Therefore

$\vec{p}_{\text{sys(before)}} = \vec{p}_{\text{R}}$
$= 8.71\times10^4 \text{ kg}\cdot\text{km/h } 36.5° \text{ W of N}$

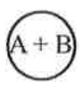
Again $\vec{p} = \vec{p}_{\text{sys(after)}} = \vec{p}_{\text{sys(before)}} = \vec{p}_{\text{R}}$

$$\vec{v} = \frac{\vec{p}}{m} = \frac{8.71\times0^4\text{kg}\cdot\text{km/h } 36.5° \text{ W of N}}{3.4\times10^3 \text{ kg}} = 26 \text{ km/h } 37° \text{ W of N}$$

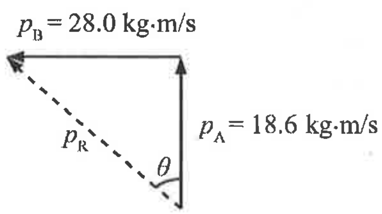
2. before collision

$m_{\text{A}} = 6.2$ kg
$\vec{v}_{\text{A}} = 3.0$ m/s north
$\vec{p}_{\text{A}} = 18.6$ kg · m/s north
$m_{\text{B}} = 8.0$ kg
$\vec{v}_{\text{B}} = 3.5$ k · m/s west
$\vec{p}_{\text{B}} = 28.0$ kg · m/s west

after collision



$m = m_{\text{A}} + m_{\text{B}} = 14.2$ kg
$\vec{v} = ?$
$\vec{p} = ?$



$$p_{\text{R}} = \sqrt{p_{\text{A}}^2 + p_{\text{B}}^2} = \sqrt{(18.6 \text{ kg}\cdot\text{m/s})^2 + (28.0 \text{ kg}\cdot\text{m/s})^2} = 33.6 \text{ kg}\cdot\text{m/s}$$

$$\tan\theta = \frac{p_{\text{B}}}{p_{\text{A}}} = \frac{28.0 \text{ kg}\cdot\text{m/s}}{18.6 \text{ kg}\cdot\text{m/s}} = 1.51$$

$\theta = 56.4°$
$\doteq 56°$

$\vec{p} = \vec{p}_{\text{R}} = 33.6$ kg·m/s 56° W of N

$$\vec{v} = \frac{\vec{p}}{m} = \frac{33.6 \text{ kg}\cdot\text{m/s } 56° \text{ W of N}}{14.2 \text{ kg}}$$

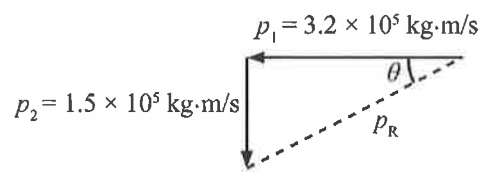
$= 2.4$ m/s 68° W of N
56°

3. before collision

$m_1 = 4.0\times10^4$ kg
$\vec{v}_1 = 8.0$ m/s west
$\vec{p}_1 = 3.2\times10^5$ kg · m/s west
$m_2 = 3.0\times10^4$ kg
$\vec{v}_2 = 5.0$ m/s south
$\vec{p}_2 = 1.5\times10^5$ kg · m/s south

after collision

$m = m_1 + m_2 = 7.0\times10^4$ kg
$\vec{v} = ?$
$\vec{p} = ?$



$$p_{\text{R}} = \sqrt{p_1^2 + p_2^2} = \sqrt{(3.2\times10^5 \text{ kg}\cdot\text{m/s})^2 + (1.5\times10^5 \text{ kg}\cdot\text{m/s})^2} = 3.53\times10^5 \text{ kg}\cdot\text{m/s}$$

$$\tan\theta = \frac{p_2}{p_1} = \frac{1.5\times10^5 \text{ kg}\cdot\text{m/s}}{3.2\times10^5 \text{ kg}\cdot\text{m/s}} = 0.469$$

$\theta = 25°$

$\vec{p} = \vec{p}_{\text{R}} = 3.53\times10^5$ kg · m/s 26° S of W

$$\vec{v} = \frac{\vec{p}}{m} = \frac{3.53\times10^5 \text{ kg}\cdot\text{m/s } 26° \text{ S of W}}{7.0\times10^4 \text{ kg}}$$

$= 5.0\times$ ~~10^4~~ m/s 25° S of W