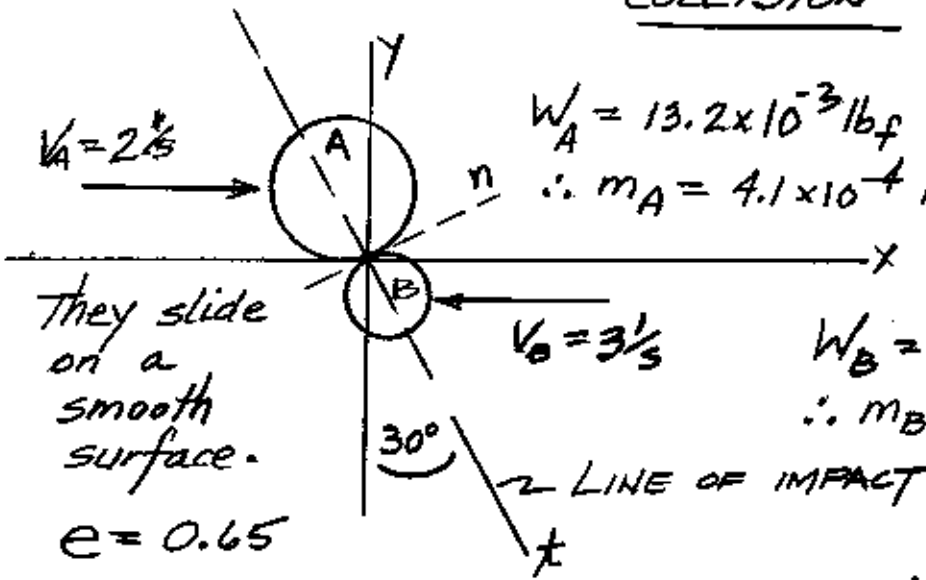
HIBBELER

COLLISION

15-84



$W_A = 13.2\times10^{-3}$ lbf
$\therefore m_A = 4.1\times10^{-4}$ lbm

$W_B = 6.6\times10^{-3}$ lbf
$\therefore m_B = 2.05\times10^{-4}$ lbm

They slide on a smooth surface.

$e = 0.65$

Do ANALYSIS ALONG LINE of IMPACT FIRST.

$$e = 0.65 = \frac{(V_{Bf} - V_{Af})}{(V_{Ai} - V_{Bi})} = \frac{V_{Bf} - V_{Af}}{2\sin 30° - (-3\sin 30°)}$$

↑ LEFT

$$\therefore V_{Bf} - V_{Af} = .65(1 + 1.5) = 1.625$$

CONSERVATION of MOMENTUM: $m_A V_{A_i} + m_B V_{B_i} = m_A V_{Af} + m_B V_{Bf}$

$$(4.1\times10^{-4})(2\sin 30°) + (2.05\times10^{-4})(-3\sin 30°) = (4.1\times10^{-4})V_{Af} + (2.05\times10^{-4})[1.625 + V_{Af}]$$

$$1.0125\times10^{-4} - (2.05\times10^{-4})(1.625) = 6.15\times10^{-4} V_{Af}$$

$$-2.306\times10^{-4} = 6.15\times10^{-4} V_{Af}$$

$$\therefore V_{Af} = -0.375\ ft/s$$

$$\therefore V_{Bf} = 1.25\ ft/s$$

⊥ LINE OF IMPACT (n dir.)

$m_A V_{A_i} = m_A V_{Af}$

$V_{Af} = 2\cos 30° = 1.732\ ft/s$

$m_B V_{B_i} = m_B V_{Bf}$

$V_{Bf} = 3\cos 30° = 2.598$

$V_{Af} = \sqrt{(1.732)^2 + (-.375)^2} = 1.77\ ft/s$ $\quad 102° - 60 = 42°$

$V_{Bf} = \sqrt{(2.598)^2 + (1.25)^2} = 2.88\ ft/s$ $\quad 257° - 60 = -34°$