At $t = 10$, $s_x = 10t$

$= 10(10)$

$= 100$ m

Q. 6. $s_y = 49t - \frac{1}{2}(9.8)t^2 = 0$

$\therefore 49t - 4.9t^2 = 0$

$\therefore t(49 - 4.9t) = 0$

$\therefore t = 0$ **OR** $t = 10$

at $t = 10$, $s_x = 50t$

$= 50(10)$

$= 500$ m

Q. 7. (i) $u_y = 14$, $a_y = -9.8$,
$s_y = H$, $v_y = 0$

$v^2 = u^2 + 2as$

$\therefore 0 = (14)^2 + 2(-9.8)H$

$\therefore H = 10$ m

(ii) $\frac{3}{4}H = \frac{3}{4}H(10)$

$= 7.5$

$s_y = 7.5$

$\Rightarrow 14t - 4.9t^2 = 7.5$

$\Rightarrow 49t^2 - 140t + 75 = 0$

$\Rightarrow (7t - 5)(7t - 15) = 0$

$\Rightarrow t = \frac{5}{7}$ **OR** $\frac{15}{7}$

Q. 8. $s_y = -82.5$

$\Rightarrow 8t - 4.9t^2 = -82.5$

$\Rightarrow 49t^2 - 80t - 825 = 0$

$\Rightarrow t = 5$ **OR** $-\frac{330}{98}$

At $t = 5$, $s_x = 12t$

$= 12(5)$

$= 60$ m

Q. 9. (i) $s_y = -78.4$

$\Rightarrow -4.9t^2 = -78.4$

$\Rightarrow t^2 = 16$

$\Rightarrow t = 4$

(ii) $\vec{u} = 98\cos 30°\vec{i} + 98\sin 30°\vec{j}$

$= 84.868\,\vec{i} + 49\vec{j}$

$s_y = -78.4$

$\Rightarrow 49t - 4.9t^2 = -78.4$

$\Rightarrow 49t^2 - 490t - 784 = 0$

$\Rightarrow t^2 - 10t - 16 = 0$

$\Rightarrow t = 11.4$ $(-1.4$ is rejected$)$

Q. 10. $u_x = 50\cos\theta$

$= 50\left(\frac{3}{5}\right)$

$= 30$

$u_y = 50\sin\theta$

$= 50\left(\frac{4}{5}\right)$

$= 40$

$v_x = 30$

$v_y = 40 - gt$

$s_x = 30t$

$s_y = 40t - \frac{1}{2}gt^2$

(i) $\vec{r} = 30t\vec{i} + \left[40t - \frac{1}{2}gt^2\right]\vec{j}$

$= 30t\vec{i} + (40 - 4.9t^2)\vec{j}$ m

(ii) $v_x = 30$

$v_y = 40 - g(1) = 30.2$

$\Rightarrow \vec{v} = 30\vec{i} + 30.2\vec{j}$ m/s

Magnitude

$|\vec{v}| = \sqrt{30^2 + 30.2^2}$

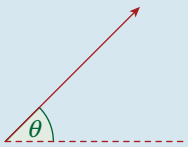
$= 43$ m/s

Direction

$\tan\theta = \frac{30.2}{30}$

$\Rightarrow \theta = \tan^{-1}\frac{30.2}{30}$

$= 45°$



(iii) Range: s_x when $s_y = 0$

$s_y = 0$

$\Rightarrow 40t - \frac{1}{2}gt^2 = 0$

$\Rightarrow 80t - gt^2 = 0$

$\Rightarrow t(80 - gt) = 0$

$\Rightarrow \underbrace{t = 0}_{\text{Point of Projection}}$ $\underbrace{t = \frac{80}{g}}_{\text{Time of Flight}}$

Range $= 30\left(\frac{80}{g}\right)$

$= 245$ m