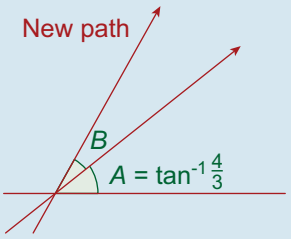
(iv)



$\tan B = \frac{12}{12}$

$\tan B = 1$

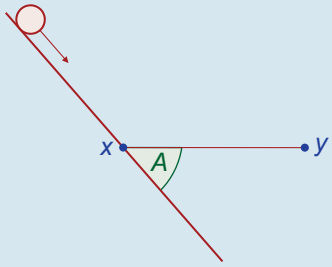
$\Rightarrow B = 45°$

$\tan (A + B) = \pm\frac{\tan A + \tan B}{1 - \tan A \tan B}$

$= \pm\frac{\frac{4}{3} + 1}{1 - \left(\frac{4}{3}\right)(1)} = \pm 7$

$\tan (A + B) = -7$ (Since $A + B > 90°$)

Q. 14. (i)



$\tan A = \frac{7}{24}$

$\Rightarrow \begin{cases} \cos A = \frac{24}{25} \\ \sin A = \frac{7}{25} \end{cases}$

$\vec{u} = 25 \cos A\vec{i} - 25 \sin A\vec{j}$

$= 24\vec{i} - 7\vec{j}$

Before	(Mass)	After
$24\vec{i} - 7\vec{j}$	0.1	$24\vec{i} + p\vec{j}$

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

$\Rightarrow \frac{p}{-7} = -\frac{3}{7} \Rightarrow p = 3$

$\Rightarrow$ New Velocity $= 24\vec{i} + 3\vec{j}$

New Speed $= \sqrt{24^2 + 3^2}$

$= 24.2$ m/s

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

$= 0.1(24\vec{i} + 3\vec{j}) - 0.1(24\vec{i} - 7\vec{j})$

$= 1\vec{j}$ Ns

Magnitude $= 1$ Ns

(iii) $\text{K.E.}_{\text{before}} = \frac{1}{2}(0.1)(24^2 + (-7)^2)$

$= 31.25$ J

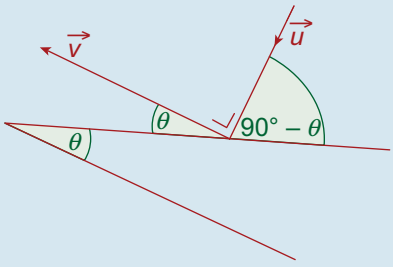
$\text{K.E.}_{\text{after}} = \frac{1}{2}(0.1)(24^2 + 3^2)$

$= 29.25$ J

Loss $= 31.25 - 29.25$

$= 2$ J

Q. 15.



$\vec{u} = -u \cos (90° - \theta)\vec{i} - u \sin (90° - \theta)\vec{j}$

$= -u \sin \theta\vec{i} - u \cos \theta\vec{j}$

$\vec{v} = -v \cos \theta\vec{i} + v \sin \theta\vec{j}$

Before	(Mass)	After
$-u \sin \theta\vec{i} - u \cos \theta\vec{j}$	M	$-v \cos \theta\vec{i} + u \sin \theta\vec{j}$

$\vec{i}$ – velocity is unchanged

$\Rightarrow -u \sin \theta = -v \cos \theta$

$\Rightarrow u \sin \theta = v \cos \theta$ … **Equation 1**

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

$\Rightarrow \frac{v \sin \theta}{-u \cos \theta} = \frac{-2}{3}$

$\Rightarrow 3v \sin \theta = 2u \cos \theta$ … **Equation 2**

Dividing **2** by **1** gives:

$\frac{3v}{u} = \frac{2u}{v}$

$\Rightarrow v^2 = \frac{2}{3}u^2$

$\Rightarrow \frac{1}{2}Mv^2 = \frac{2}{3}\left(\frac{1}{2}Mu^2\right)$

$\Rightarrow \frac{2}{3}$ of the energy is preserved.

$\Rightarrow \frac{1}{3}$ of the energy has been lost.