Pistol firing

Calculate the recoil speed of a pistol (mass 0.90 kg) given that the bullet has mass 8.0 g and emerges from the pistol with a speed of 352 ms\(^{-1}\). Assume the momentum of the exhaust gas is negligible.

**Solution:** Before firing the momentum is zero

\[ p_i = 0 \]

The only forces acting are internal forces, so the total momentum doesn't change. Hence

\[ p_i = p_f = 0 = m_Bv_B + m_Pv_P \]

\[ = +0.008 \times 352 + 0.9v_P \]

so

\[ v_P = \frac{-0.008 \times 352}{0.9} = -3.1 \text{ ms}^{-1} \]

(the negative sign tells us the pistol recoils to the right).