

9.23. Model: We assume that the momentum is conserved in the collision.

Visualize: Please refer to Figure EX9.23.

Solve: The conservation of momentum equation yields

$$(p_{\text{ix}})_1 + (p_{\text{ix}})_2 = (p_{\text{ix}})_1 + (p_{\text{ix}})_2 \Rightarrow (p_{\text{ix}})_1 + 0 \text{ kg m/s} = 2 \text{ kg m/s} - 4 \text{ kg m/s} \Rightarrow (p_{\text{ix}})_1 = -2 \text{ kg m/s}$$

$$(p_{\text{iy}})_1 + (p_{\text{iy}})_2 = (p_{\text{iy}})_1 + (p_{\text{iy}})_2 \Rightarrow (p_{\text{iy}})_1 - 1 \text{ kg m/s} = 2 \text{ kg m/s} + 1 \text{ kg m/s} \Rightarrow (p_{\text{iy}})_1 = 4 \text{ kg m/s}$$

Thus, the final momentum of particle 1 is $(-2\hat{i} + 4\hat{j})$ kg m/s.