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cannon. Given  $m_1 = 500 \text{ kg}$  and  $m_2 = 2 \text{ kg}$   
Initial Velocities, Velocity of cannon ( $u_1$ ) =  $0 \text{ m/s}$  Velocity of cannon ball ( $u_2$ ) =  $0 \text{ m/s}$   
Final Velocities, Velocity of cannon ( $v_1$ ) =  $0 \text{ m/s}$  Velocity of cannon ball ( $v_2$ ) =  $200 \text{ m/s}$   
Using the law of conservation of momentum  $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$   
 $(500)(0) + (2)(0) = (500)(v_1) + 2(200)$   
 $-400 = 500v_1$   
 $v_1 = -0.8 \text{ m/s}$  (here, - sign indicates that the recoil motion of the cannon is opposite to the motion of the cannon ball)  
Thus, the cannon gun will recoil at a speed of  $0.8 \text{ m/s}$  after firing the cannon.  
Find the velocity of a bullet of mass  $8 \text{ grams}$  when fired from a pistol of mass  $2.4 \text{ kg}$ . (Recoil velocity of the pistol is  $1 \text{ m/s}$ )  
Mass of Bullet,  $m_1 = 8 \text{ gram} = 0.008 \text{ kg}$   
Mass of Pistol,  $m_2 = 2.4 \text{ kg}$   
Initial velocity of the bullet,  $u_1 = 0$   
Initial Recoil velocity of a pistol,  $u_2 = 0$   
Velocity of a bullet,  $v_1 = ?$   
Recoil Velocity of pistol,  $v_2 = 1 \text{ m/s}$   
Using the law of conservation of momentum,  $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$   
 $(0.008)(0) + (2.4)(0) = (0.008)(v_1) + (2.4)(1.5)$   
 $0 = (0.008)(v_1) + 3.6$   
 $(0.008)(v_1) = -3.6$   
 $v_1 = -3.6 / (0.008) = -450 \text{ m/s}$   
Hence, the recoil velocity of the pistol is  $450 \text{ m/s}$