$$\Rightarrow \tan^2 A - 4\tan A + 3 = 0 \quad \ldots \text{ let } x = \tan A$$

$$\Rightarrow x^2 - 4x + 3 = 0$$

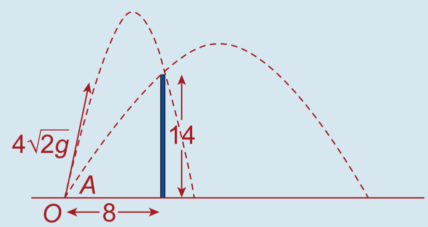
$$\Rightarrow (x - 3)(x - 1) = 0$$

$$\Rightarrow x = 3 \quad \textbf{OR} \quad x = 1$$

$$\Rightarrow \tan A = 3 \quad \textbf{OR} \quad \tan A = 1$$

$$\Rightarrow A = 72^\circ \quad \textbf{OR} \quad A = 45^\circ$$

Q. 3. $u_x = 4\sqrt{2g}\cos A \qquad u_y = 4\sqrt{2g}\sin A$



$v_x = 4\sqrt{2g}\cos A$

$v_y = 4\sqrt{2g}\sin A - gt$

$s_x = 4t\sqrt{2g}\cos A$

$s_y = 4t\sqrt{2g}\sin A - \frac{1}{2}gt^2$

$s_x = 8 \qquad$ when $\quad s_y = 14$

$\Rightarrow 4t\sqrt{2g}\cos A = 8 \qquad$ when $\quad 4t\sqrt{2g}\sin A - \frac{1}{2}gt^2 = 14$

$\Rightarrow t\sqrt{2g}\cos A = 2$

$$\Rightarrow t = \frac{2}{\sqrt{2g}\cos A}$$

$\dfrac{\sin A}{\cos A} = \tan A$ $\qquad$ $\dfrac{1}{\cos^2 A} = 1 + \tan^2 A$

$$\Rightarrow \quad 4\left[\frac{2}{\sqrt{2g}\cos A}\right]\sqrt{2g}\sin A - \frac{1}{2}g\left[\frac{2}{g\cos^2 A}\right] = 14$$

$$\Rightarrow 8\tan A - (1 + \tan^2 A) = 14$$

$$\Rightarrow \tan^2 A - 8\tan A + 15 = 0 \quad \ldots \text{ let } x = \tan A$$

$$\Rightarrow x^2 - 8x + 15 = 0$$

$$\Rightarrow (x - 5)(x - 3) = 0$$

$$\Rightarrow x = 5 \quad \textbf{OR} \quad x = 3$$

$$\Rightarrow \tan A = 5 \quad \textbf{OR} \quad \tan A = 3$$

$$\Rightarrow A = 79^\circ \quad \textbf{OR} \quad A = 72^\circ$$

We get the time of flight by letting $s_x = 8$ (Flight ends when it hits the target)

Firstly, look at the particle fired at an angle A where $\tan A = 5 \Rightarrow \cos A = \dfrac{1}{\sqrt{26}}$

$\Rightarrow 4t\sqrt{2g}\cos A = 8$

$\Rightarrow t\sqrt{2g}\cos A = 2$

$$\Rightarrow t = \frac{2}{\sqrt{2g}\cos A}$$

$$= \sqrt{\frac{2}{g}}\left[\frac{1}{\cos A}\right]$$

$$= \sqrt{\frac{2}{g}}\sqrt{26}$$

$$= \sqrt{\frac{52}{g}} = 2.3 \text{ s}$$

Secondly, look at the particle fired at an angle A where $\tan A = 3 \Rightarrow \cos A = \dfrac{1}{\sqrt{10}}$

$$t = \sqrt{\frac{2}{g}}\left[\frac{1}{\cos A}\right]$$

$$= \sqrt{\frac{2}{g}}\sqrt{10} = \sqrt{\frac{20}{g}} = 1.4 \text{ s}$$