HW 1

① $F = G\frac{Mm}{r^2} \Rightarrow G = \frac{Fr^2}{Mm}$

$[F] = \frac{kg \cdot m}{s^2}$

$[M] = [m] = kg$

$[r^2] = m^2$

$$[G] = \left[\frac{Fr^2}{Mm}\right] = \frac{[F]\cdot[r^2]}{[M]\cdot[m]} = \frac{\left(\frac{kg\cdot m}{s^2}\right)\cdot(m^2)}{(kg)\cdot(kg)} = \frac{m^3}{s^2 kg}$$

HW 1

(2)

a) $1 \text{ hour} = (60)(60\text{ s}) = 3600\text{s}$

$1 \text{ mile} = 1609.3 \text{ m}$

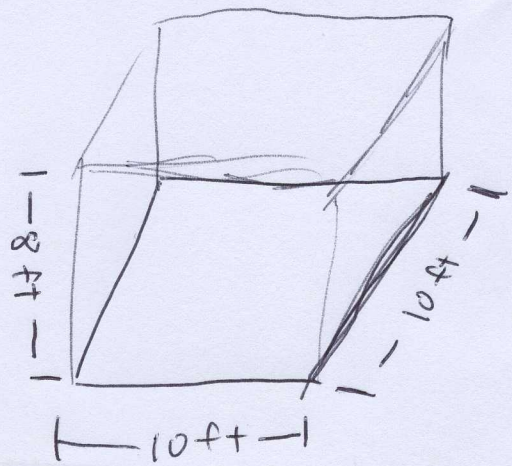
$$\left(3 \times 10^8 \frac{\text{m}}{\text{s}}\right)\left(\frac{1 \text{ mile}}{1609.3\text{m}}\right)\left(\frac{3600\text{s}}{1 \text{ hour}}\right) = 6.7 \times 10^8 \frac{\text{mile}}{\text{hour}}$$

b) $$\text{time} = \frac{\text{Distance}}{\text{Speed}} = \frac{93 \times 10^6 \text{ miles}}{6.7 \times 10^8 \frac{\text{mile}}{\text{hour}}} = .139 \text{ hours}$$

$\sim$ 8 minutes

HW 1

(3) Typical room



the rooms volume is $(10ft)\cdot(10ft)\cdot(8ft) = 800\,ft^3$

$$V_{room} = 800\,ft^3$$

A ping-pong ball's radius is 1 inch.

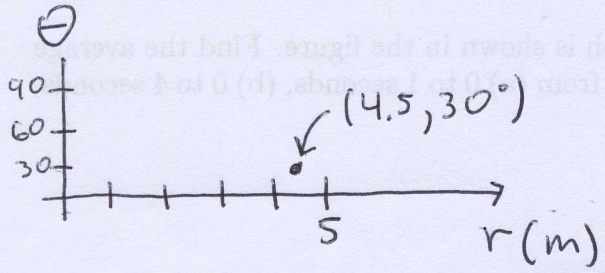
So the volume is

$$V_{ball} = \frac{4}{3}\pi\left(\frac{1}{12}ft\right)^3 = 2.4\times10^{-3}\,ft^3$$

$$N = \frac{V_{room}}{V_{ball}} = \frac{800\,ft^3}{2.4\times10^{-3}\,ft^3} \approx 3\times10^5 \text{ balls}$$

HW 1

(4)



to get x, y coordinates use

$$X = r\cos\theta = (4.5\,m)(\cos 30) = (4.5\,m)\left(\frac{\sqrt{3}}{2}\right) = 3.9\,m$$

$$y = r\sin\theta = (4.5m)(\sin 30) = (4.5m)\left(\frac{1}{2}\right) = 2.25\,m$$