

a) $\vec{J} = F \Delta t$

$F = 55 \text{ N}$

$t = 1.0 \text{ ms} \times \frac{1 \text{ s}}{1000 \text{ ms}} = 0.001 \text{ s}$

$J = 55 (0.001)$

$\vec{J} = 0.055 \text{ N}\cdot\text{s} \rightarrow \boxed{5.5 \times 10^{-2} \text{ N}\cdot\text{s} = \text{J}}$

10) $m_1 v_1 + m_2 v_2 = m_3 v_3$

$m_1 = 55 \text{ kg} (53+2)$

$m_2 = 45 \text{ kg}$

$v_1 = 1.6 \text{ m/s}$

$v_2 = 0$

$m_3 = 55 + 45 = 100 \text{ kg}$

$(55 \text{ kg})(1.6) = (100 \text{ kg})(v_3)$

$\frac{88}{100} = \frac{100 v_3}{100}$

$\boxed{0.88 \text{ m/s} = v_3}$

Formulas

$F = ma$

$p = mv$

$\Delta p = F \Delta t$

$p = \text{kg}\cdot\text{m/s}$

$\Delta p = \text{N}\cdot\text{s}$

1) $F = 1.16 \times 10^2 \text{ N}$

$m = 5.8 \times 10^3 \text{ kg}$

$a = ?$

$\frac{1.16 \times 10^2}{5.8 \times 10^3} = \frac{5.8 \times 10^3 (a)}{5.8 \times 10^3}$

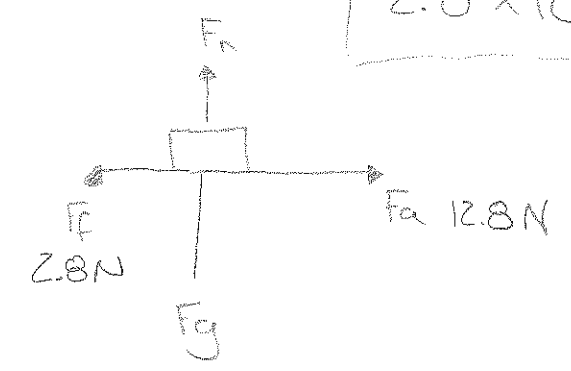
$0.02 = a$

$\boxed{0.02 \text{ m/s}^2 = a}$

$\boxed{2.0 \times 10^{-2} \text{ m/s}^2 = a}$

2) $F = ma$

$m = 5.0 \text{ kg}$



$F_{\text{net}} = F_a - F_f$

$12.8 - 2.8 = 10 \text{ N}$

$\boxed{F_{\text{net}} = 10 \text{ N}}$

$F = ma$

$\frac{10 \text{ N}}{5.0 \text{ kg}} = \frac{(5.0 \text{ kg})(a)}{5.0 \text{ kg}}$

$\boxed{2.0 \text{ m/s}^2 = a}$

3) momentum: mass \cdot velocity $[\text{kg} \cdot \text{m/s}]$

\vec{J}
Impulse: force \cdot time $[\text{units N} \cdot \text{s}]$

From Newton's 2nd Law

$$F = ma \quad a = \frac{\Delta v}{\Delta t}$$

$$F = \frac{m \Delta v}{\Delta t} \rightarrow \Delta t \cdot F = \frac{m \Delta v}{\Delta t} \cdot \Delta t$$

$$J = \underbrace{F \Delta t}_{\text{impulse}} = \underbrace{m \Delta v}_{\text{momentum}} = \Delta p$$

4) $p = m \Delta v$

$$m = 100 \text{ kg}$$
$$v = 10 \text{ m/s}$$

$$p = (100)(10)$$

$$p = 1000 \text{ kg} \cdot \text{m/s}$$

5) $\vec{J} = F \Delta t = m \Delta v$

$$m = 46 \text{ g} = 0.046 \text{ kg}$$

$$\Delta v = 60 \text{ m/s}$$

$$J = (0.046)(60)$$

$$J = 2.76 \text{ N} \cdot \text{s}$$

6) $v = ?$

$$m = 0.010 \text{ kg}$$

$$p = 0.25 \text{ kg} \cdot \text{m/s}$$

$$p = m \Delta v$$

$$0.25 = (0.010)(v)$$

$$\div 0.01 \quad \div 0.010$$

$$25 = v \quad \boxed{v = 25 \text{ m/s}}$$

revised
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27

7) For every action, there is an equal and opposite reaction \rightarrow The reaction force on the rifle accelerates it into the shoulder

$$8) m_1 v_1 + m_2 v_2 = m_3 v_3$$

$$m_1 = 0.250 \text{ kg}$$

$$m_2 = 0.300 \text{ kg}$$

$$v_1 = 5.0 \text{ m/s}$$

$$v_2 = 2.0 \text{ m/s}$$

$$m_3 = 0.550 \text{ kg}$$

$$v_3 = ?$$

$$(0.250)(5.0) + (0.300)(2.0) = (0.550)(v_3)$$

$$1.25 + 0.6 = (0.550)(v_3)$$

$$1.85 = 0.550 v_3$$

$$\div 0.550 \quad \div 0.550$$

$$3.36 = v_3$$

$$\boxed{v_3 = 3.4 \text{ m/s}}$$