Task:

A 75.9 kg person throws a 0.059 kg snowball forward with a ground speed of 31.5 m/s. A second person, of mass 65 kg, catches the snowball. Both people are on skates. The first person is initially moving forward with a speed of 2.36 m/s, and the second person is initially at rest.
What is the velocity of the first person immediately after the snowball is thrown? Disregard friction between the skates and the ice.
Answer in units of m/s

Solution:

$M_1 = 75.9 \, kg,$

$V_1 = 2.36 \dfrac{m}{s}$

$m_1 = 0.059 \, kg,$

$v_1 = 31.5 \dfrac{m}{s},$

$M_2 = 65 \, kg,$

$V_2 = 0 \dfrac{m}{s}$

$(M_1 + m_1)V_1 = M_1 V_1' + m_1 v_1$

$$V_1' = \frac{(M_1 + m_1)V_1 - m_1 v_1}{M_1} = \frac{(75.9 \, kg + 0.059 \, kg) \cdot 2.36 \frac{m}{s} - 0.059 \, kg \cdot 31.5 \frac{m}{s}}{75.9 \, kg} = 2.337 \frac{m}{s}$$

Answer:

$V_1' = 2.337 \dfrac{m}{s}$