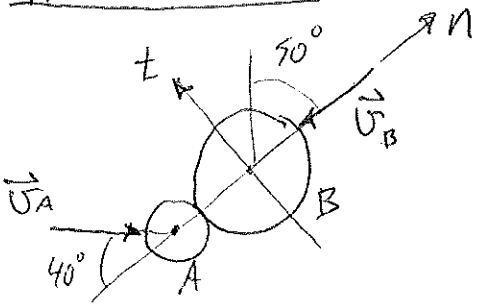
PROB. 13-165



$m_A = 0.6\ kg$, $v_A = 6\ \frac{m}{s}$

$m_B = 1.0\ kg$, $v_B = 4\ \frac{m}{s}$, $e = 0.8$

IF NO FRICTION, FIND v_A', v_B'

t-AXIS: MOMENTUM OF EACH PARTICLE IS CONSERVED

$$(v_A')_t = (v_A)_t = -v_A \cdot \sin 40^\circ = -6 \sin 40^\circ = -3.857\ \frac{m}{s}$$

$$(v_B')_t = 0$$

n-AXIS: CONSERVE MOMENTUM OF BOTH PARTICLES

$$m_A (v_A)_n + m_B (v_B)_n = m_A (v_A')_n + m_B (v_B')_n$$

$$(v_A')_n = \frac{1}{m_A}\left[m_A (v_A)_n + m_B (v_B)_n - m_B (v_B')_n\right]$$

$$(v_A')_n = (v_A)_n + \frac{m_B}{m_A}\left[(v_B)_n - (v_B')_n\right]$$

$$(v_A')_n = \left(4.596\ \tfrac{m}{s}\right) + \frac{(1\ kg)}{(0.6\ kg)} \cdot \left[\left(-4.0\ \tfrac{m}{s}\right) - (v_B')_n\right]$$

$$(v_A')_n = -2.070 - 1.667\,(v_B')_n$$

RESTITUTION:

$$(v_B')_n - (v_A')_n = e\left[(v_A)_n - (v_B)_n\right]$$

$$(v_B')_n = (v_A')_n + 0.8\left[(4.596) - (-4.0)\ \tfrac{m}{s}\right]$$

$$(v_B')_n = (v_A')_n + 6.877$$

$$(v_A')_n = -2.070 - 1.667\left[(v_A')_n + 6.877\right]$$

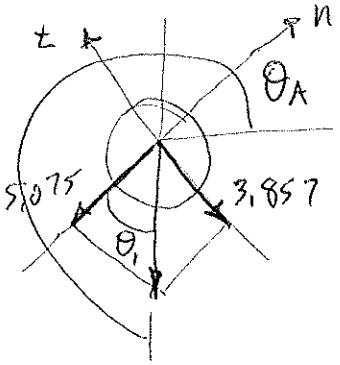
PROB. 13-165 CONT

$2.667(v_A')_n = -13.53$

$\boxed{(v_A')_n = -5.075 \frac{m}{s}}$

$\boxed{(v_B')_n = -5.075 + 6.877 = 1.802 \frac{m}{s}}$

BALL A:



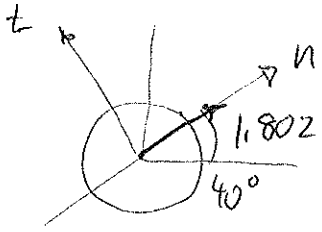
$(v_A')_t = -3.857$, $(v_A')_n = -5.075$

$\boxed{v_A' = 6.374 \frac{m}{s}}$

$\theta_1 = TAN^{-1}\left(\frac{3.857}{5.075}\right) = 37.23°$

$\theta_A = 180 + 40 + 37.23 \boxed{= 257.2°}$

BALL B:



$\boxed{v_B' = 1.802 \frac{m}{s}}$

$\boxed{\theta_B = 40°}$