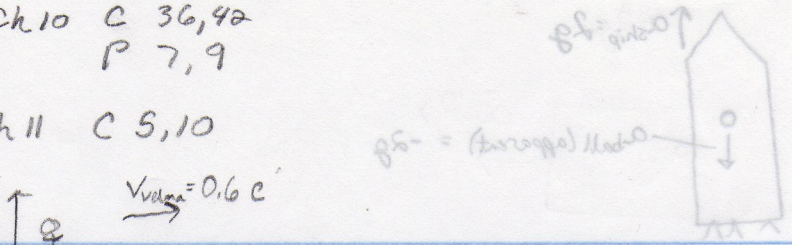
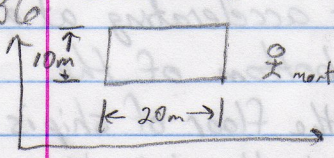
Ch 10 C 36, 42
P 7, 9

Ch 11 C 5, 10

Physics 107
Homework #6
10/25/06

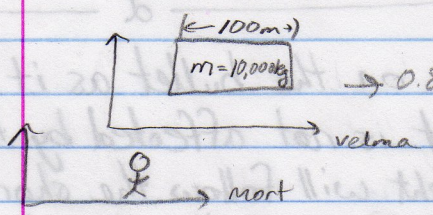



Ch10 C36




Velma's velocity is along the same direction as the length of the pool. There is no component to her velocity in the direction of the width of the pool (she is travelling perpendicular to the width). So, the width of the pool would not be affected but length would be. Velma would measure the width to be 10m. $L = \frac{L_p}{\gamma} = \left(\sqrt{1-\left(\frac{0.64}{4}\right)}\right)(20m) = (0.8)(20m) = \underline{16m \text{ long}}$.

C42.




Velma measures the rest mass and the proper length since the ship is at rest with respect to her. Mort will see the length contracted and a greater mass.

$L = \frac{L_p}{\gamma}$ $\quad m = \gamma m_0$ $\quad \gamma = \frac{1}{\sqrt{1-v^2/c^2}}$

$\gamma = 1/\sqrt{1-\left(\frac{0.8c}{c}\right)^2} = 1/\sqrt{1-(0.8)^2}$

$= 1/\sqrt{1-0.64} = 1/\sqrt{0.36} = 1/0.6$

$\gamma = 1.67$

$L = L_p/\gamma = 100m/1.67 = \underline{60m = L}$ as measured by Mort

$m = \gamma m_0 = (1.67)(10{,}000kg) = \underline{1.67\times10^4 kg = m}$

P 7. $E = 90J$ $\quad E = mc^2$ $\quad m = E/c^2 = 90J/(3\times10^8 m/s)^2$

$= 10^{-15} kg$

Its mass is increased by $10^{-15}$ kg.

P 9. $F_{per\,person} = 600N$ $\quad m_{0,shoe} = 0.5kg$ $\quad$ Energy = Work $\quad d = ?$

population = 300 Million people

$= 300\times10^6$ people $\quad = F\cdot d$

$= mc^2$

$F_{total} = F_{per\,person} \times Population$

$= (600N)(300\times10^6)$

$= 1.8\times10^{11} N$

$F_{total}\cdot d = m_{total} c^2$

$d = m_{tot} c^2 / F_{total}$

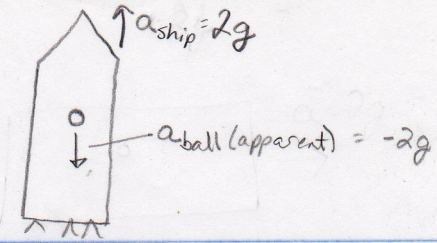
$= (1kg)(3\times10^8 m/s)^2 / 1.8\times10^{11} N$

$= 9\times10^{16} kg\,m^2/s^2 / 1.8\times10^{11} kg\,m/s^2$

$m_{total} = 2\times0.5kg$ (1 shoe + 1 anti-shoe)

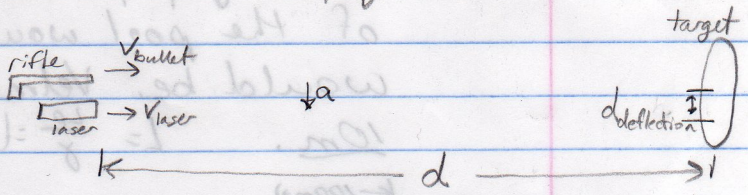
$= 1kg$

$\underline{d = 5\times10^5 m = 500km}$ !




Chap11 C5. $a_{ship} = 2g$ The ball will look like it is accelerating at a rate of 2g toward the bottom of the rocket ship. This is because the floor of ship is accelerating upward to meet the ball while the ball stays in the same location (see page 250.).

C10. $v_{bullet} \approx 100\ m/s$
$v_{laser} = c = 3 \times 10^8\ m/s$




Gravity is pulling downward on the bullet as it travels to the target. The laser light is not affected by the force of gravity. The laser light will follow the shortest path through spacetime. This path will be slightly curved because the mass of the Earth distorts spacetime. The spacetime distortion will be very small, so the curve of the light's path will be hardly noticeable compared to that of the bullet.