Quantité de mouvement

3ème

① $p = m \cdot v$ $m = 0{,}125\,[kg]$ $v = 68\left[\frac{km}{h}\right] = 18{,}9\left[\frac{m}{s}\right]$

$$p = 0{,}125\,kg \cdot 18{,}9\,\frac{m}{s} = 2{,}4\left[\frac{kg \cdot m}{s}\right]$$

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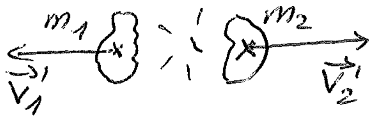
② $m_{tot} = 8{,}0\,[kg]$ $m_1 = 2{,}0\,[kg]$ $m_2 = 6{,}0\,[kg]$

__Avant:__ $v_1 = 0$; $v_2 = 0$;



__Après:__ $v_1' = 6{,}0\left[\frac{m}{s}\right]$ $v_2' = ?$

__Conservation:__ $\vec{P}_{tot}\,(\text{avant}) = \vec{P}'_{tot}\,(\text{après})$

(A 1 dimension): $0 = \vec{P}_1' + \vec{P}_2' = m_1 \cdot \vec{v}_1' + m_2 \cdot \vec{v}_2'$

$\Rightarrow \vec{v}_2' = -\frac{m_1}{m_2} \cdot \vec{v}_1'$ ($\vec{v}_2'$ de sens opposé à $\vec{v}_1'$)

$$v_2' = \|\vec{v}_2'\| = \frac{m_1}{m_2} \cdot v_1' = \frac{2\,kg}{6\,kg} \cdot 6\,\frac{m}{s} = \underline{\underline{2{,}0\left[\frac{m}{s}\right]}}$$

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③ $m_{fusil} = 4{,}5\,[kg]$; $m_{balle} = 8{,}0 \cdot 10^{-3}\,[kg]$; $v_{balle} = 720\,\frac{m}{s}$

__Avant:__ $v_{balle} = 0$ et $v_{fusil} = 0$

__Après:__ $v_{balle} = 720\left[\frac{m}{s}\right]$ et $v_{fusil} = ?$

__Conservation__ $\vec{P} = \vec{P}'$

$$\vec{P}_{fusil} + \vec{P}_{balle} = \vec{P}'_{fusil} + \vec{P}'_{balle}$$

$$0 = m_{fusil} \cdot \vec{v}'_{fusil} + m_{balle} \cdot \vec{v}'_{balle}$$

$$\Rightarrow v'_{fusil} = \frac{m_{balle}}{m_{fusil}} \cdot v'_{balle} = \frac{8{,}0 \cdot 10^{-3}\,kg}{4{,}5\,kg} \cdot 720\,\frac{m}{s} = \underline{\underline{1{,}28\left[\frac{m}{s}\right]}}$$

$$a = \frac{\Delta v}{\Delta t} = \frac{1{,}28\,\frac{m}{s}}{0{,}2\,s} = 6{,}4\left[\frac{m}{s^2}\right]; \quad F_{fusil} = m_{fusil} \cdot a = \underline{\underline{28{,}8\,[N]}}$$

④ $m_1 = 1200 [kg]$; $V_1 = 7,5 [\frac{m}{s}]$; $m_2 = 800 [kg]$; $V_2 = 10,2 [\frac{m}{s}]$

Choc, système isolé => conservation de la quantité de mouvement :

$$\vec{p} = \vec{p}\,'$$

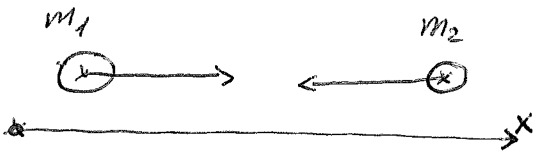
$$\vec{p_1} + \vec{p_2} = \vec{p_1}' + \vec{p_2}'$$

$$m_1 \vec{V_1} + m_2 \vec{V_2} = m_1' \vec{V_1}' + m_2' \vec{V_2}'$$

Mais $\vec{V_1}' = \vec{V_2}' = \vec{V}'$
et $m_1 + m_2 = 2'000 [kg]$

$$m_1 \vec{V_1} + m_2 \vec{V_2} = \vec{V}'(m_1 + m_2)$$

Donc $$\vec{V}' = \frac{m_1 \vec{V_1} + m_2 \vec{V_2}}{m_1 + m_2}$$



$$V' = \frac{m_1 V_1 - m_2 V_2}{m_1 + m_2} = \frac{1200 kg \cdot 7,5 \frac{m}{s} - 800 kg \cdot 10,2 \frac{m}{s}}{2000 kg}$$

Finalement : $V' = \underline{\underline{0,42 [\frac{m}{s}]}}$

positif donc <u>même sens que $\vec{V_1}$</u> (et même direction).

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⑤

$m_1 = 53 [kg]$	$V_1 = 0$	$V_1' = 2,8 [\frac{m}{s}]$
$m_2 = 48 [kg]$	$V_2 = 0$	$V_2' = 1,5 [\frac{m}{s}]$
$m_3 = X [kg]$	$V_3 = 0$	$V_3' = 0,10 [\frac{m}{s}]$

conservation : $m_1 \cdot V_1 + m_2 V_2 + m_3 V_3 = m_1 V_1' + m_2 V_2' + m_3 V_3'$

$$m_3 = \frac{m_1 \cdot V_1' + m_2 \cdot V_2'}{V_3'}$$

$$m_3 = \frac{53 [kg] \cdot 2,8 [\frac{m}{s}] + 48 [kg] \cdot 1,5 [\frac{m}{s}]}{0,10 [\frac{m}{s}]} \cong \underline{\underline{2,2 \cdot 10^3 [kg]}}$$