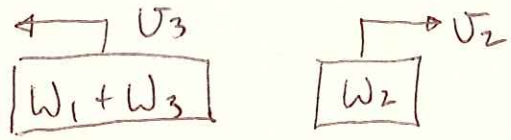
PROB. 14-3

$W_1 = 180^{LB}$, $W_2 = 120^{LB}$, $W_3 = 300^{LB}$

RELATIVE VELOCITY = $16 \frac{ft}{s}$

a) WOMAN DIVES FIRST



$$m\bar{v} = \Sigma m_i \vec{v}_i$$

$$0 = \left(\frac{W_1}{g} + \frac{W_3}{g}\right)\vec{v}_3 + \left(\frac{W_2}{g}\right)\vec{v}_2$$

$$(W_1 + W_3)(-v_3)\hat{i} + W_2(v_2)\hat{i} = 0$$

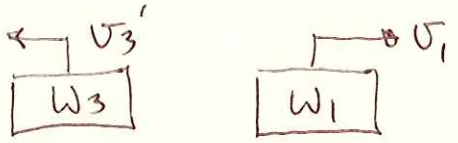
$$\vec{v}_2 = \vec{v}_3 + \vec{v}_{2/3} \;:\; (v_2)\hat{i} = (-v_3)\hat{i} + (16)\hat{i}$$

$$v_2 = 16 - v_3$$

$$(W_1 + W_3)v_3 + W_2(16 - v_3) = 0$$

$$v_3 = \frac{16W_2}{(W_1 + W_2 + W_3)} = \frac{16(120)}{(180 + 120 + 300)} = 3.20 \frac{ft}{s} \leftarrow$$

MAN DIVES SECOND:



$$m\bar{v} = \Sigma m_i \vec{v}_i$$

$$\left(\frac{W_1}{g} + \frac{W_3}{g}\right)\vec{v}_3 = \left(\frac{W_1}{g}\right)\vec{v}_1 + \left(\frac{W_3}{g}\right)\vec{v}_3'$$

$$(W_1 + W_3)(-v_3)\hat{i} = (W_1)(v_1)\hat{i} + (W_3)(-v_3')\hat{i}$$

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PROB. 14-3 CONT.

$$\vec{v}_1 = \vec{v}_3' + \vec{v}_{1/3}' \;:\; (v_1)\hat{i} = (-v_3')\hat{i} + (16)\hat{i}$$

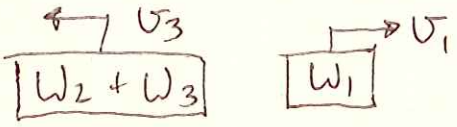
$$v_1 = 16 - v_3'$$

$$(W_1 + W_3)(-v_3) = W_1(16 - v_3') + W_3(-v_3')$$

$$v_3' = \frac{(W_1 + W_3)v_3 + 16W_1}{(W_1 + W_3)} = \frac{(180 + 300)(3.2) + (16)(180)}{(180 + 300)}$$

$$\boxed{v_3' = 9.2 \ \frac{ft}{s} \leftarrow}$$

b) MAN DIVES FIRST



$$0 = \left(\frac{W_2}{g} + \frac{W_3}{g}\right)(-v_3)\hat{i} + \left(\frac{W_1}{g}\right)(v_1)\hat{i}$$

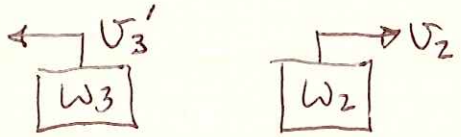
$$\vec{v}_1 = \vec{v}_3 + \vec{v}_{1/3} \;:\; (v_1)\hat{i} = (-v_3)\hat{i} + (16)\hat{i}$$

$$v_1 = 16 - v_3$$

$$0 = -(W_2 + W_3)v_3 + W_1(16 - v_3)$$

$$v_3 = \frac{16W_1}{(W_1 + W_2 + W_3)} = \frac{16(180)}{(180 + 120 + 300)} = 4.80 \ \frac{ft}{s} \leftarrow$$

WOMAN DIVES SECOND:



$$\left(\frac{W_2}{g} + \frac{W_3}{g}\right)(-v_3)\hat{i} = \left(\frac{W_3}{g}\right)(-v_3')\hat{i} + \left(\frac{W_2}{g}\right)(v_2)\hat{i}$$

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PROB. 14-3 CONT.

$$\vec{v}_2 = \vec{v}_3' + \vec{v}_{2/3}' \;:\; v_2 = 16 - v_3'$$

$$(w_2 + w_3)(-v_3) = (w_3)(-v_3') + (w_2)(16 - v_3')$$

$$v_3' = \frac{(w_2 + w_3)v_3 + 16 w_2}{(w_2 + w_3)} = \frac{(120 + 300)(4.8) + 16(120)}{(120 + 300)}$$

$$\boxed{v_3' = 9.371 \ \frac{ft}{s} \leftarrow}$$

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