## Answer on Question #51268, Physics, Other

1) A bullet that has a mass of 0.1 kg has a velocity of 420 m/s just before it hits the 1.5 target. If the bullet continues with a speed of 300 m/s, how fast will the target be going after collision?

**Solution:**

1) Given:

$m_1 = 0.1$ kg,

$m_2 = 1.5$ kg,

$v_{1i} = 420$ m/s,

$v_{2i} = 0$,

$v_{1f} = 300$ m/s,

$v_{2f} = ?$

The equation that denotes the conservation of momentum is:

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$$

where, $m_1$ = mass of object or body 1

$m_2$ = mass of object or body 2

$v_{1i}$ = initial velocity of object or body 1

$v_{2i}$= initial velocity of object or body 2

$v_{2f}$ = final velocity of the object 2

From above equation we have,

$$v_{2f} = \frac{m_1 v_{1i} + m_2 v_{2i} - m_1 v_{1f}}{m_2}$$

$$v_{2f} = \frac{0.1 * 420 - 0.1 * 300}{1.5} = 8 \text{ m/s}$$

2) An 8.5 kg cart traveling at 9.54 m/s (this movement defines the positive direction) has a head on elastic collision with a 36.8 kg cart (v = 0). If the final velocity of the first cart is 3.57 m/s, what was the final velocity of the second cart

**Solution:**

Given:

$m_1 = 8.5$ kg,

$m_2 = 36.8$ kg,

$v_{1i} = 9.54$ m/s,

$v_{2i} = 0$,

$v_{1f} = 3.57$ m/s,

$v_{2f} = ?$

The equation that denotes the conservation of momentum is:

$$m_1 v_{1i} + m_2 v_{2i} = m_1 v_{1f} + m_2 v_{2f}$$

$$v_{2f} = \frac{m_1 v_{1i} + m_2 v_{2i} - m_1 v_{1f}}{m_2}$$

$$v_{2f} = \frac{8.5 * 9.54 - 8.5 * 3.57}{36.8} = 1.38 \text{ m/s}$$

**Answer:** 1) 8 m/s; 2) 1.38 m/s.