



PROBLEM SOLUTIONS



1. Use ratio $4000/1 = 150 \text{ lbs/lb}$ $x = 0.0375 \text{ lbs} \times 16 \text{ oz/lb} = 0.6 \text{ oz}$ (About a third the mass of an average empty aluminum pop can.)

2. $M = \text{mass} \times \text{velocity}$ $M_{\text{train}} = 6500 \text{ tons} \times 40 \text{ mph} = 260,000 \text{ tons mph}$

Therefore $260,000 \text{ tons mph} = 2 \text{ tons} \times v_{\text{car}}$

 $V_{\text{car}} = 130,000 \text{ mph}$ Divide by speed of sound (1090 ft/sec or 747 mph) = 174 times greater than speed of sound.

3. Distance = velocity x time
Distance = $74 \text{ ft/sec} \times 16 \text{ sec} = 1184 \text{ ft}$. (3 3/4+ football fields)

4. Momentum before collision = momentum after collision
 $12,000 \text{ tons} \times 45 \text{ mph} = 12,002 \text{ tons} \times \text{velocity after}$ velocity after = 44.99 mph

5. Train Distance = velocity x time $500 \text{ ft} = 65.7 \text{ ft/sec} \times t$
 $t = 7.6 \text{ sec}$ for train to reach crossing.
Car Distance = $1/2 a \times t^2$ $50 \text{ ft} \times 2 = 5 \text{ ft/sec}^2 \times t^2$
 $t^2 = 20 \text{ sec}^2$ $t = 4.4 \text{ sec}$ to travel 50 ft
 $4.4 \text{ sec} + 4 \text{ sec wait time} = 8.4 \text{ sec}$
Call 911 as train reached crossing .8 sec before car.