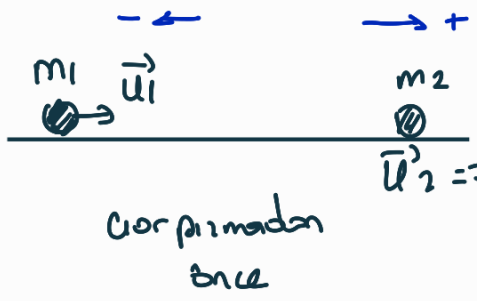
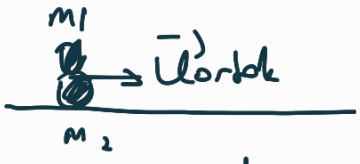
✱ Esnek Olmayan Çarpışma ✱

I. Merkezi – Esnek Olmayan Çarpışma



Çarpışmadan önce



Çarpışmadan sonra

→ Momentum Korunur:

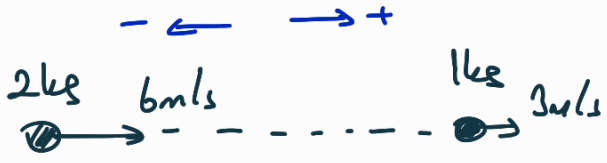
$$\vec{P}_{önce} = \vec{P}_{sonra}$$

$$+ m_1 . u_1 + 0 = (m_1 + m_2) . \vec{u}_{ortak}$$

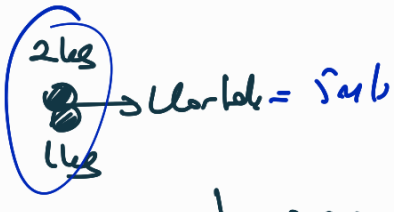
✱ Toplam enerji korunur.

✱ Kinetik enerji korunmaz.

Örnek



Çarpışmadan önce



Çarpışmadan sonra

a) $\vec{u}_{ortak} = ?$

$$\vec{P}_{ö} = \vec{P}_{sonra}$$

$$+2.6 + 1.3 = (2+1) . u_{ortak}$$

$$u_{ortak} = 3 m/s$$

b) Fizikçiye dönüşen enerji kaç joule?

$$E_{ilk} = \frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 . u_2^2$$

$$= \frac{1}{2} . 2 . 6^2 + \frac{1}{2} . 1 . 3^2$$

$$= 36 + 4{,}5 = 40{,}5 J$$

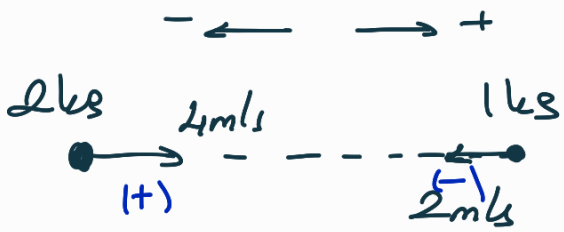
$$E_{son} = \frac{1}{2} (m_1 + m_2) . u_{ortak}^2$$

$$= \frac{1}{2} . (2+1) . 3^2$$

$$= 13{,}5 J$$

$$\Delta E = 40{,}5 - 13{,}5 = 27 \text{ joule}$$

Örnek



a) Vortak = ?

b) Isya dönüşen enerji?

$\vec{P}_{önce} = \vec{P}_{sonra}$

$+2.4 - 1.2 = (2+1).V_{ortak}$

$8 - 2 = 3.V_{ortak}$

$V_{ortak} = 2 m/s$

$E_{ilk} = \frac{1}{2} m_1.V_1^2 + \frac{1}{2}.m_2.V_2^2$

$= \frac{1}{2}.2.4^2 + \frac{1}{2}.1.2^2$

$= 16 + 2 = 18 J$

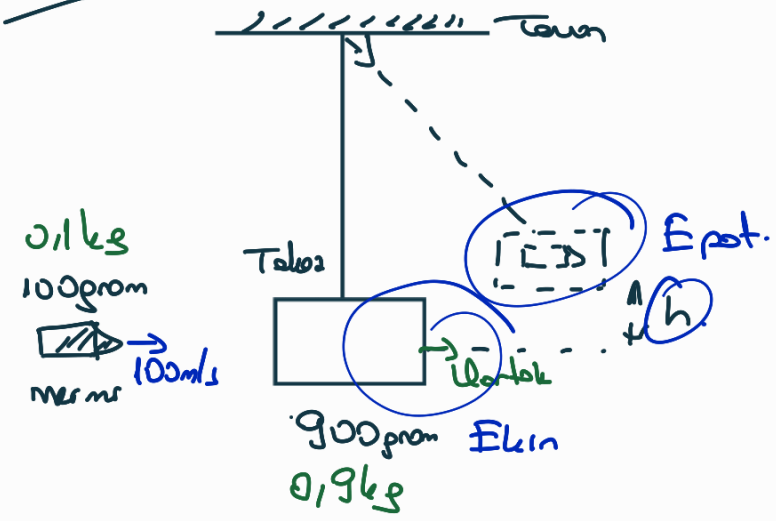
$E_{son} = \frac{1}{2}(m_1+m_2).V_{ort}^2$

$= \frac{1}{2}.(2+1).2^2$

$= \frac{1}{2}\ 3.\ 4. = 6 J$

$\Delta E = 18 - 6 = \underline{12 J}$

Örnek



h = ?

$\vec{P}_{ö} = \vec{P}_{sonra}$

$0,1.100 + 0 = (0,1+0,9).V_{ortak}$

$10 = 1.V_{ortak}$

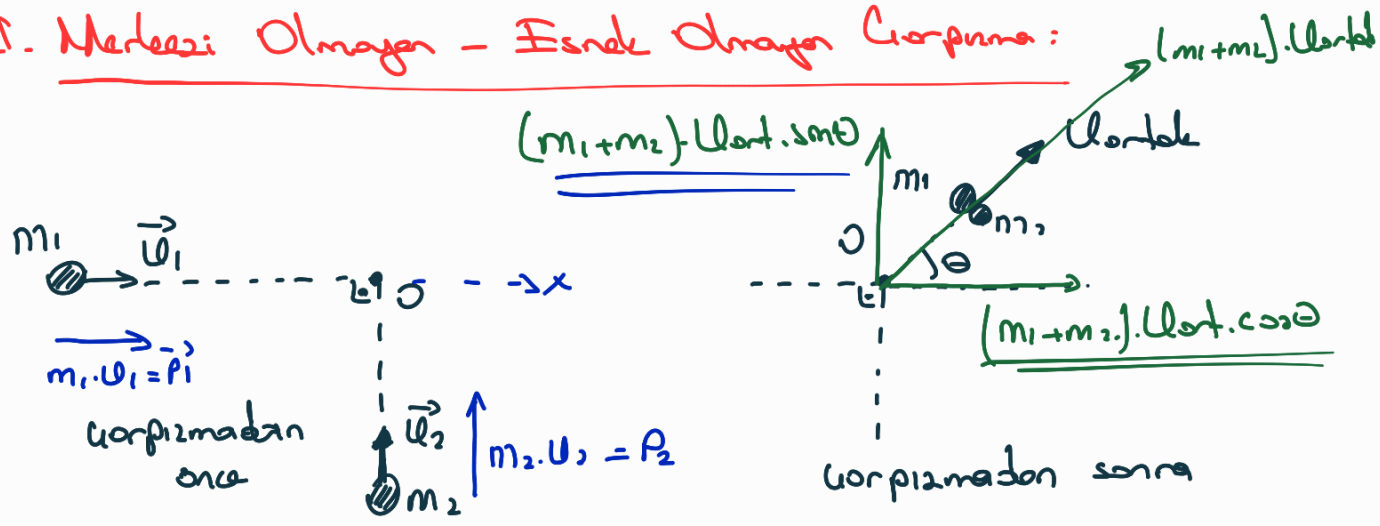
$V_{ortak} = 10 m/s$

$E_{kin} = E_{pot.}$

$\frac{1}{2} m.V^2 = m.g.h$

$\frac{1}{2}.10^2 = 10.h \quad \underline{h = 5m}$

II. Merkezi Olmayan – Esnek Olmayan Çarpışma:



$$\vec{P}_{önce} = \vec{P}_{sonra}$$

$$x \Rightarrow \vec{P}_{ö(x)} = \vec{P}_{s(x)}$$

$$y \Rightarrow \vec{P}_{ö(y)} = \vec{P}_{s(y)}$$

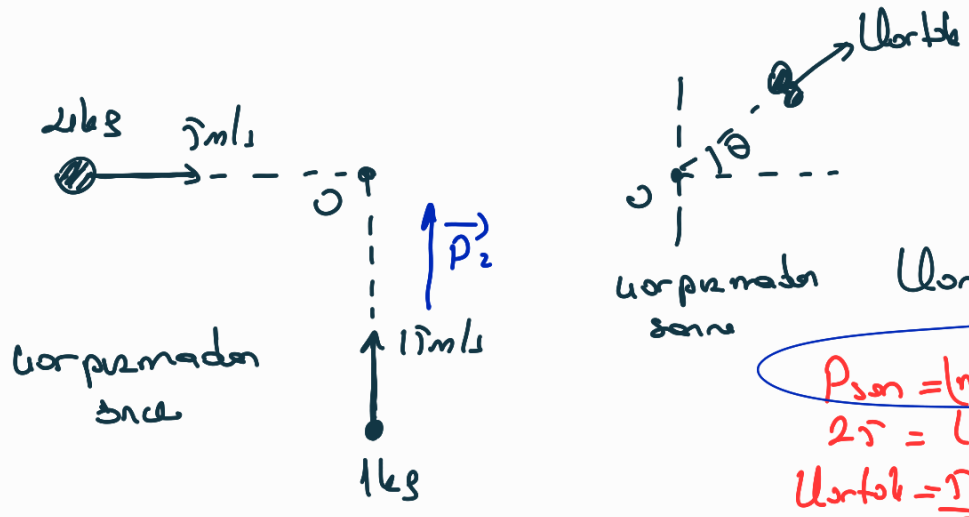
X : $P_ö = P_s$

$m_1.v_1 = (m_1+m_2).V_{ort}.\cos\theta$

Y : $P_ö = P_s$

$m_2.v_2 = (m_1+m_2).V_{ort}.\sin\theta$

Örnek



Vortak = ?

$P_{son} = (m_1+m_2).V_{ortak}$

$25 = (4+1).V_{ortak}$

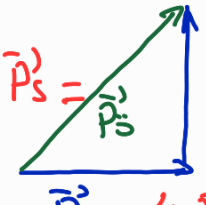
$V_{ortak} = 5 m/s$

$\vec{P}_{son} = 25 kg\frac{m}{s}$

$\vec{P_1}$

$\vec{P}_{önce} = \vec{P}_{sonra}$

$\vec{P_1} + \vec{P_2} = \vec{P}_{sonra}$



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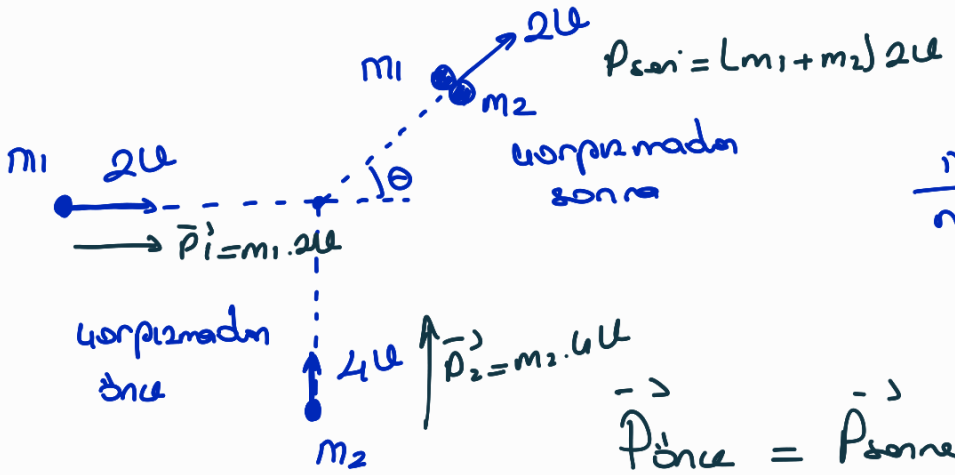
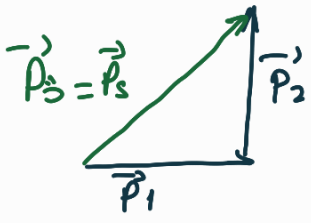
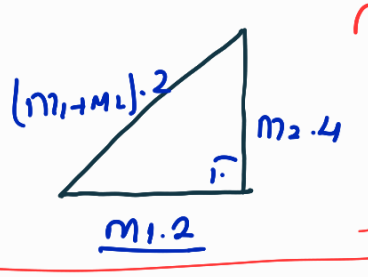


$$\vec{p}_{önce} = \vec{p}_{sonra}$$

$$\vec{p}_1 + \vec{p}_2 = \vec{p}_{sonra}$$





FİŞİK

matematik

$$(2m_1)^2 + (4m_2)^2 = \left[(m_1+m_2)\cdot\frac{2}{4}\right]^2$$

$$4m_1^2 + 16m_2^2 = 4m_1^2 + 8m_1m_2 + 4m_2^2$$

$$16m_2^2 - 4m_2^2 = 8m_1 \cdot m_2$$

$$12m_2^2 = 8m_1 \cdot m_2$$

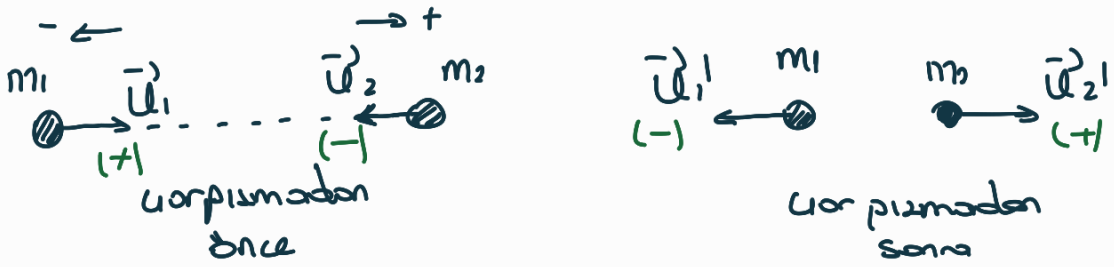
$$\frac{12m_2}{12} = \frac{8m_1}{12}$$

$$m_2 = \frac{2m_1}{3}$$

$$\frac{m_1}{m_2} = \frac{3}{2}$$

✱ Esnek Çarpışmalar ✱

I. Merkezi - Esnek Çarpışmalar



✱ Momentum Korunur.

$$\vec{P}_{önce} = \vec{P}_{sonra}$$

$$\vec{P}_1 + \vec{P}_2 = \vec{P}_1' + \vec{P}_2'$$

$$+m_1.v_1 - m_2.v_2 = -m_1.v_1' + m_2.v_2'$$

✱ Enerji Korunur

$$E_{önce} = E_{sonra}$$

$$E_1 + E_2 = E_1' + E_2'$$

$$\frac{1}{2}m_1.v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1.v_1'^2 + \frac{1}{2}m_2.v_2'^2$$

✱ Hızlar Korunur.

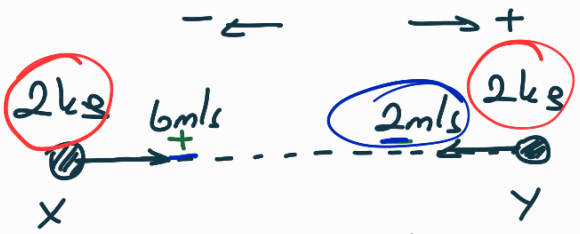
$$\vec{v}_1 + \vec{v}_1' = \vec{v}_1 + \vec{v}_2'$$

Not: Esnek çarpışma soruları çözülürken, esnek olmayan çarpışma gibi ortak hız bulunur. Sonra;

$$\vec{v}_1' = 2.\vec{v}_{ortak} - \vec{v}_1$$

$$\vec{v}_2' = 2.\vec{v}_{ortak} - \vec{v}_2$$

"Örnek



çarpışmadan önce

esnek çarpışma

çarpışmadan sonra

* Ortak hız bulunur.

$+2.6 - 2.2 = (2+2).\vec{u}_{ortak}$

$12 - 4 = 4.\vec{u}_{ortak}$

$\vec{u}_{ortak} = +2 m/s$

$\vec{u}_x' = 2.\vec{u}_{ortak} - \vec{u}_x$

$= 2.(+2) - (+6)$

$= 4 - 6 = -2 m/s$

$\vec{u}_y' = 2.\vec{u}_{ortak} - \vec{u}_y$

$= 2.(+2) - (-2)$

$= 4 + 2$

$= 6 m/s$

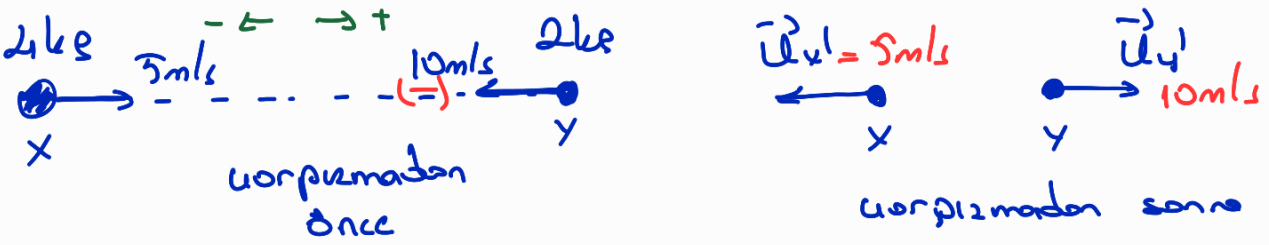
Not: Esnek çarpışmada çarpışan cisimlerin kütleleri eşit ise hızlarını birbirlerine aktarırlar.

çarpışmadan önce

çarpışmadan sonra

esnek çarpışma

$\frac{m_1}{m_2} = ?$ $\quad m_1 = m_2 \Rightarrow \frac{m_1}{m_2} = 1$ //



esnek çarpışma

→ önce ortak hız bulunur.

$+4.5 - 2.10 = (4+2).u_{ortak}$

$20 - 20 = 6.u_{ortak}$

$\vec{u}_{ortak} = 0$

$\vec{u}_{x'} = 2.\vec{u}_{ortak} - \vec{u}_x$

$= 2.0 - (+5)$

$= -5m/s$

$\vec{u}_{y'} = 2.\vec{u}_{ortak} - \vec{u}_y$

$= 2.0 - (-10)$

$= +10m/s$

Not: Esnek çarpışmada çarpışan cisimlerin çarpışmadan önce momentum büyüklükleri eşit ise hızlarını birbirlerine aktarırlar.