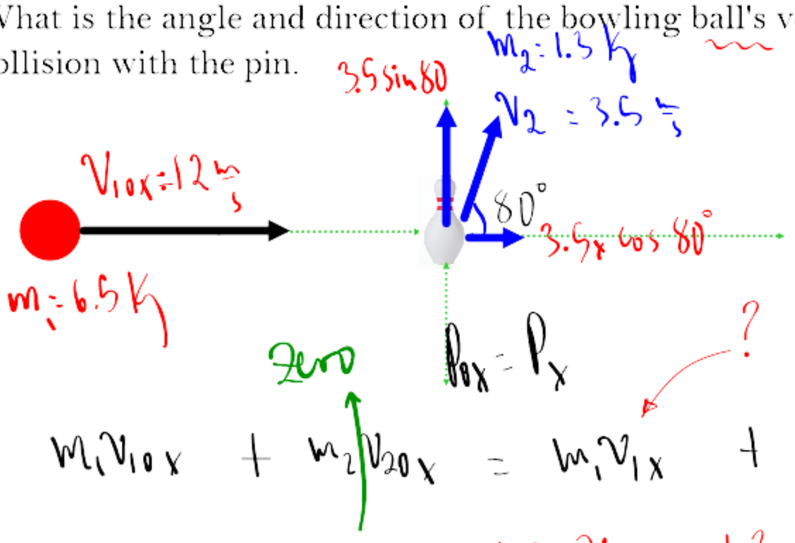
Test Review # 5

3/05/24 6:33 am

In order to complete a tough "split" in bowling, a bowling ball of mass 6.5 kg is rolled with a velocity of 12 m/s. The ball hits a 1.3 kg bowling pin, sending it off with a speed of 3.5 m/s at an angle of 80 degrees with respect to the original direction of the bowling ball. What is the angle and direction of the bowling ball's velocity after the collision with the pin.




Zero

$p_{ox} = p_x$ ?

$m_1 v_{1ox} + m_2 v_{2ox} = m_1 v_{1x} + m_2 v_{2x}$

$6.5 \times 12 = 6.5 \cdot v_{1x} + 1.3 \times 3.5 \times \cos(80°)$

$78 = 6.5\, v_{1x} + 0.79$

$\frac{78 - 0.79}{6.5} = v_{1x} = 11.9 \frac{m}{s}$

$p_{oy} = p_y$

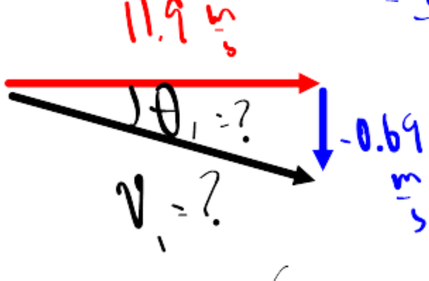
$m_1 v_{1oy} + m_2 v_{2oy} = m_1 v_{1y} + m_2 v_{2y}$

Zero

$0 = 6.5 \cdot v_{1y} + 1.3 \times 3.5 \times \sin(80°)$

$0 = 6.5\, v_{1y} + 4.48$

$\frac{-4.48}{6.5} = v_{1y} = -0.69 \frac{m}{s}$




$v_1^2 = v_{1x}^2 + v_{2x}^2$

$v_1 = \sqrt{11.9^2 + 0.69^2} \approx 11.9 \frac{m}{s}$

$\theta_1 = \tan^{-1}\left(\frac{v_y}{v_x}\right)$

$\theta = \tan^{-1}\left(\frac{-0.69}{11.9}\right) = -3.32°$ SfE