**5.** before collision


Consider right as positive and left as negative

$m_1 = 40.0 \text{ g}$
$\vec{v}_1 = 9.00 \text{ m/s}$
$\vec{p}_1 = 3.60\times10^2 \text{ g}\cdot\text{m/s}$

$m_2 = 55.0 \text{ g}$
$\vec{v}_2 = -6.00 \text{ m/s}$
$\vec{p}_2 = -3.30\times10^2 \text{ g}\cdot\text{m/s}$

$\therefore \vec{p}_{\text{before}} = \vec{p}_1 + \vec{p}_2 = 3.00\times10^1 \text{ g}\cdot\text{m/s}$

after collision

$m = m_1 + m_2 = 95.0 \text{ kg}$
$\vec{v} = ?$
$\vec{p} = \vec{p}_{\text{after}} = \vec{p}_{\text{before}} = 3.00\times10^1 \text{ g}\cdot\text{m/s}$

$$\vec{v} = \frac{\vec{p}}{m}$$
$$= \frac{3.00\times10^1 \text{ g}\cdot\text{m/s}}{95.0 \text{ g}}$$
$$= 0.316 \text{ m/s right}$$

**6.** before collision

$m = 76 \text{ kg}$
$v = 0$
$p = 0$
$\vec{p}_{\text{before}} = 0$

after collision


ball student

Consider left as negative

$m_o = 0.20 \text{ kg}$ $m_s = 76 \text{ kg}$
$\vec{v}_o = -22 \text{ m/s}$ $\vec{v}_s = ?$
$\vec{p}_o = -4.4 \text{ kg}\cdot\text{m/s}$ $\vec{p}_s = ?$

$\vec{p}_{\text{after}} = \vec{p}_{\text{before}} = 0$

$\vec{p}_{\text{after}} = \vec{p}_o + \vec{p}_s = 0$
$\vec{p}_s = 4.4 \text{ kg}\cdot\text{m/s}$

$$\vec{v}_s = \frac{\vec{p}_s}{m}$$
$$= \frac{4.4 \text{ kg}\cdot\text{m/s}}{76 \text{ kg}}$$
$$= 0.058 \text{ m/s right}$$

**7.** before collision

$m = 1.13\times10^3 \text{ kg}$
$v = 0$
$p = 0$
$\vec{p}_{\text{before}} = 0$

after collision


Consider east as positive

$m_L = 1.1\times10^3 \text{ kg}$ $m_P = 25 \text{ kg}$
$\vec{v}_L = ?$ $\vec{v}_P = 325 \text{ m/s}$
$\vec{p}_L = ?$ $\vec{p}_P = 8.13\times10^3 \text{ kg}\cdot\text{m/s}$

$\vec{p}_{\text{after}} = \vec{p}_{\text{before}} = 0$
$\vec{p}_{\text{after}} = \vec{p}_L + \vec{p}_P = 0$
$\vec{p}_L = -8.13\times10^3 \text{ kg}\cdot\text{m/s}$

$$\vec{v}_L = \frac{p_L}{m_L}$$
$$= \frac{-8.13\times10^3 \text{ kg}\cdot\text{m/s}}{1.1\times10^3 \text{ kg}}$$
$$= -7.4 \text{ m/s}$$
$$= 7.4 \text{ m/s west}$$

**8.** before collision

$m = ?$
$v = 0$
$p = 0$
$\vec{p}_{\text{before}} = 0$

after collision