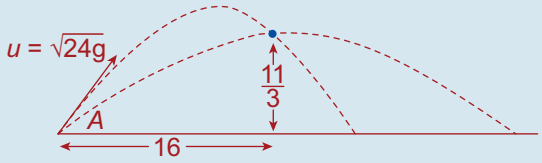
Exercise 3C

Q. 1. $u_x = \sqrt{24g}\cos A \qquad u_y = \sqrt{24g}\sin A$



$v_x = \sqrt{24g}\cos A$

$v_y = \sqrt{24g}\sin A - gt$

$s_x = \sqrt{24g}\,t\cos A$

$s_y = \sqrt{24g}\,t\sin A - \frac{1}{2}gt^2$

$s_x = 16$ when $\vec{s_y} = \frac{11}{3}$

$\Rightarrow \sqrt{24g}\,t\cos A = 16$ when $\sqrt{24g}\,t\sin A - \frac{1}{2}gt^2 = \frac{11}{3}$

$\Rightarrow t = \frac{16}{\sqrt{24g}\cos A}$

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

$\Rightarrow \sqrt{24g}\left[\frac{16}{\sqrt{24g}\cos A}\right]\sin A - \frac{1}{2}g\left[\frac{256}{24g\cos^2 A}\right] = \frac{11}{3}$

$\Rightarrow 16\tan A - \frac{16}{3}(1 + \tan^2 A) = \frac{11}{3}$

$\Rightarrow 48\tan A - 16 - 16\tan^2 A = 11$

$\Rightarrow 16\tan^2 A - 48\tan A + 27 = 0$ … let $x = \tan A$

$\Rightarrow 16x^2 - 48x + 27 = 0$

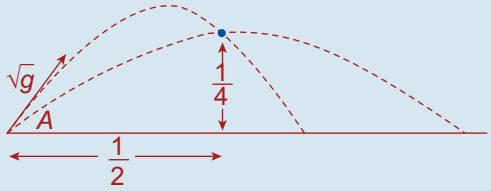
$\Rightarrow (4x - 9)(4x - 3) = 0$

$\Rightarrow x = \frac{9}{4}$ **OR** $x = \frac{3}{4}$

$\Rightarrow \tan A = \frac{9}{4}$ **OR** $\tan A = \frac{3}{4}$

$\Rightarrow A = 66°$ **OR** $A = 37°$

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



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

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

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

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

$s_x = \frac{1}{2}$ when $s_y = \frac{1}{4}$

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

$\Rightarrow t = \frac{1}{2\sqrt{g}\cos A}$

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

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

$\Rightarrow \frac{1}{2}\tan A - \frac{1}{8}(1 + \tan^2 A) = \frac{1}{4}$ … multiply by 8.

$\Rightarrow 4\tan A - 1 - \tan^2 A = 2$