Elastic Collisions

In every collision, momentum is conserved (neglecting friction) ($\vec{P}_{total} = \vec{P}'_{total}$)

In some collisions, kinetic energy is conserved. If kinetic energy is conserved, we classify the collision as an elastic collision. ($E_{K\,total} = E'_{K\,total}$)

MP 10.3 p320

		BEFORE		AFTER	
		bill ball	steel ball	bill ball	steel ball
+ original direction of bill. ball	m	0.250 kg	0.800 kg	0.250 kg	0.800 kg
	v	+5.00 m/s	0	−2.62 m/s	v
	p	+1.25 kg·m/s	0	−0.655 kg·m/s	(0.800 kg)v

$\vec{P}_{total}$ $\vec{P}'_{total}$

$\vec{P}_{total} = \vec{P}'_{total}$

$1.25\,kg\cdot m/s + 0 = -0.655\,kg\cdot m/s + (0.800\,kg)v$

$1.905\,kg\cdot m/s = (0.800\,kg)v$

$v = +2.38125\,m/s$

$\vec{v} = 2.38\,m/s$ [in the orig. dir. of bill ball]

BEFORE

Bill: $E_K = \frac{1}{2}(0.250\,kg)(5.00\,m/s)^2 = 3.125\,J$

Steel: $E_K = 0\,J$

3.125 J

same ∴ ELASTIC COLLISION

AFTER

Bill: $E_K = \frac{1}{2}(0.250\,kg)(2.62\,m/s)^2 = 0.85805\,J$

Steel: $E_K = \frac{1}{2}(0.800\,kg)(2.38125\,m/s)^2 = 2.26681\,J$

3.126 J

TO DO

PP 10.3 p322