 + \sqrt{18.1^2 + (4 \times 4.9 \times 2)}}{9.8} = 3.8 \text{ s}$
 e) $s_x = ?$ $u_x = 15.7 \text{ m s}^{-1}$; $v_x = u_x$; $a_x = 0 \text{ m s}^{-2}$; $t = 3.8 \text{ s}$
 $s_x = u_x t [+ \frac{1}{2} a_x t^2]$ $\therefore s_x = 15.7 \times 3.8 = 59.7 \text{ m}$