Q. 10. (i) $u = 0, \quad a = 9.8, \quad s = 40$

$v = \sqrt{u^2 + 2as}$

$= \sqrt{0 + 2(9.8)(40)}$

$= 28$ m/s

(ii) Let v_1 = speed directly after impact with ground.

$\frac{\text{NEW}}{\text{OLD}} = -e$

$\Rightarrow \frac{v_1}{-28} = -\frac{1}{2}$

$\Rightarrow v_1 = 14$ m/s

(iii) $u = 14, \quad a = -9.8, \quad v = 0$

$s = \frac{v^2 - u^2}{2a}$

$= \frac{0 - 14^2}{2(-9.8)}$

$= 10$ m

Q. 11. (i) $u = 0, \quad a = g, \quad s = h$

$v = \sqrt{u^2 + 2as}$

$= \sqrt{0 + 2gh}$

$= \sqrt{2gh}$

(ii) Let v_1 = the speed with which it first rises from the ground.

$\frac{\text{NEW}}{\text{OLD}} = -e$

$\Rightarrow \frac{v_1}{-\sqrt{2gh}} = -e$

$\Rightarrow v_1 = e\sqrt{2gh}$

(iii) $u = e\sqrt{2gh}, \quad a = -g, \quad v = 0$

$s = \frac{v^2 - u^2}{2a}$

$= \frac{0 - 2e^2gh}{-2g} = e^2h$

Q. 12.

Before	**(Mass)**	**After**
$u\cos A\vec{i} + u\sin A\vec{j}$	M	$v\cos B\vec{i} + v\sin B\vec{j}$

$u\cos A = u\cos B$ … **Equation 1** ($\vec{i}$-velocity remains the same)

$\frac{\text{NEW}}{\text{OLD}} = -e$

$\Rightarrow \frac{u\sin B}{-u\sin A} = -e$

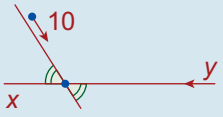
$\Rightarrow eu\sin A = u\sin B$ … **Equation 2**

Dividing **2** by **1** gives : $e\tan A = \tan B$

$\Rightarrow e = \frac{\tan B}{\tan A}$

Q. 13. (i) $\vec{u} = 20\left(\frac{3}{5}\right)\vec{i} - 20\left(\frac{4}{5}\right)\vec{j}$

$= 12\vec{i} - 16\vec{j}$



Before	**(Mass)**	**After**
$12\vec{i} - 16\vec{j}$	M	$12\vec{i} + p\vec{j}$

$\frac{\text{NEW}}{\text{OLD}} = -e$

$\Rightarrow \frac{p}{-16} = -\frac{3}{4} \Rightarrow p = 12$

New Velocity $= 12\vec{i} + 12\vec{j}$

New Speed $= \sqrt{144 + 144}$

$= 12\sqrt{2}$ m/s

(ii) $\vec{I} = M\vec{v} - M\vec{u}$

$= M(12\vec{i} + 12\vec{j}) - M(12\vec{i} - 16\vec{j})$

$= 28M\vec{j}$ Ns

Magnitude $= 28M$ Ns

(iii) $\frac{1}{2}Mu^2 - \frac{1}{2}Mv^2$

$= \frac{1}{2}M(144 + 256) - \frac{1}{2}M(144 + 144)$

$= 56M$ J