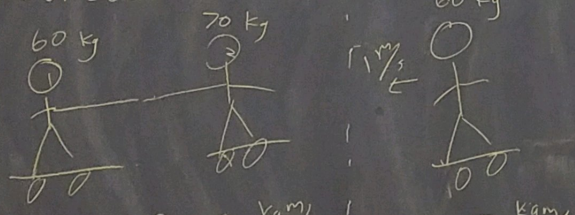
Conservation of momentum

$p_0 = p_f$

initial momentum = final momentum

Remember, momentum is a vector. The direction matters.

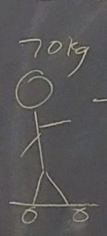


$p_0 = 0$ kgm/s ; $p_f = 0$ kgm/s

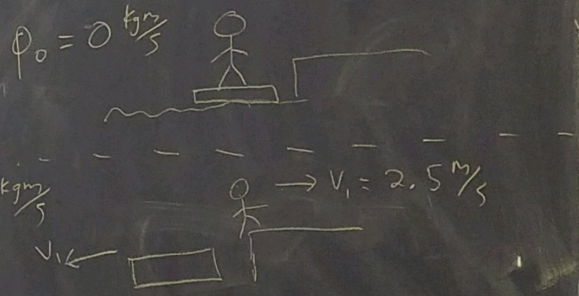
$m_1 v_1 = m_2 v_2$

$(60\text{kg})(1\text{ m/s}) = (70\text{kg})\, v_2$

$v_2 = 0.86$ m/s



A 76 kg boater, initially at rest in a stationary 45 kg boat, steps out of the boat with a velocity of 2.5 m/s to the right, what is the velocity of the boat?



$p_f = 0$ $p_1 \leftarrow$  $\rightarrow p_2$

$p_1 = p_2$ $\quad m_1 v_1 = m_2 v_2$

$(45\ kg)v_1 = (76\ kg)(2.5\ m/s)$

$v_1 = \frac{190\ kg\,m/s}{45\ kg} =$ **4.2 m/s to the left**

Mass	kg	(kilogram)
Displacement/Distance	m	(meter)
time	s	(second)
Velocity/speed	m/s	
acceleration	m/s^2	
Force	N	(Newton)
Work/Energy	J	(Joules)
momentum	kgm/s	
Power	W	(watts)

Classwork

1. A 44 kg student on skates throws a 22kg exercise ball. Both were at rest, then after throwing the ball, the student glides back at 3.5 m/s. What is the velocity of the ball?
2. Two objects have a head on collision, if you know the change in momentum of one object, can you find the change in momentum of the other object?
3. A boy on skates at rest tosses a 8.0 kg jug of water 3.0 m/s forward. The boy moves in the opposite direction at 0.60 m/s. What is the mass of the boy?