SQ1: $F\Delta t = \Delta p$

$= mv_f - mv_i$

$= .05 \cdot 10 - .05 \cdot (-10)$

$= 1 \ \text{kg m/s}$

$= F \cdot .01\,\text{s}$

$\Rightarrow F = 1/.01 = \boxed{100\ \text{N}}$

SQ2: $p_0 = p_f$

$p_{1o} \longrightarrow \qquad p_{1f} \longleftarrow$

$p_{2o} \ \cdot \qquad p_{2f} \longrightarrow$

- $p_{2f} > p_{1o}$ to balance reversal of p_{1f}
- speed less, momentum more

SQ3: $\vec{p}_0 = \vec{p}_{1o} + \vec{p}_{2o}$ = $\rightarrow$ + $\uparrow$ = $\nearrow$

$\vec{p}_f = \vec{p}_0 = \ \downarrow + \ ?$

only **Case 4** works

SQ4: $p_0 = 30 \cdot 4 = 120\ \text{kg m/s}$

$= p_f = (30+10)v_f$

$\Rightarrow v_f = 120/40 = \boxed{3\ \text{m/s}}$

SQ5: Ball changes its momentum and therefore so does Earth

SQ6: $p_{oy} = 0 = p_{fy}$

$= 2 \cdot V_3 - 1 \cdot V_{2y} - 1 \cdot V_{1y}$

$V_{1y} = V_{2y} = 10 \cdot \cos(60°)$

$= 5$ m/s

$\Rightarrow \quad 2V_3 - 1 \cdot 5 - 1 \cdot 5 = 0$

or $2V_3 = 10$

$\boxed{V_3 = 5 \text{ m/s}}$

SQ7: $\alpha = -2/5$ rad/s²

$\omega^2 = \omega_0^2 + 2\alpha\Delta\theta$

$0 = 2^2 + 2 \cdot -2/5 \cdot \Delta\theta$

$= 4 - 4/5\,\Delta\theta$

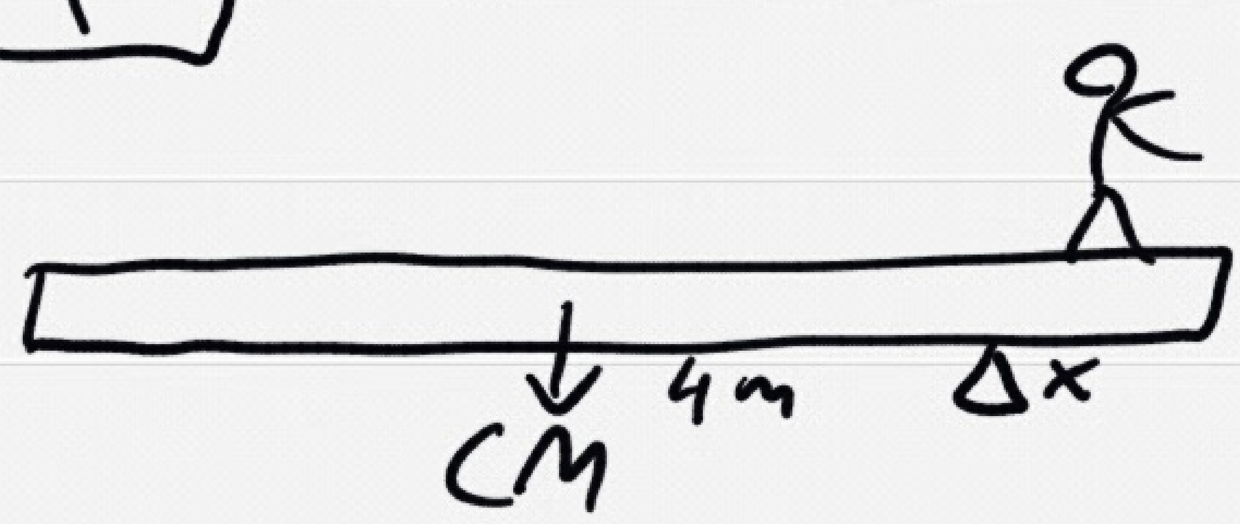
$\Rightarrow \boxed{\Delta\theta = 5 \text{ rad}}$

SQ8: $KE = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$

$= \frac{1}{2}mv^2 + \frac{1}{2}I\,v^2/r^2$

Hoop has most I, so most KE

SQ9:



$\Sigma\tau = 0$ so $\tau_{plank} = \tau_{person}$

$100 \cdot 4 = 800 \cdot \Delta x$

$\boxed{\Delta x = 0.5 \text{ m}}$

SQ10: $\omega = v/r = 8/0.4 = \boxed{20 \text{ rad/s}}$

SQ11: $a_c = v^2/r$

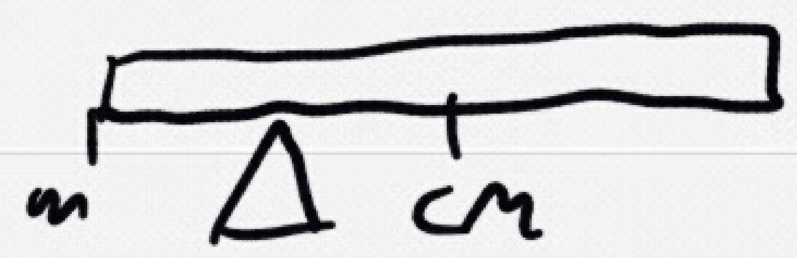
$v = \omega r$

$\Rightarrow a_c = \omega^2 r^2 / r = \omega^2 r$

$= 2^2 \cdot 1$

$= \boxed{4 \text{ m/s}^2}$

SQ12:



$\Sigma \tau = 0$

$\tau_m = \tau_{stick}$

$1 \, g \cdot 0.25 = m_p \cdot g \cdot 0.25$

$\Rightarrow \boxed{m_p = 1 \text{ kg}}$

SQ13: $E = \frac{1}{2} k A^2 = \frac{1}{2} k x_m^2$

$= \frac{1}{2} m v_m^2$

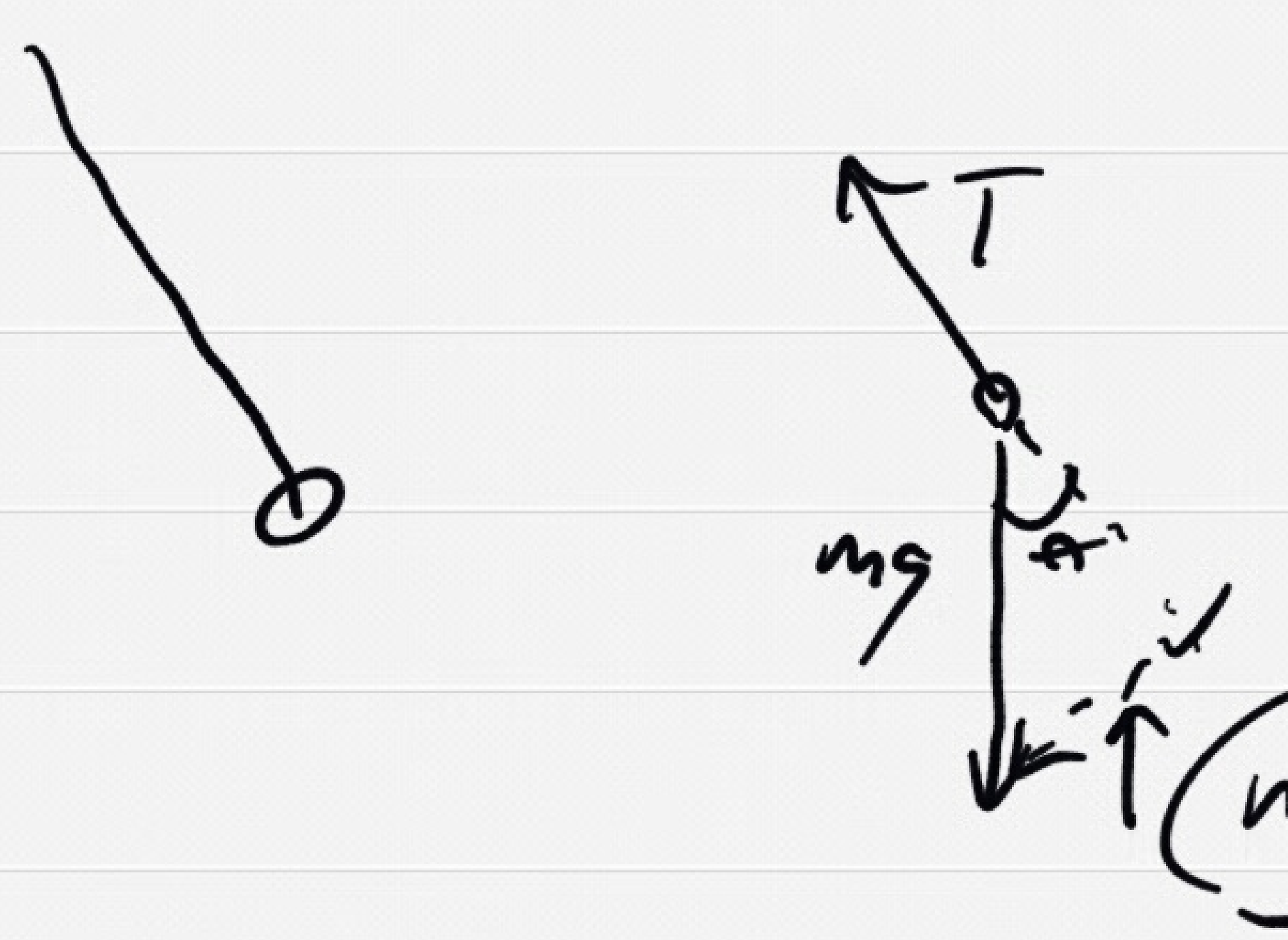
$E \rightarrow 2E$

$\Rightarrow \frac{1}{2} k A^2 \rightarrow 2 \cdot (\frac{1}{2} k A^2)$

$A^2 \rightarrow 2A^2$

$A \rightarrow \boxed{\sqrt{2} A}$

SQ14:



$\boxed{mg \sin\theta}$

SQ15: $E = \frac{1}{2} m v_m^2$

$= \frac{1}{2} \cdot 10 \cdot 10^2$

$= 500 \text{ J}$

$= \frac{1}{2} k x_m^2$

$= 2000 \, x_m^2$

$\Rightarrow x_m^2 = 500/2000 = 1/4$

$\boxed{x_m = \frac{1}{2} \text{ m}}$

SQ16: $E = KE + PE$

$= 3 + 2 = 5 \text{ J}$

@ $x = x_m$, $PE = E = \boxed{5 \text{ J}}$

SQ17: $\rho_{balloon} = m/V = 2/5 = 0.4$

$\rho_{balloon} < \rho_{air}$

balloon rises

SQ18: $P_1 = P_2$

$F_1/A_1 = F_2/A_2$

$F_2 = A_2/A_1 \; F_1$

$= r_2^2/r_1^2 \cdot F_1$

$= 10^2 \cdot 50 = 5000 \text{ N}$

$= mg$

$\Rightarrow \boxed{m = 500 \text{ kg}}$

SQ19: $P = P_1 + \rho g d = 10^3 \cdot 10 \cdot 10^4$

$= 10^8 \text{ Pa}$

$F = PA = 10^8 \cdot 100 = \boxed{10^{10} \text{ N}}$

SQ 20:

$F_B = T + W$

$T = F_B - W$

$W = 2 \cdot g = 20\ N$

$F_B = 5 \cdot g = 50\ N$

$T = 50 - 20 = \boxed{30\ N}$

SQ21: $F_B = M_{air} \cdot g$

$= \rho_{air} \cdot V \cdot g$

$= 1.3 \cdot 6 \times 10^{-3} \cdot 10$

$= \boxed{0.078}$

SQ22: $A_1 V_1 = A_2 V_2$

$A_2 = \frac{V_1}{V_2} \cdot A_1$

$= \frac{5}{20} A_1$

$= A_1 / 4$

$\pi r_2^2 = \pi r_1^2 / 4$

$r_2 = r_1 / 2$

$d_2 = d_1 / 2$

$= \boxed{3\ cm}$