$$a = \boxed{\frac{-u_1^2}{2d_1}}$$

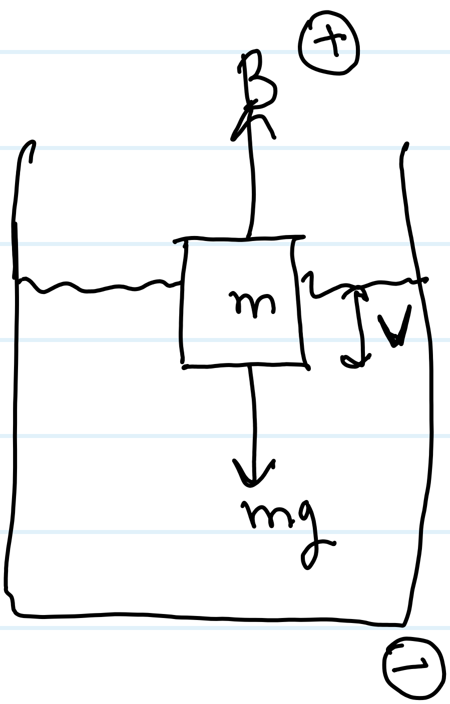
$$=$$

$$m \longrightarrow F(t) = F$$

$u = 0$

$$a = \frac{F}{m} \qquad s(t) = \frac{1}{2}\frac{F}{m}t^2$$

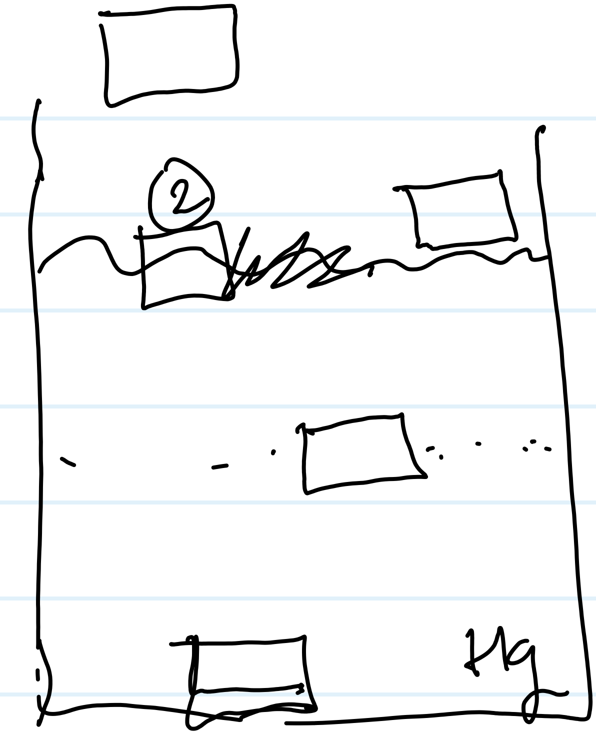
$$s \propto t^2$$

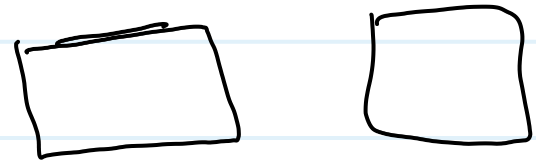


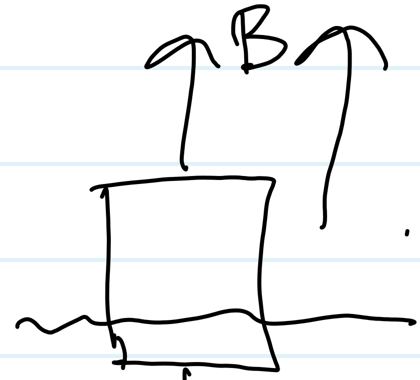
$$\boxed{F_{net} = B - mg \uparrow \; \oplus}$$

Float? $\Rightarrow F_{net} = 0$

$$\Rightarrow B = mg$$

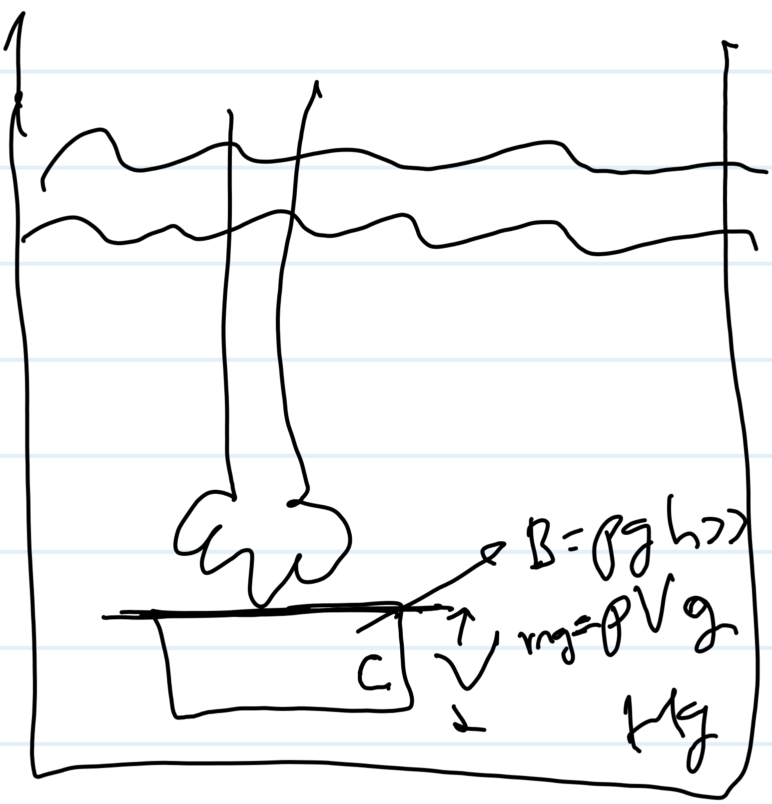


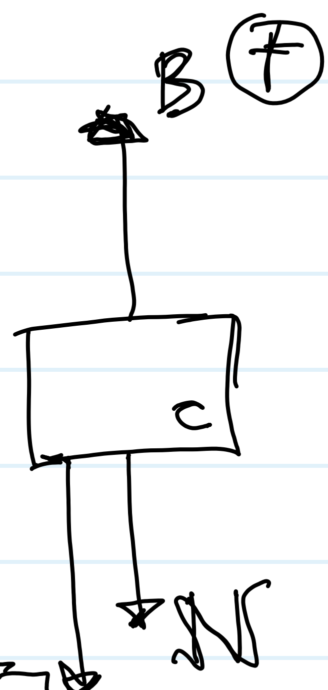




$B - mg > 0?$

mg





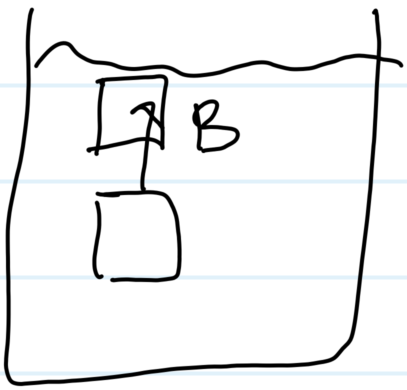
$$\boxed{F_{net} = B - mg - N}$$

mg

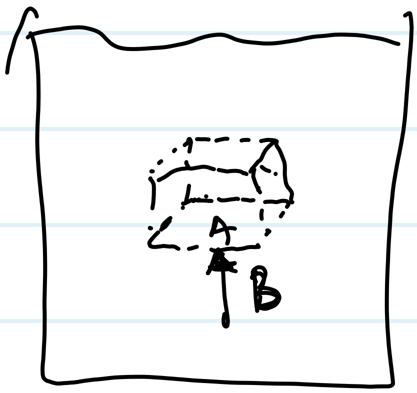
$\ominus$

$$\Rightarrow \boxed{B = mg + N \quad (>0)}$$

$$\Rightarrow \quad B \boxed{>} mg$$



$$B = \rho_L g V_L$$



$$V_{\text{Box inside liquid}} = V_{\text{liquid displaced}}$$

$$W = mg = V_{\text{Box}} \times g$$

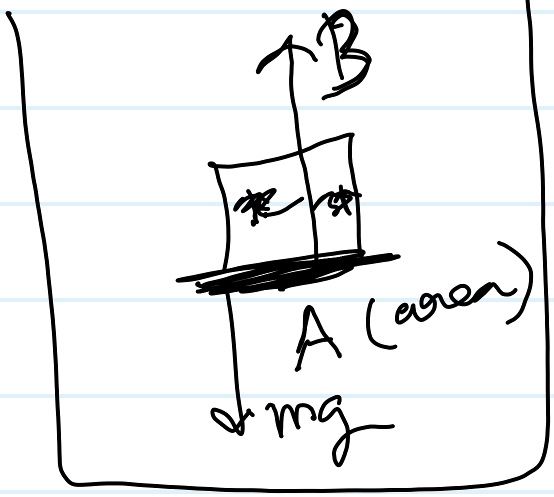
$$m = \rho V$$

$$\rho = \frac{m}{V}$$

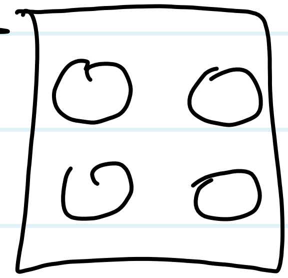
$g\,cc^{-1}$

$g\,ml^{-1}$

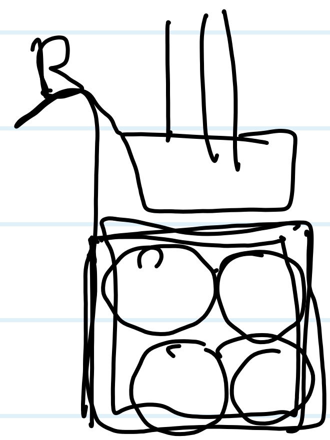
$kg\,m^{-3}$



$B =$



$P_B = \frac{F}{A}$

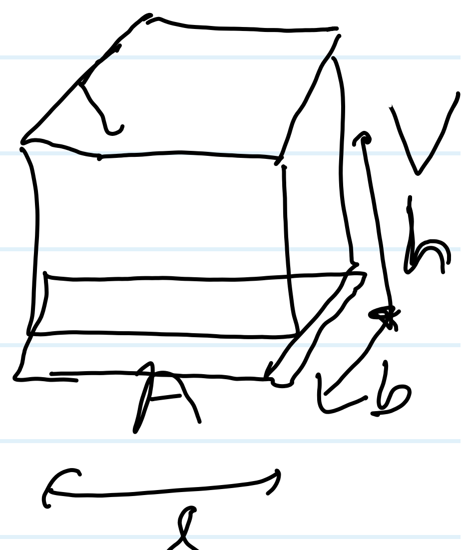


$P_B = \frac{B}{A}$

$$B = \rho_L V_L g$$

$$P_B = \frac{\rho_L V_L g}{A}$$

$$P_B = \rho_L \cdot g \cdot \frac{V_L}{A}$$



$$P_B = \rho_L g h$$

$V = l \times b \times h$

$\frac{V}{A} = \frac{l \times b \times h}{l \times b}$

$\boxed{B = \rho_L V_L g}$ $\quad \frac{V}{A} = h$

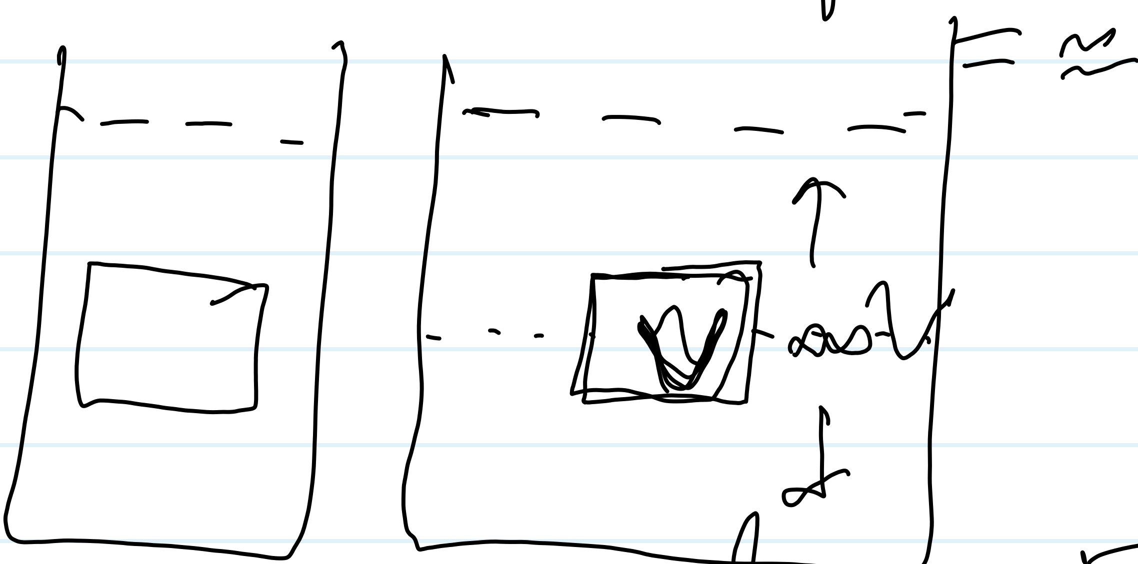
$\boxed{mg = \rho_m V_m g}$ $\quad \boxed{\rho_m = \frac{m}{V_m}}$

$B \; \ldots \; mg$

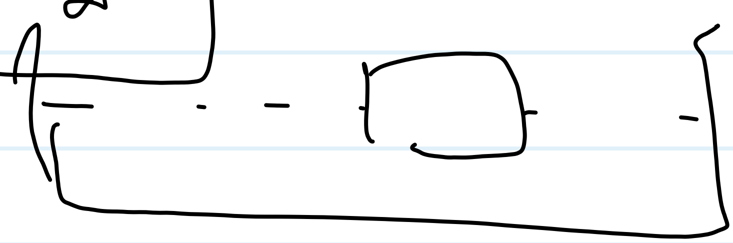
$\rho_L V_L g \; \ldots \; \rho_m V_m g$

$\rho_L V_L \qquad \rho_m V_m$

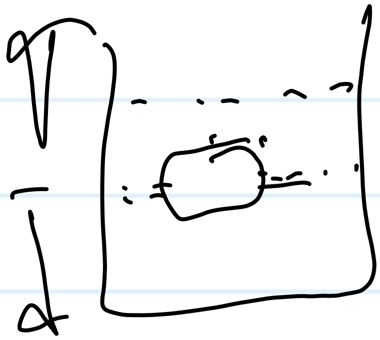
$\gg \uparrow \qquad \gg \downarrow$



V_m



$V_L = V_m$



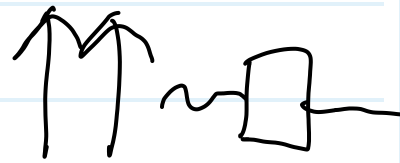
$V_L = V_m$

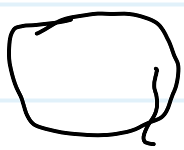
$\rho_L \quad \ldots \quad \rho_m$

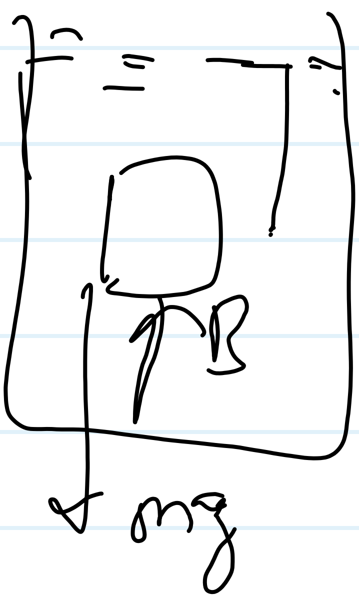
$B \quad \ldots \quad mg$

$\rho_L \boxed{V_L} g \quad \ldots \quad \rho_m V_m g$

$B > mg$ if $> \underline{\rho_m}$



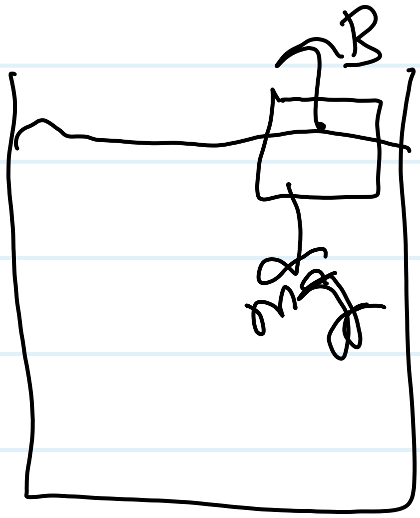




if $\rho_L > \rho_m$

$B > mg$

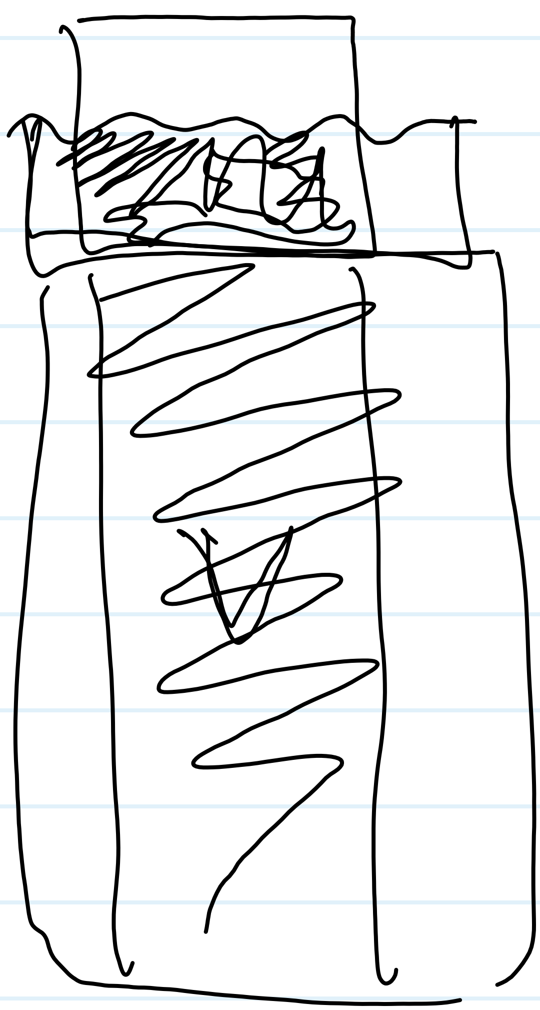
$\underline{\rho_L V_L g} \qquad \underline{\rho_m V_m g}$



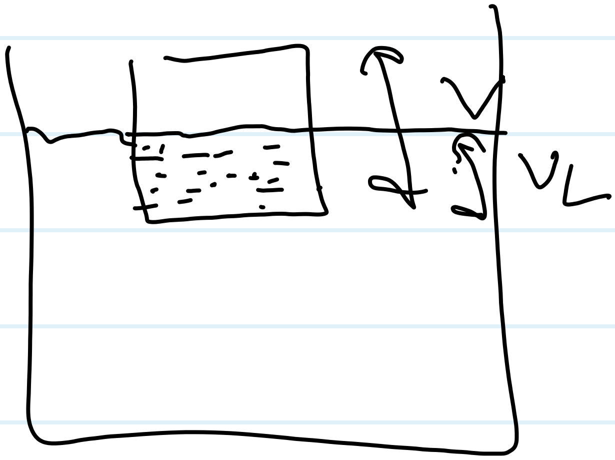
Float $\Rightarrow$ = um

$\Rightarrow F_{net} = 0$

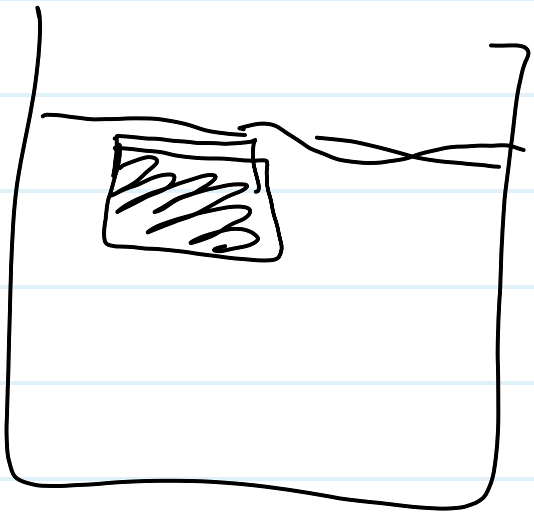
$\Rightarrow B = mg$



$V_L \quad V_m$

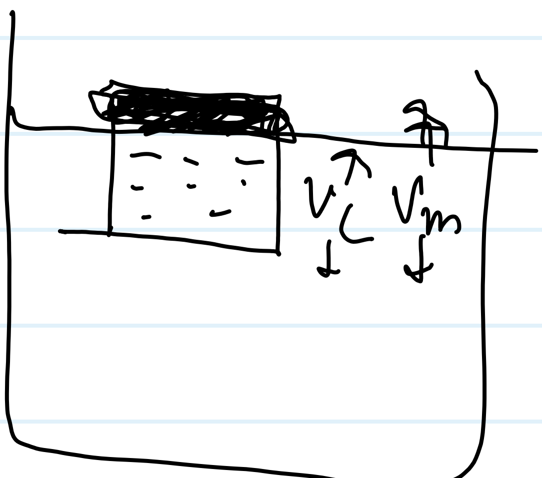


$V_L < V_m$



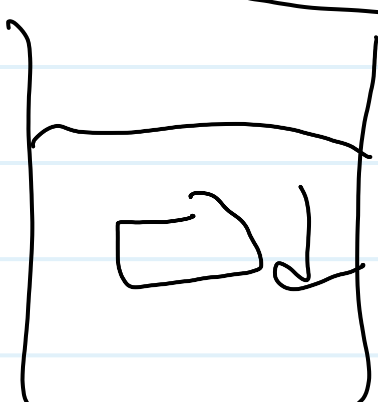
$V_L = V_m$

$B > mg$ ↑

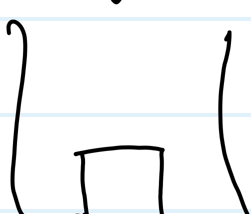


$\rho_L \; g$

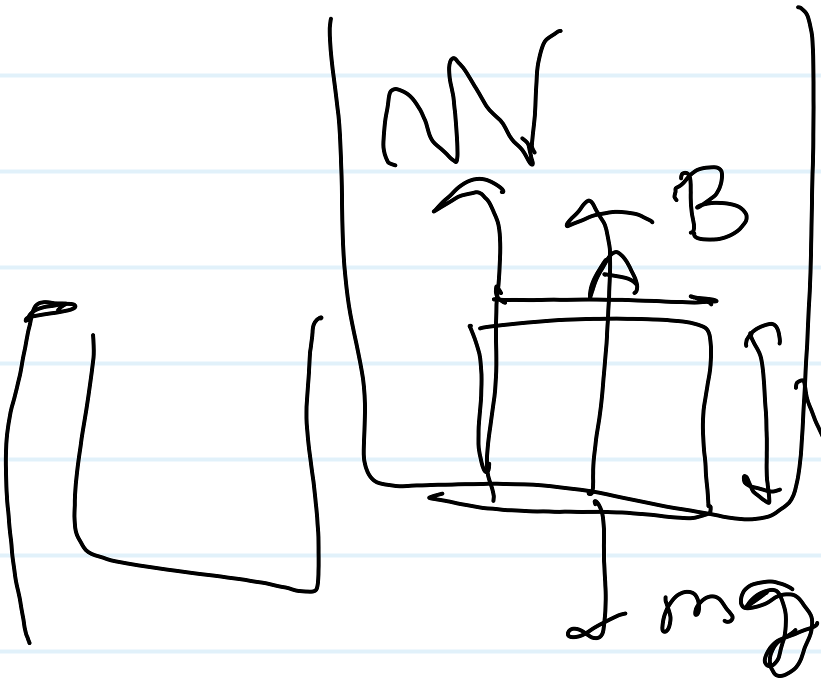
V_L



$\rho_L < \rho_m$



$mg > B$



$B = \rho_L V_L g$

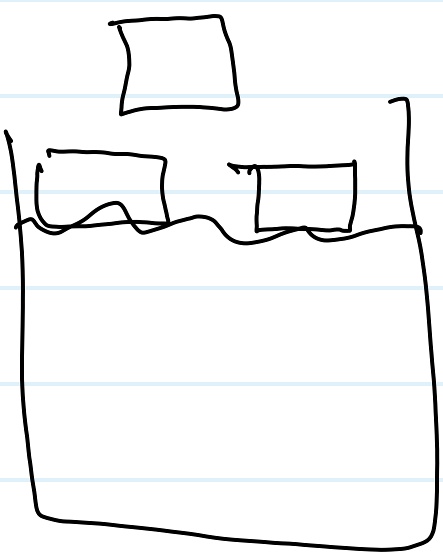
$V_L = V_m$

$g = g$

$\rho_m > \rho_L$

$$B = \rho_L V_L g$$

$= 0$



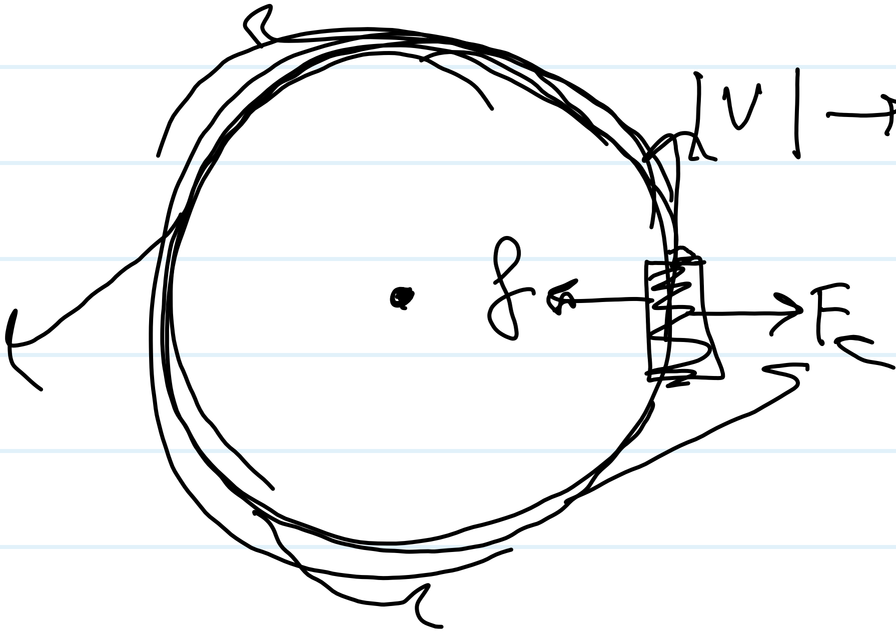
$\cancel{\rho_L = 0}$

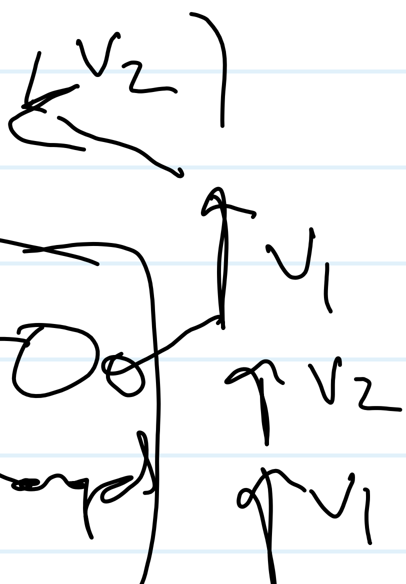
$V_L = 0$

$\cancel{g = 0}$

8 corollary

$|v| \to c$

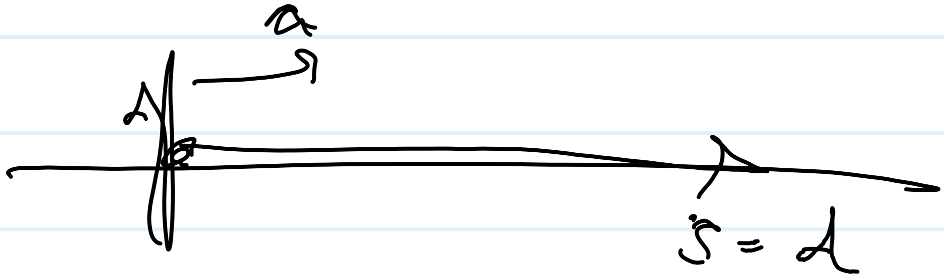




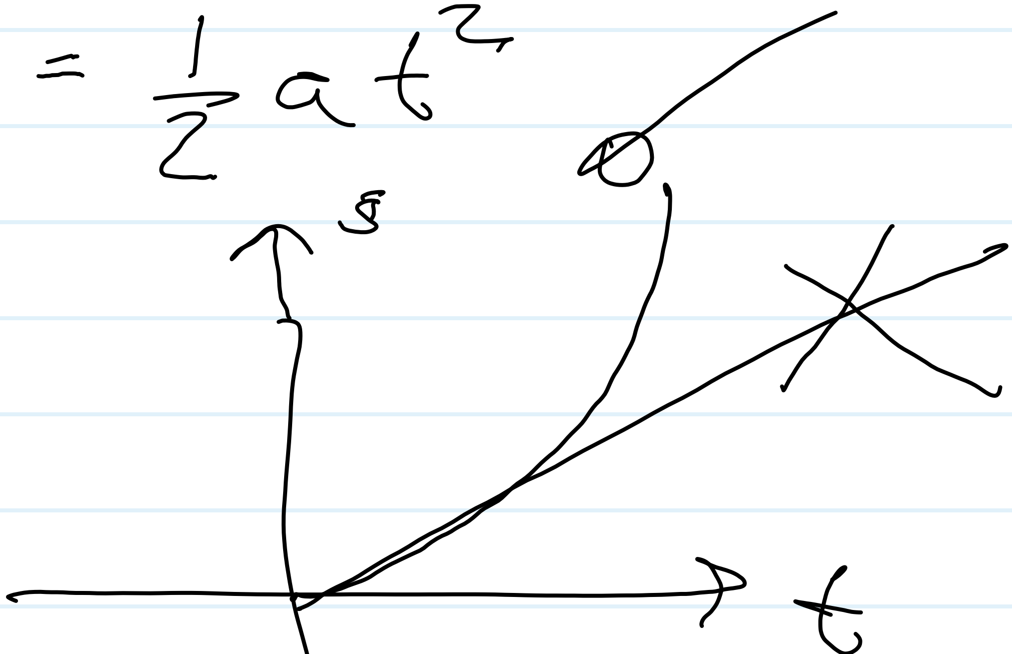
$\nabla V \Rightarrow a$

UCM $\vec{F}_{net} \neq 0$
$\vec{v}$ is changed

8. a→c

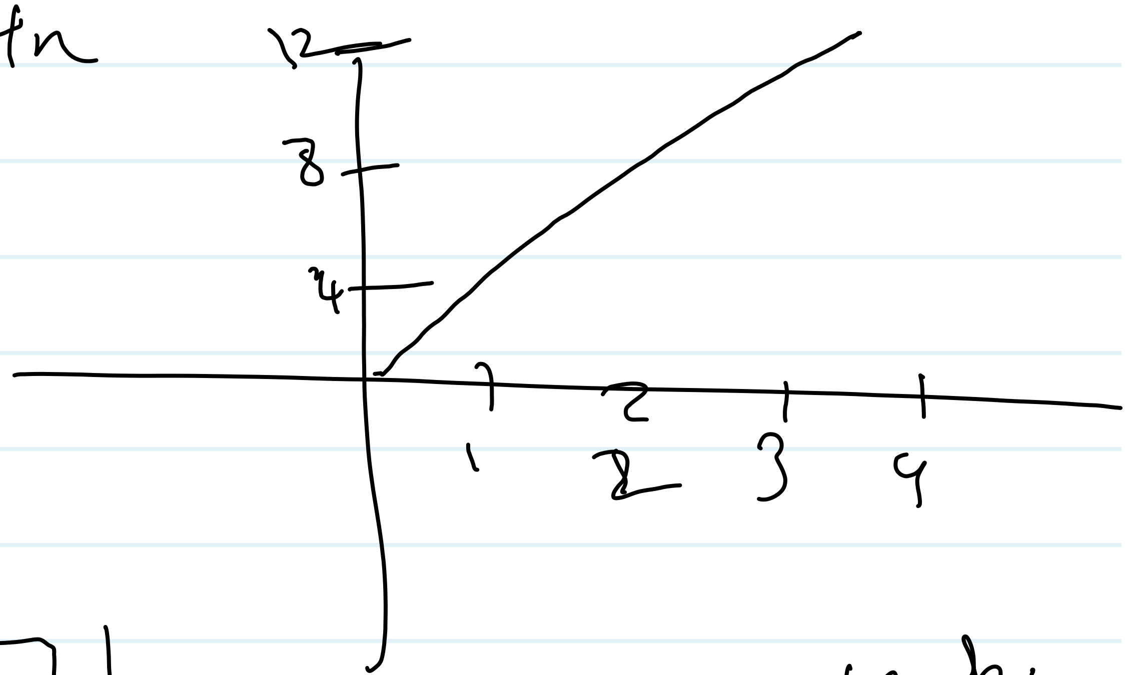


$$s = \frac{1}{2} a t^2$$

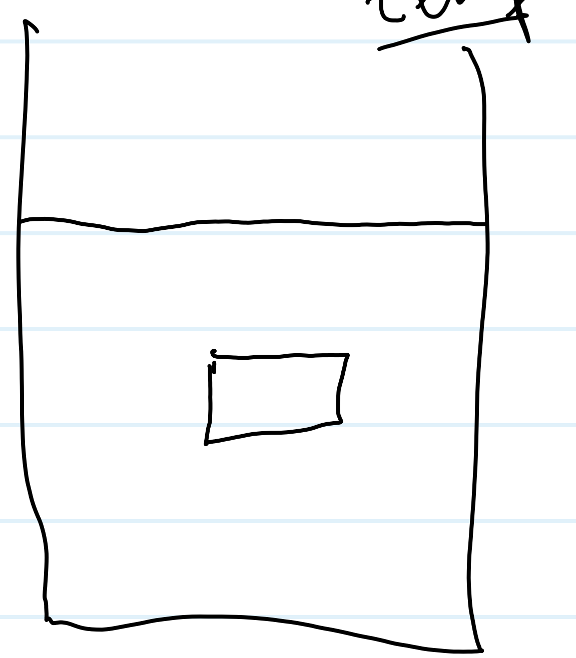


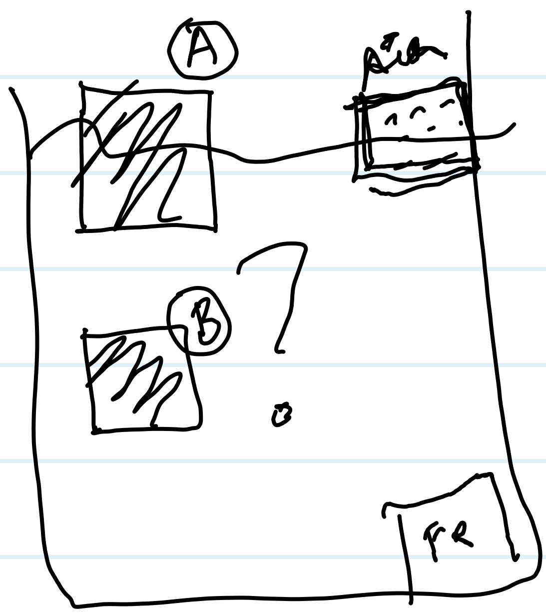
$$ut + \frac{1}{2} at^2$$

$y = 4x$

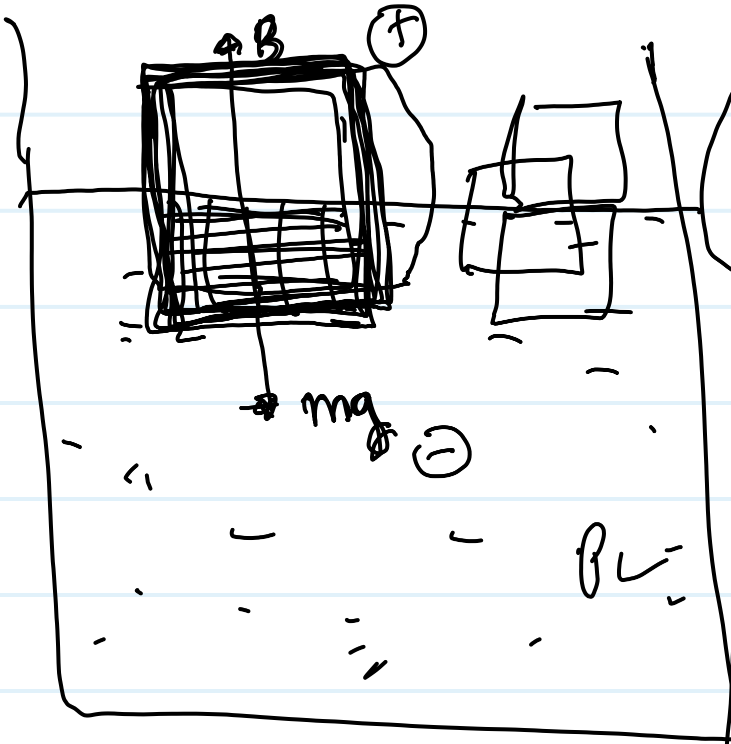


temp.





A



$$\boxed{F_{net} = B - mg = 0}$$

$$\Rightarrow B = mg \quad (a)$$

$$\boxed{B = \rho_L V_L g} \quad (b)$$

$$\boxed{mg = \rho_m V_m g} \quad (c)$$

Using (a), (b) and (c) in conjunction, we get:

$$B = mg$$

$$\Rightarrow \rho_L V_L g = \rho_m V_m g$$

$$\text{or} \quad \rho_L V_L = \rho_m V_m \quad (d)$$

$$\because \quad V_L < V_m \quad (e)$$

(box is only partially submerged)

$\therefore$ From (d) and (e):

$$\rho_L V_L = \rho_m V_m$$

or $$\frac{\rho_L}{\rho_m} = \frac{V_m}{V_L}$$

But RHS > 1 (from ⓟ)

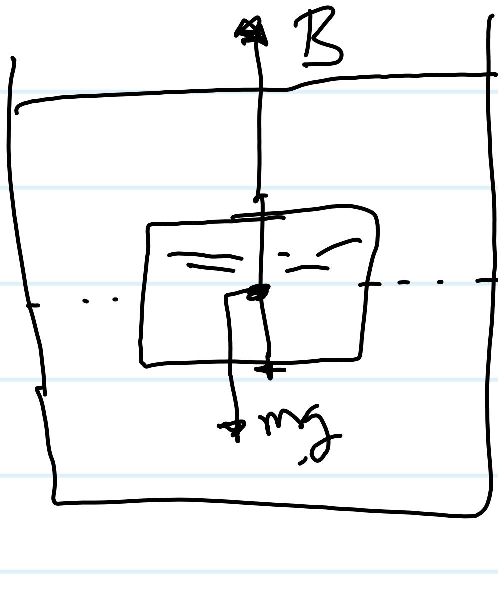
$\therefore$ LHS > 1 (LHS = RHS)

or $$\frac{\rho_L}{\rho_m} > 1$$

or $$\boxed{\rho_L > \rho_m}$$

Bouyant

B



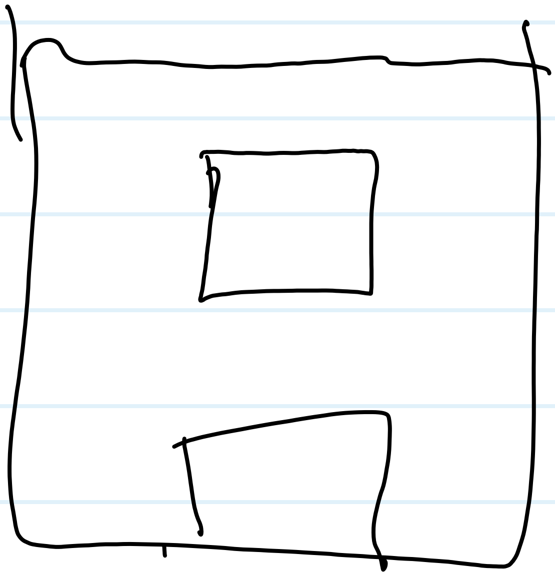
$B = mg$

or $\rho_L V_L \cancel{g} = \rho_m V_m \cancel{g}$

or $\rho_L V_L = \rho_m V_m$

But $V_L = V_m$

$\Rightarrow \rho_L = \rho_m$



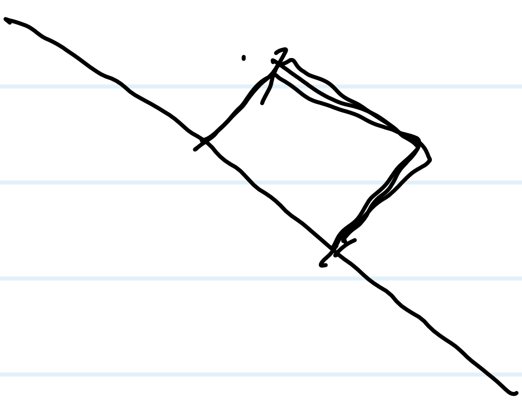
$P_{in} > P_i$

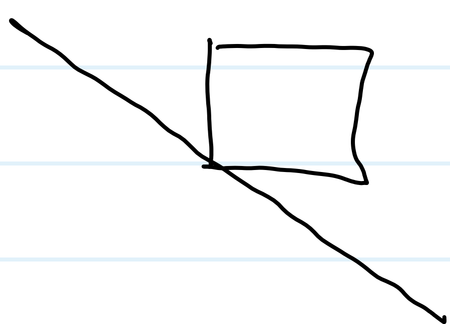
$$\vec{P} = \frac{\vec{F}}{A} \cdot ?$$

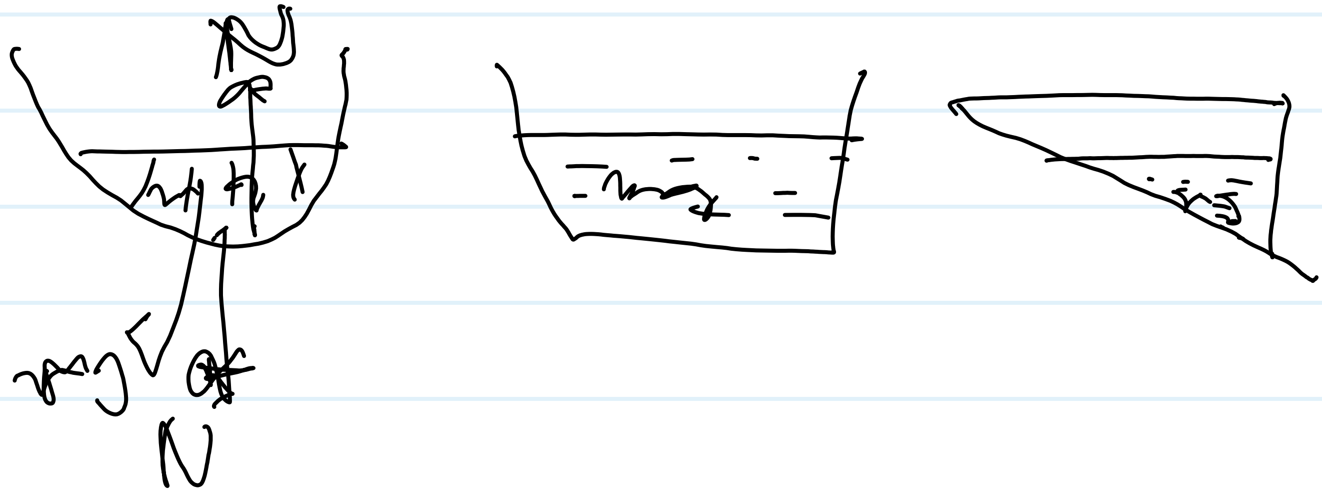
$$A \cdot F$$

$$\vec{A}$$

$$P\vec{A} = \vec{F}$$



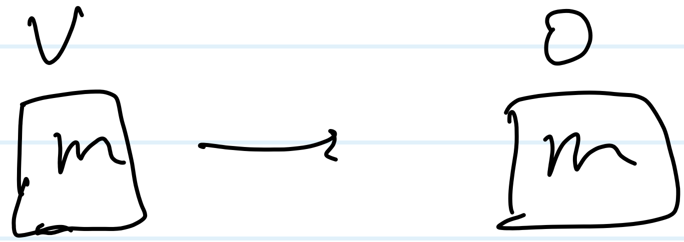




$$F_{net} = N - mg$$
$$= 0$$

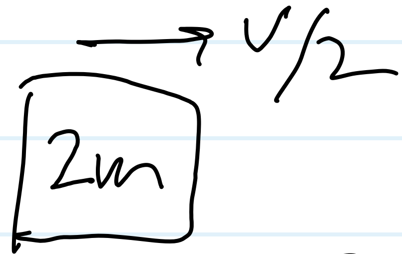
$$\Delta v = 0$$

i:



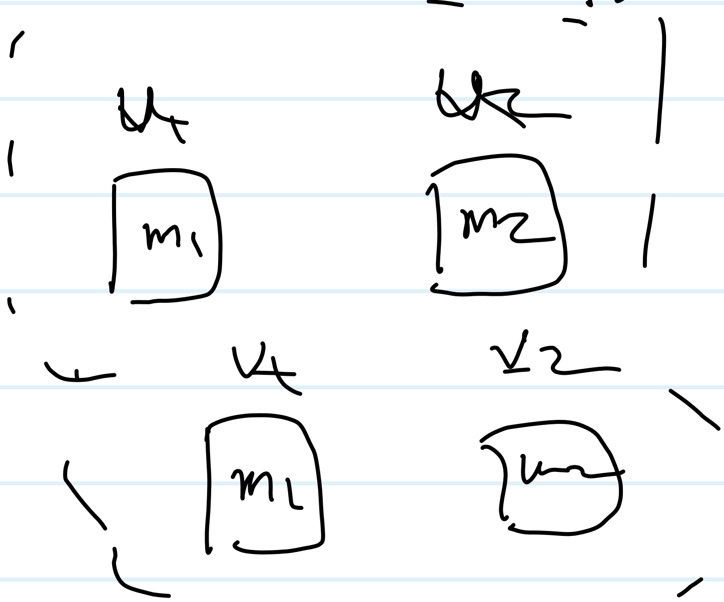
$KE_i = \frac{1}{2} m v^2$

final:



$KE_f = \frac{1}{2} \times (2m) \times \left(\frac{v}{2}\right)^2$

$F_{net} = 0$



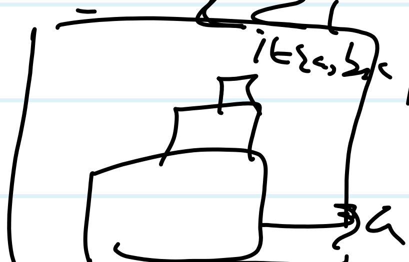
or $KE_f = \frac{1}{2} \times 2m \times \frac{v^2}{4}$

or $KE_f = \frac{1}{4} m v^2$

or $KE_f = \frac{1}{2} KE_i$

$(2a + 2b + 2c + \dots 2z)$

$$\sum_{i \in \{a,b,c\dots\}} 2i = 2 \sum_{i \in \{a,b,c\}} i$$



$$\underset{0}{F_{net}} \equiv \sum (m_i \underset{0}{a_{net}})$$

or $\boxed{F_{net} = a_{net} \sum m_i}$

$\sum m_i$

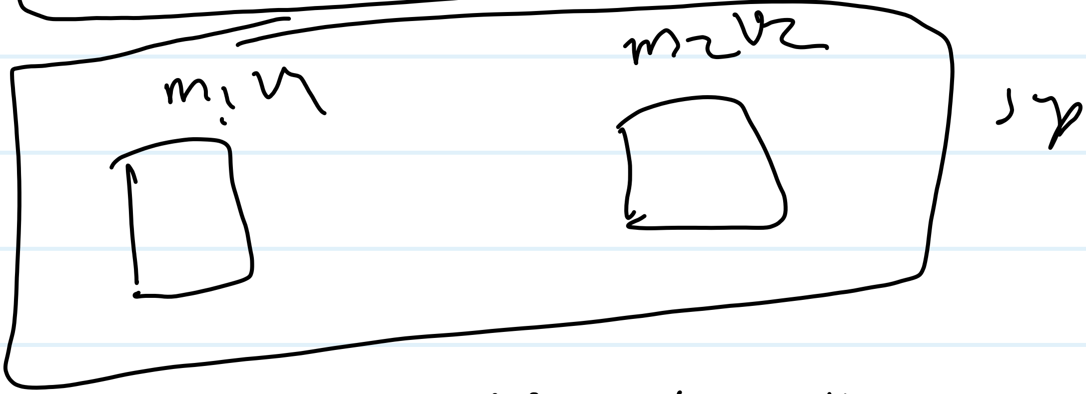
$$\Rightarrow v_{avg} = \frac{\sum p_i}{\sum m_i} = \sum (m_1 + m_2 + m_3 + \dots m_{last})$$

$$v_{net} = \frac{\sum m_i v_i}{\sum m_i} = \frac{\sum m_i u_i}{\sum m_i}$$

$$= \frac{m_1 v_1 + m_2 v_2}{m_1 + m_2}$$

$$\boxed{\sum m_i v_i = \sum m_i u_i}$$

COLM



$$p_{sys\,i} = m_1 u_1 + m_2 u_2$$

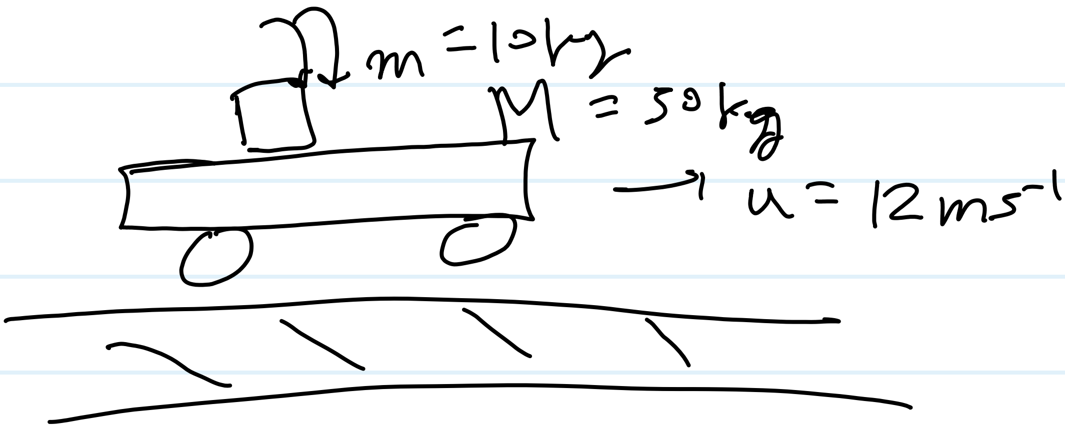
$$p_{sys\,final} = m_1 v_1 + m_2 v_2$$

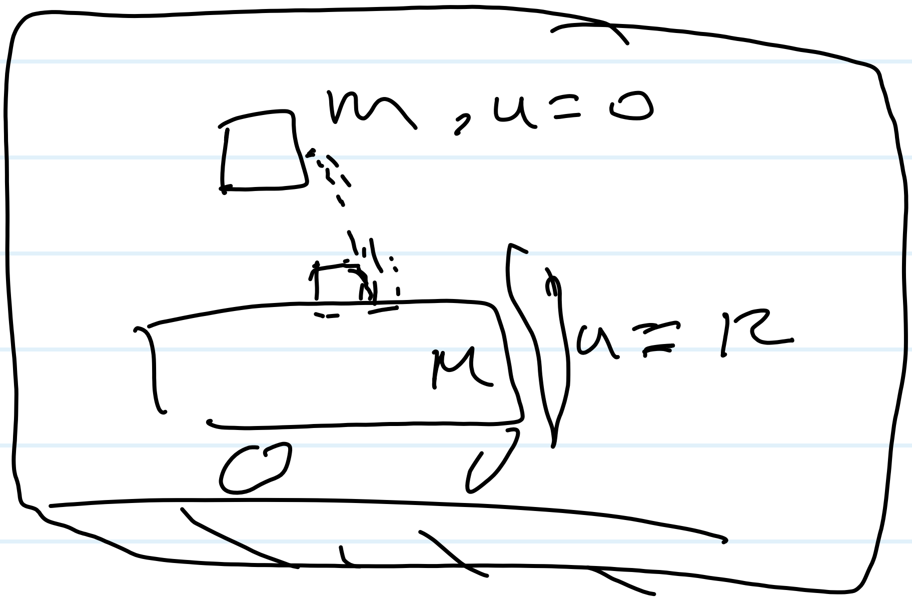
$$F_{net\,sys} = 0 \qquad F_{net\,i} = \frac{\cancel{\Delta p}^{\,0}}{\Delta t}$$

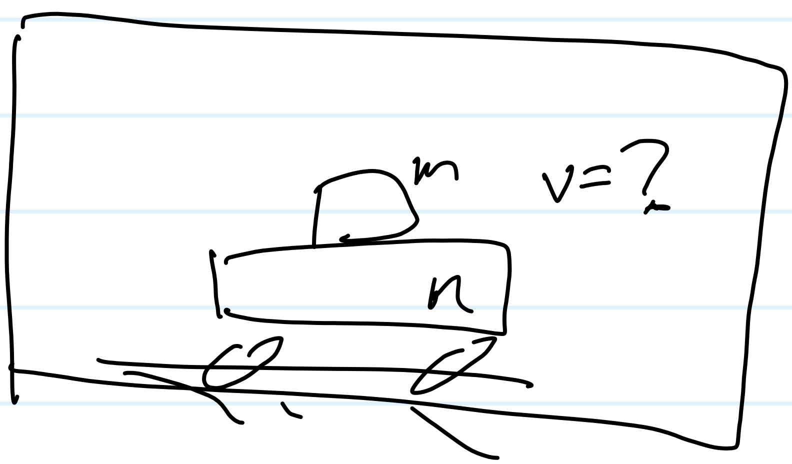
$$a_{net\,sys} = 0$$

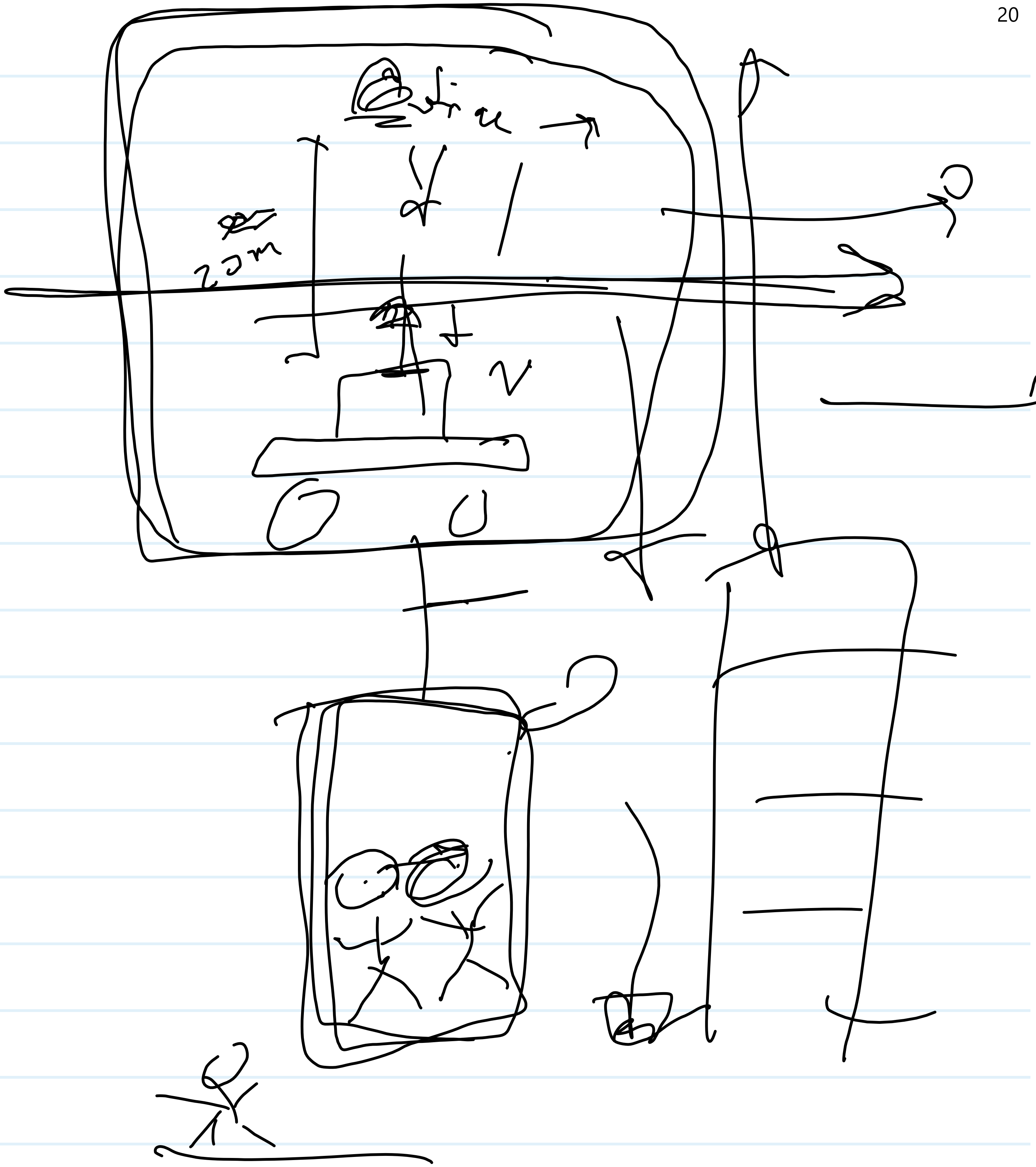
$$\Delta p_{sys} = 0$$

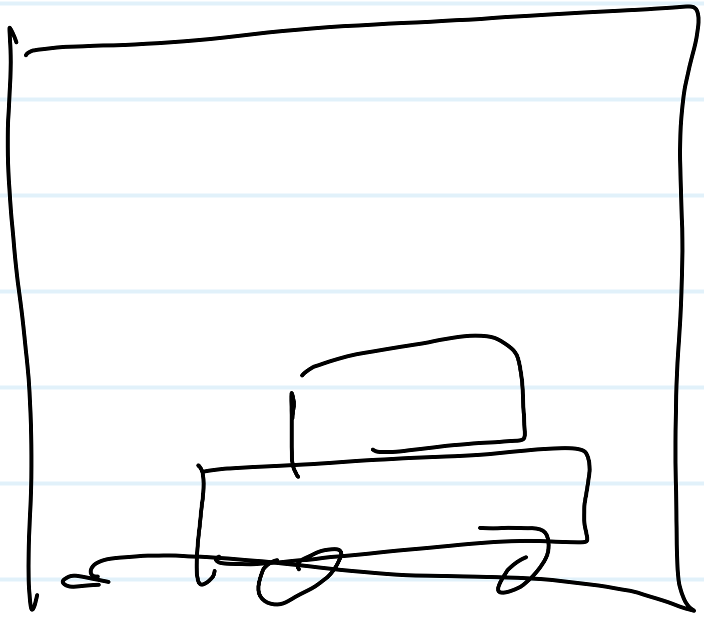
$\boxed{20)}$.

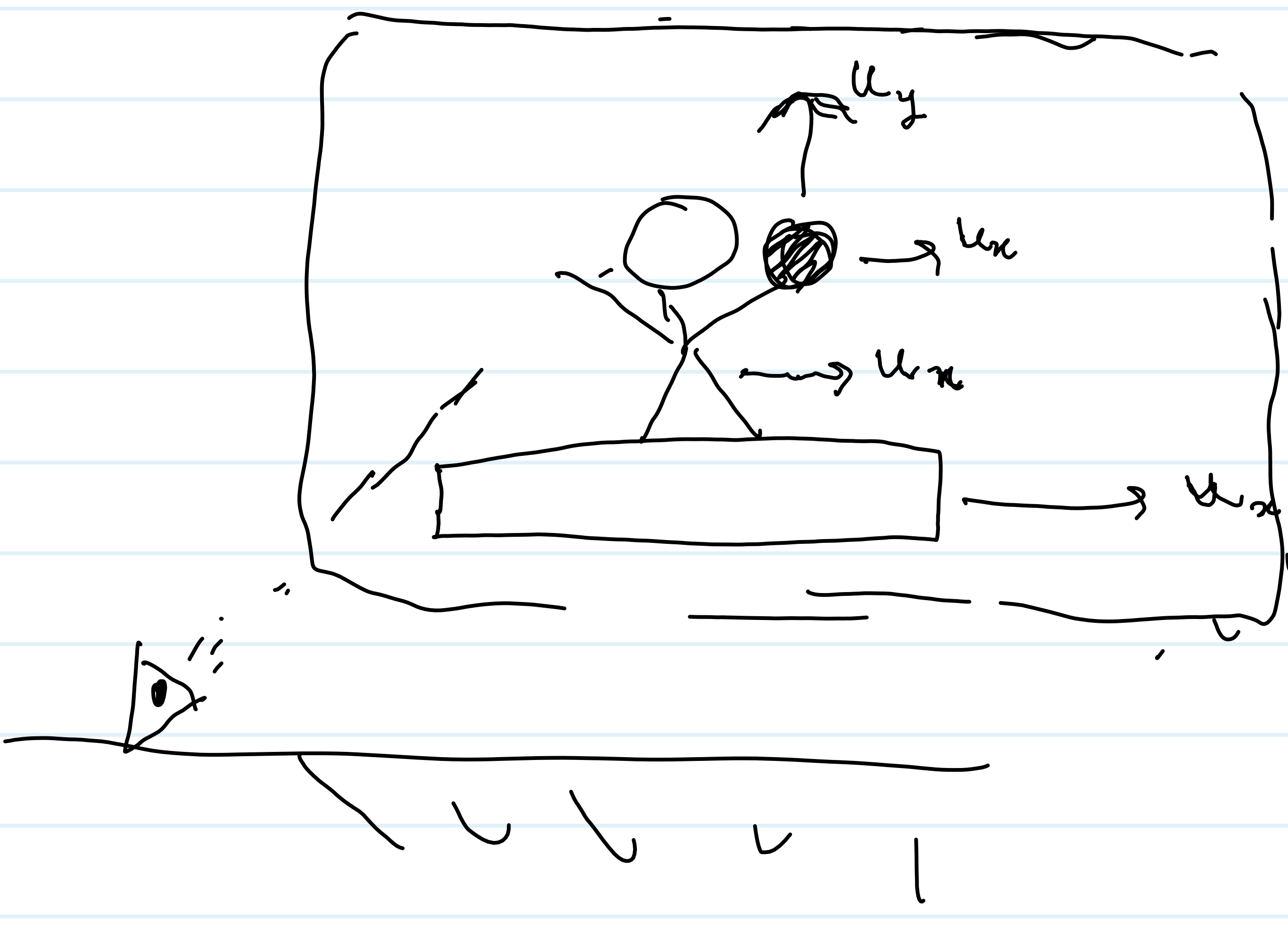


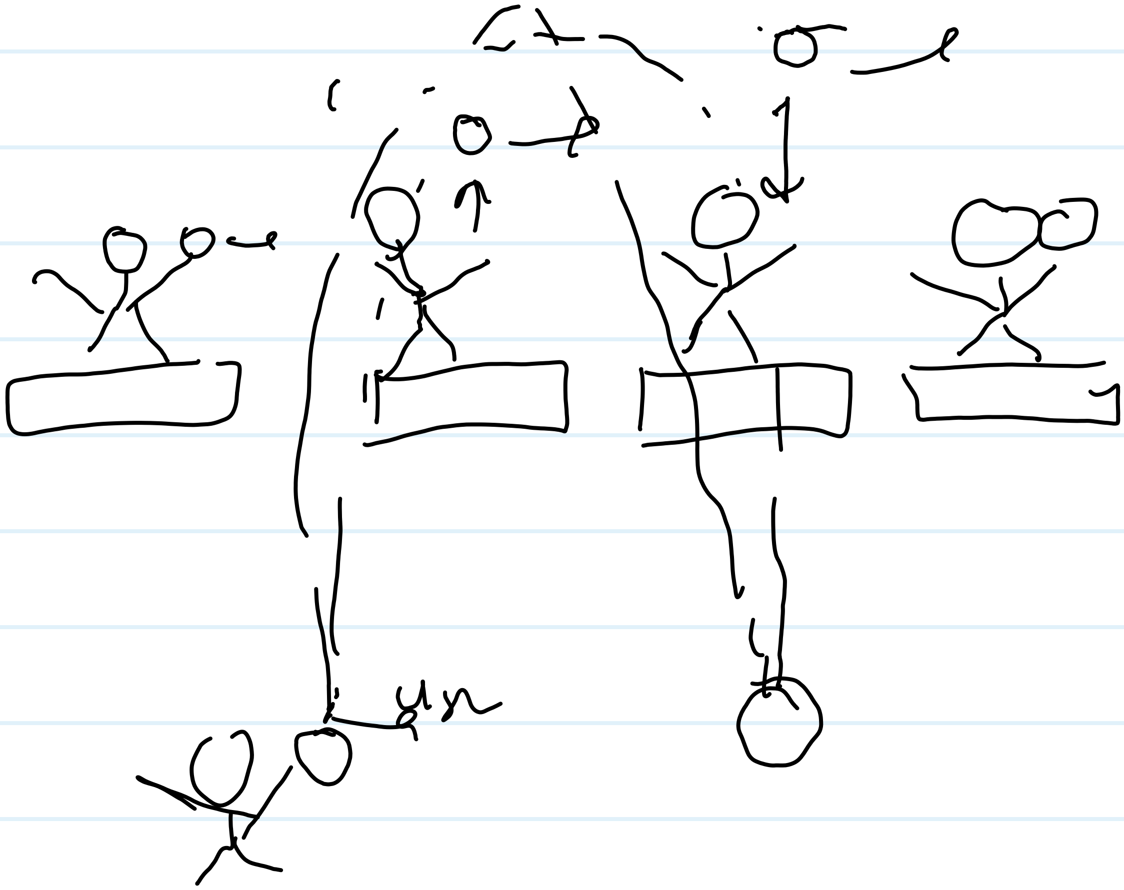




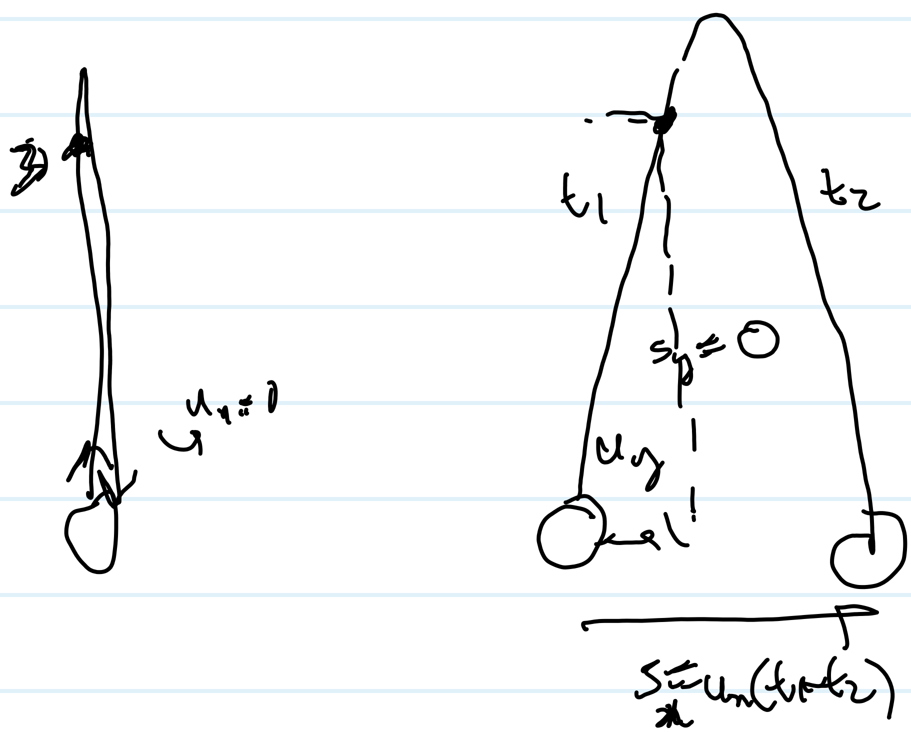


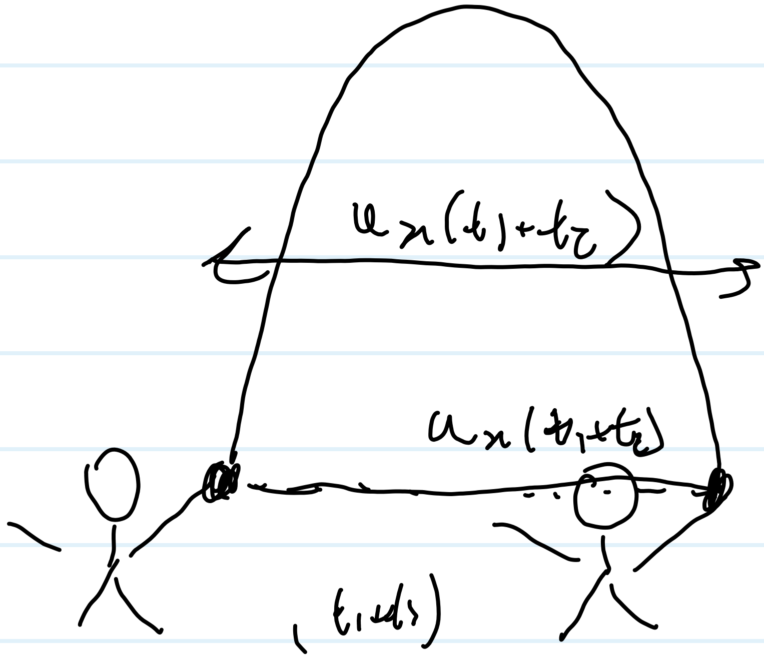



u_y
u_x
u_x
u_x

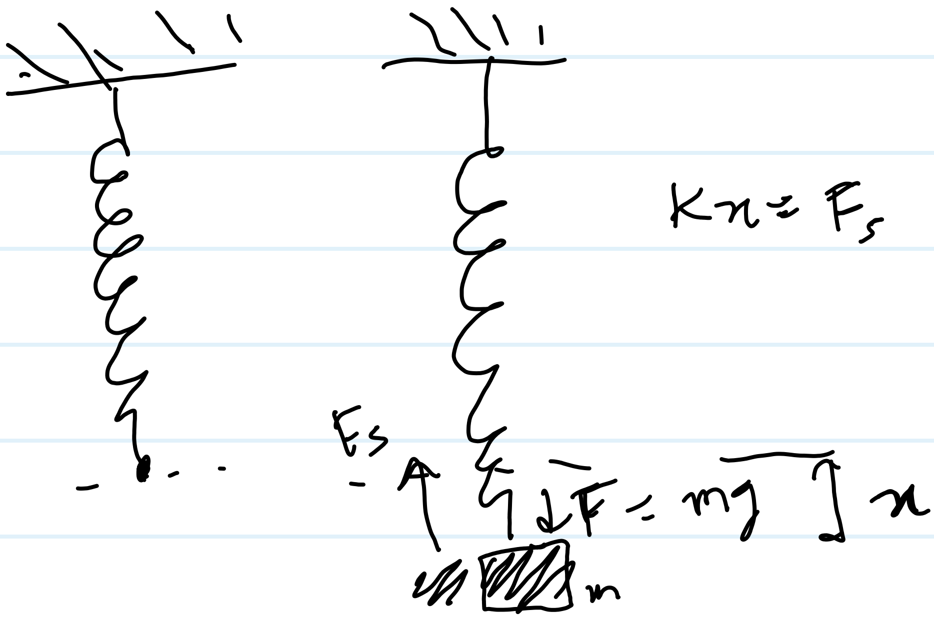


4





$$H = \frac{u_y^2}{2g}$$



$$Kx = F_s$$

m ?

$\boxed{N} = mg$

$\boxed{m = \frac{N}{g}}$

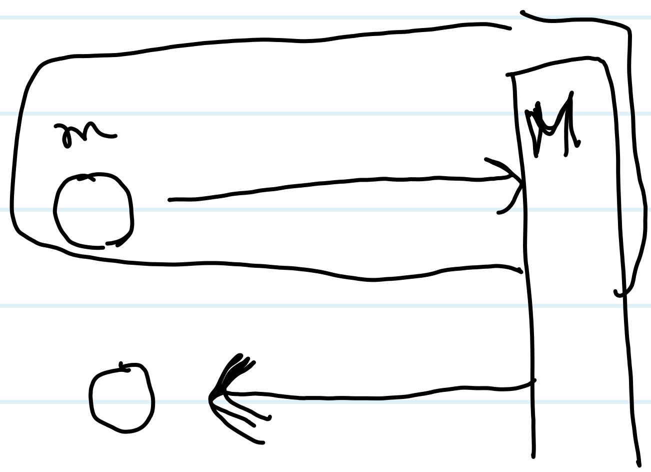
$a_{grd} > 0$

$N_j - mg > 0$

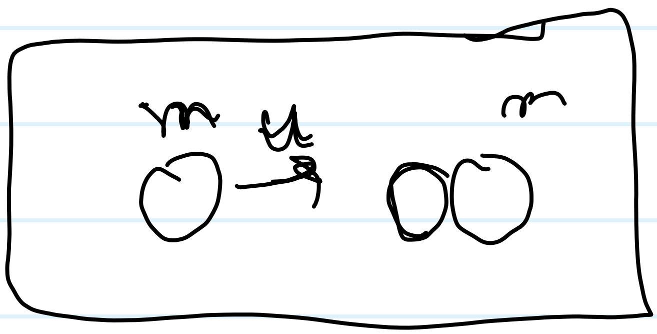
$N = mg$

$N_j = mg + \Delta N$

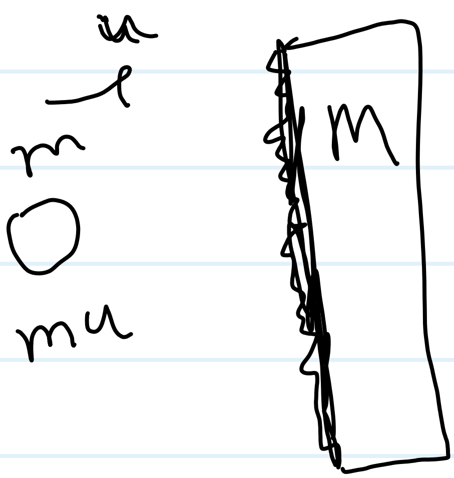
$\boxed{14.}$



$M \gg m$

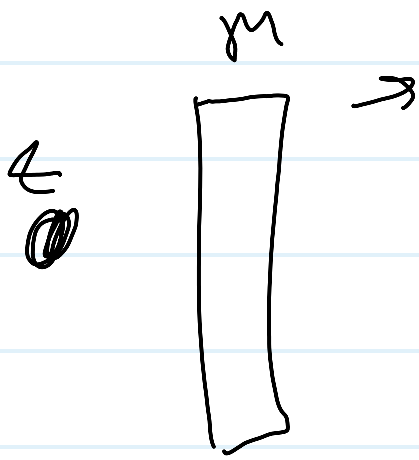


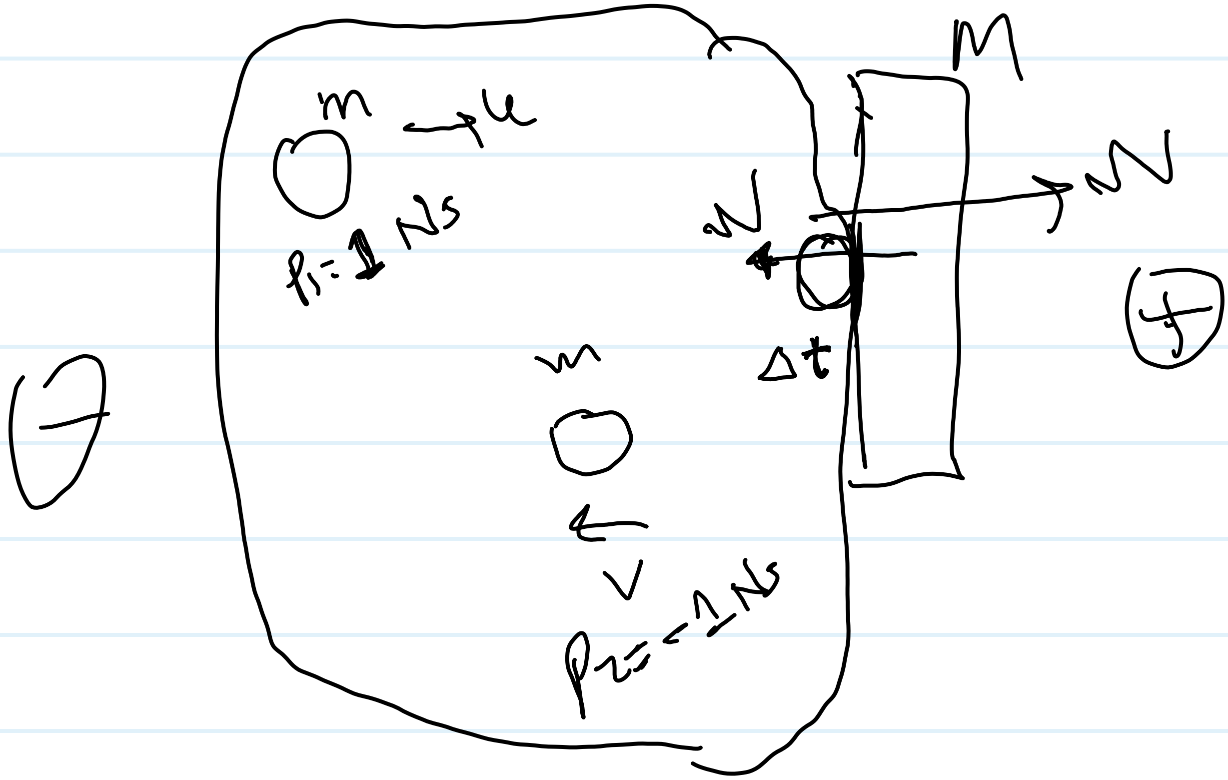
$e =$



$P_1 = mu$

$P_2 = (M+m)V$





$$\Delta p = N \cdot \Delta t$$

$$\Delta p = p_f - p_i$$

$$\Delta p = (-1) - (1)$$

$$\therefore \Delta p = -2\,\text{Ns}$$

$$N \times 0.1\,\text{s} = -2\,\text{Ns}$$

$$\therefore \boxed{N = -20\,\text{N}}$$

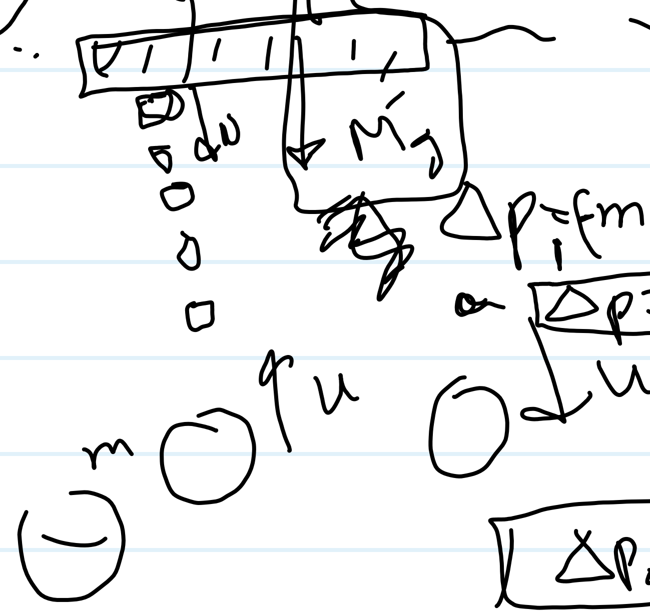
$$\boxed{F_{wb} = -N \\ = 20N}$$

N_{40}

19. (+)

N $M = 0.2kg$

Mg

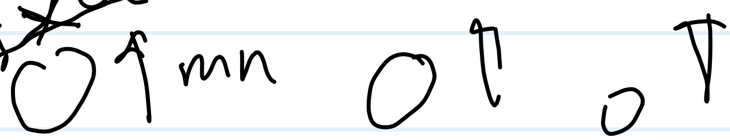


$\Delta p = (mu) - (-mu)$

or $\boxed{\Delta p = -2mu}$

$$\boxed{\Delta p_{40} = -80mu}$$

$$F = \frac{\Delta p}{\Delta t}$$



$= \cancel{-80 \times 0.2kg \times u}$
1

$\therefore F$

$p_i = +40mu$

$p_f = -40mu$

$= -16u\ N$

$\Delta p = -80mu$

$\therefore F$

$N_{40} = -F$

$= 16u\ N$

$N_{40} = Mg$

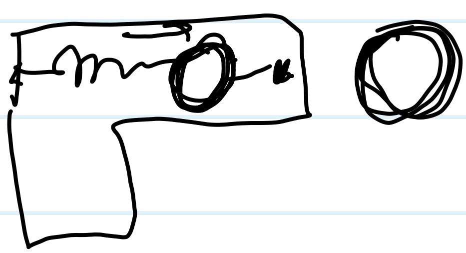
$\Rightarrow 16u = 0.2 \times 10$

$\Rightarrow 16u = 2$

$\Rightarrow u = \frac{1}{8}\ ms^{-1} \Rightarrow \frac{100}{8}\ cms^{-1}$

$\Rightarrow \boxed{u = 12.5\ cms^{-1}}$ Ans

$\boxed{20.}$ $F_{bg}(t) = 600 - 2.5t$, $[t] = s$



$F_{bg}(t=0) = 600\ N$

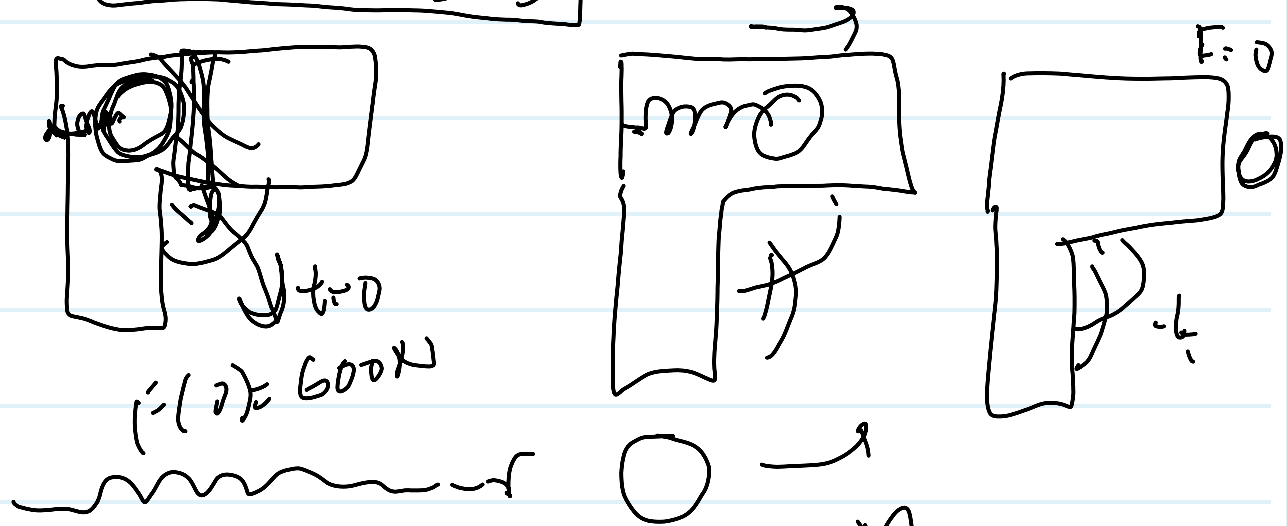
$F_{bg}(t=t_T) = 0\ N$

$F_{bg}(t_T) = 600 - 2.5\, t_T = 0$

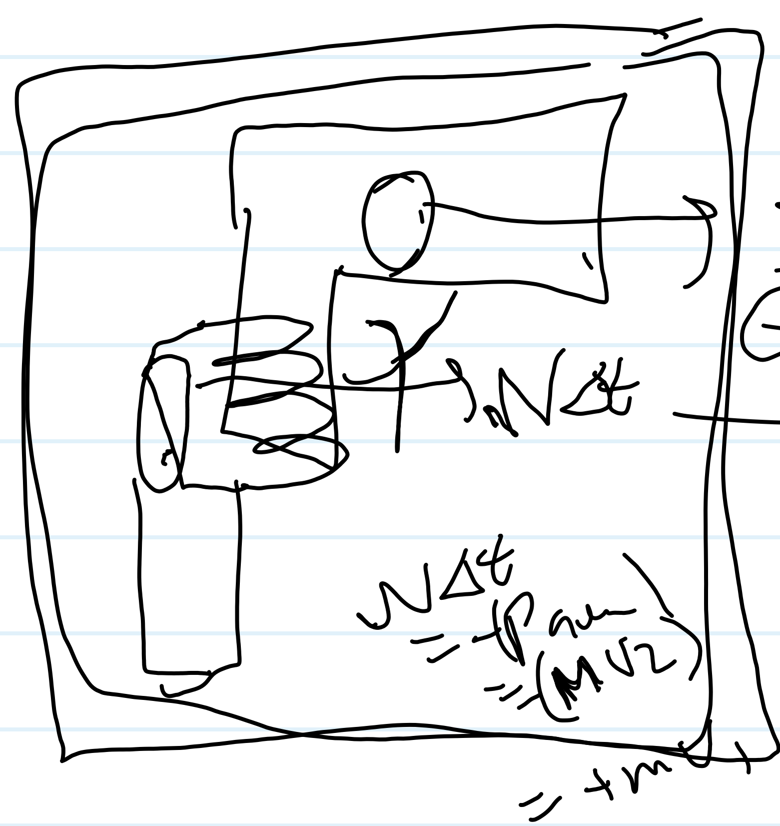
$\Rightarrow t_T = \frac{600}{2.5}$

$\Rightarrow t_T = 300e{-5}$

a $\boxed{t_T = 3e-3 \text{ s}}$

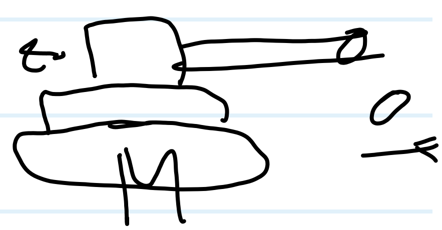


27.

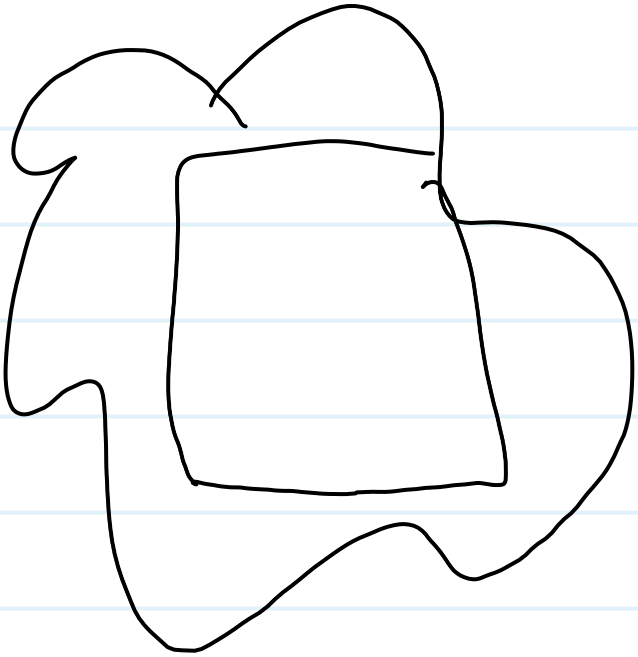


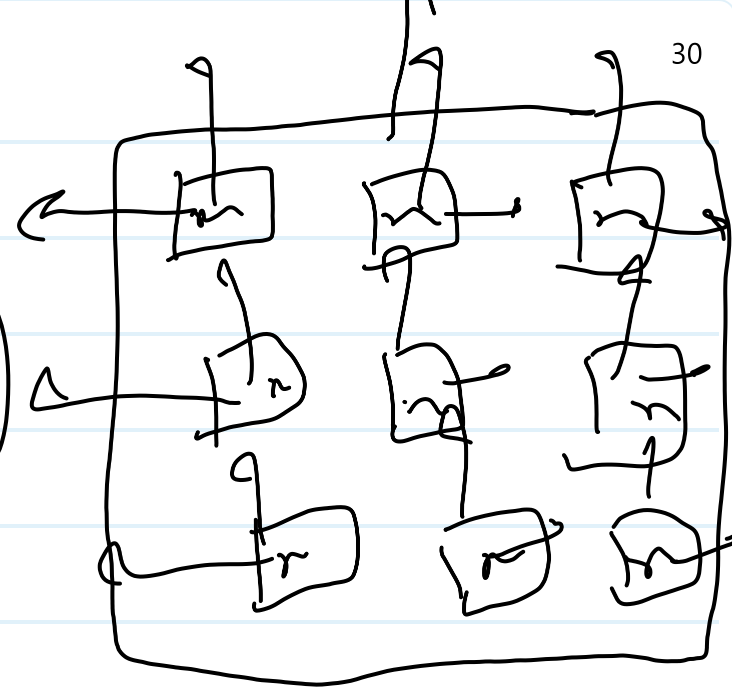
$0 = mv_f + Mv_2$

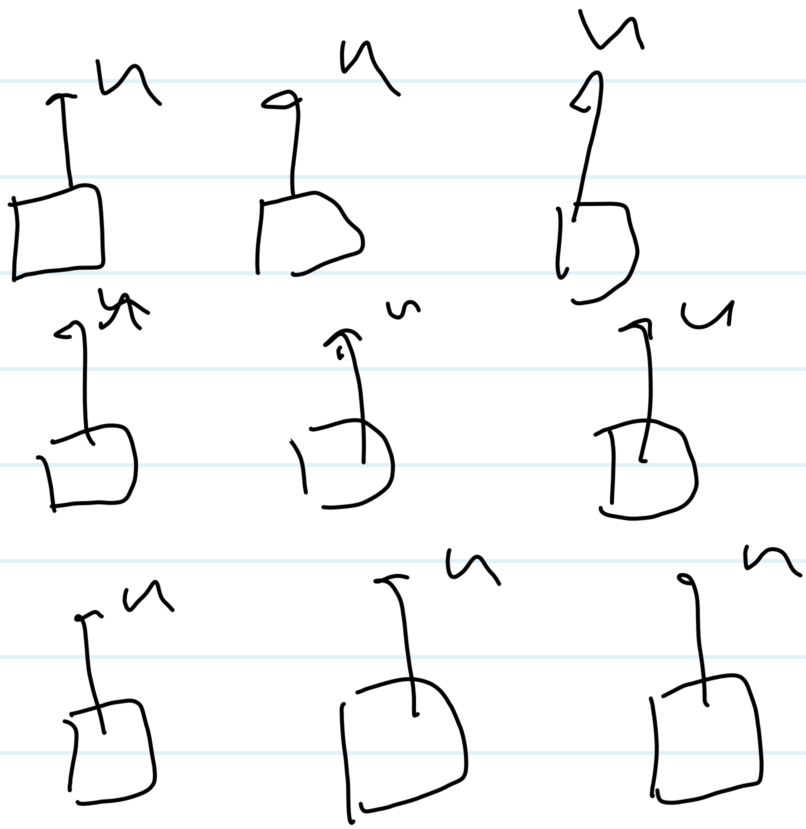
a $v_2 = -\frac{m}{M} v_1$

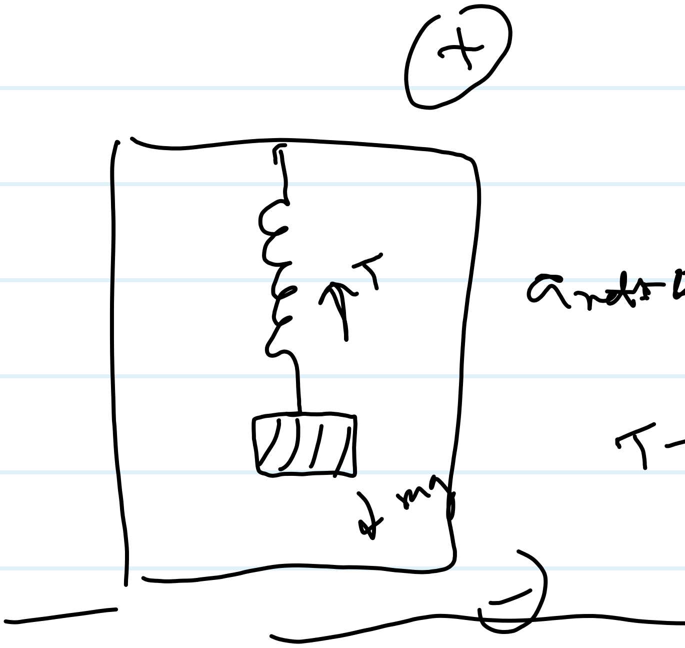


71.



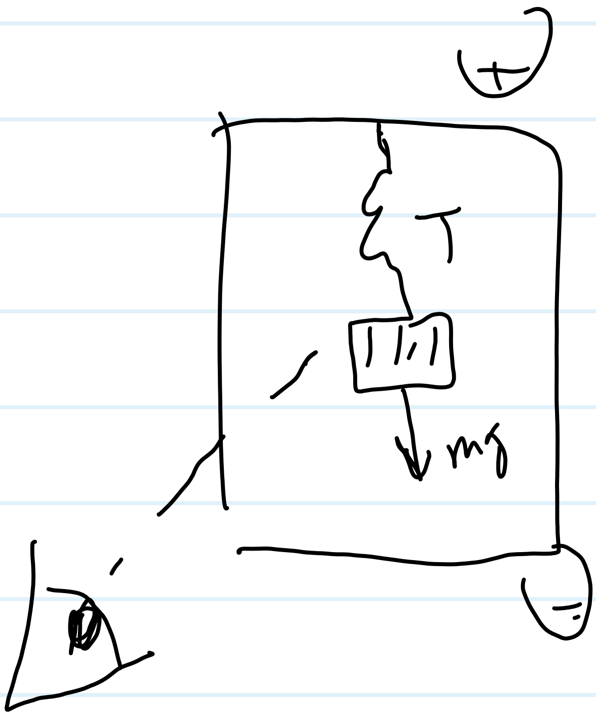






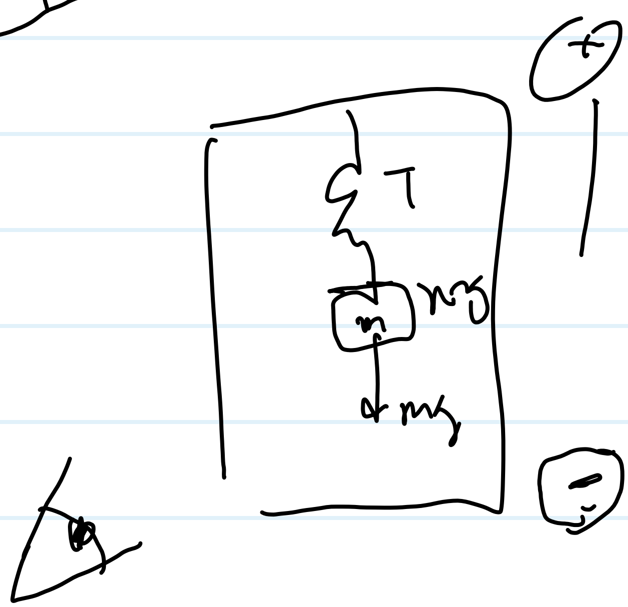
$a_{net} = 0$

$T - mg = 0$



$\downarrow a_{net}$

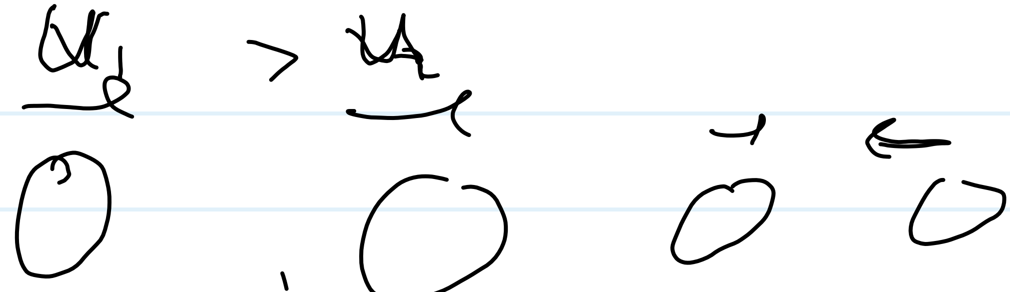
$T - mg = -ma_{net}$

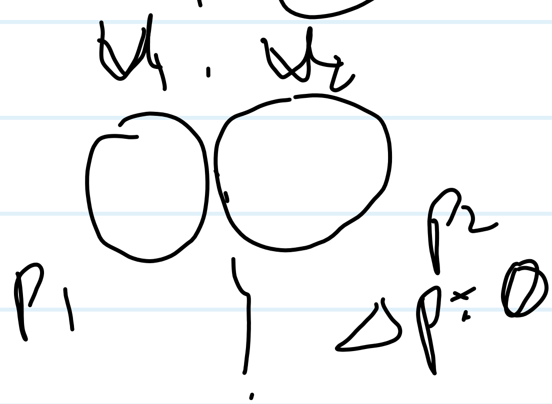


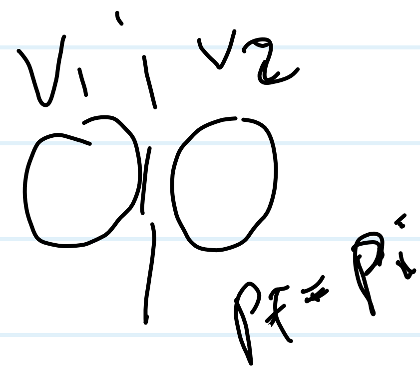
$a_{net} > 0$

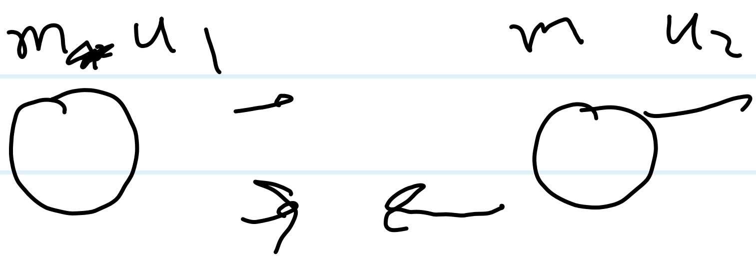
$T - mg = ma_{net}$

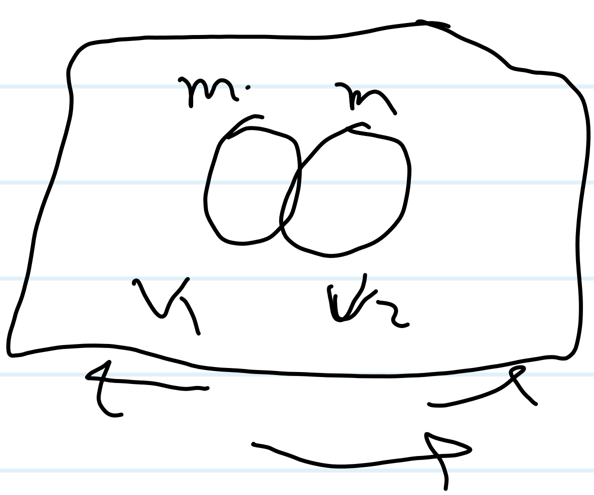
$T > mg$


u1 > u2

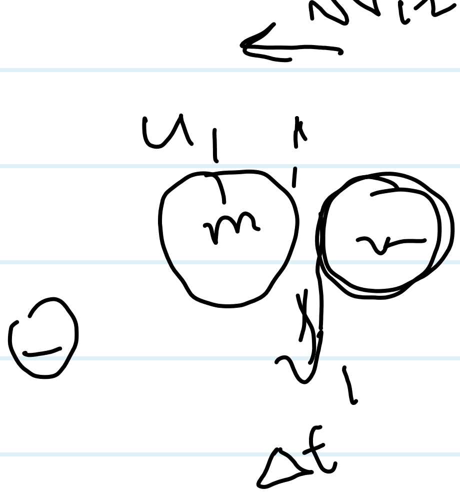

u1
u2
p1
p2
Δp = 0


v1
v2
pf = pi


m u1
m u2


m
m
v1
v2

$$p_i = p_f$$

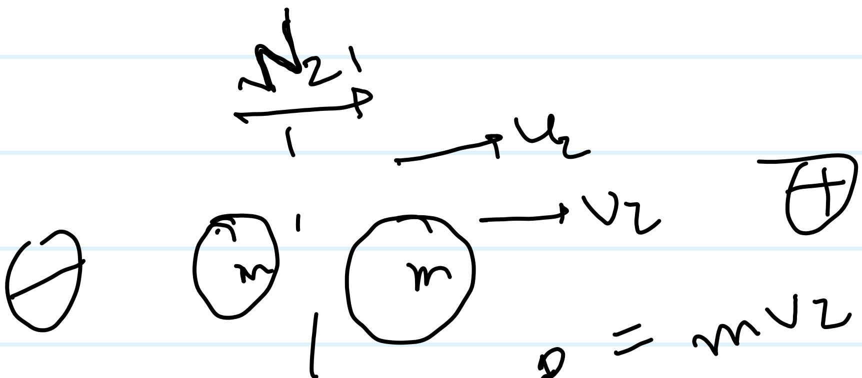


$$\Delta p_1 = mv_1 - mu_1$$

$$N_{12} = \frac{\Delta p_1}{\Delta t}$$

+

or $$\boxed{N_{12} = \frac{mv_1 - mu_1}{\Delta t}}$$



$$\Delta p_2 = mv_2 - mu_2$$

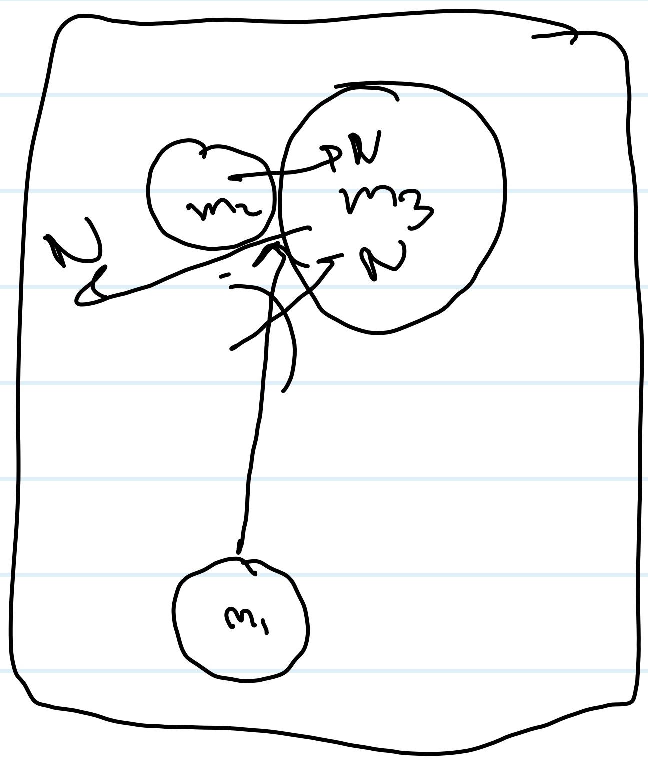
$$N_{21} = \frac{\Delta p_2}{\Delta t}$$

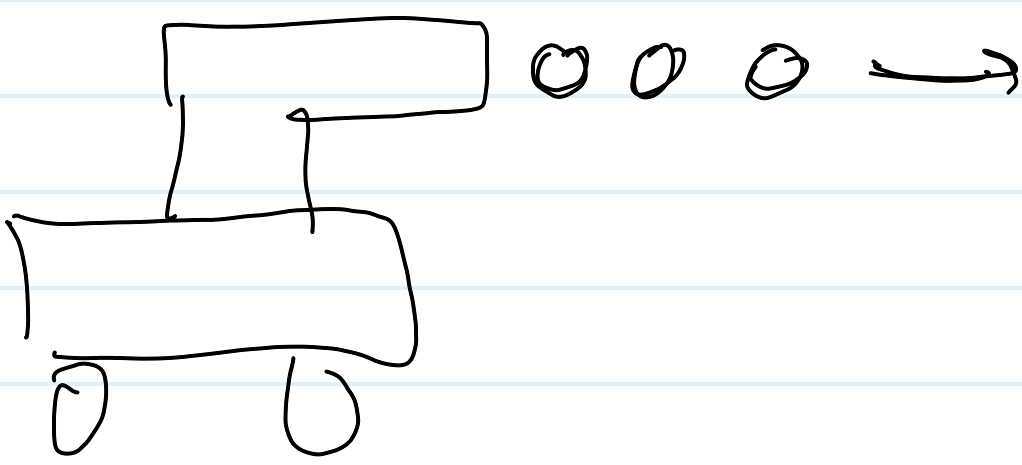
or $$\boxed{N_{21} = \frac{mv_2 - mu_2}{\Delta t}}$$

$$N_{12} + N_{21} = 0 \Rightarrow$$ magnitudes are equal,

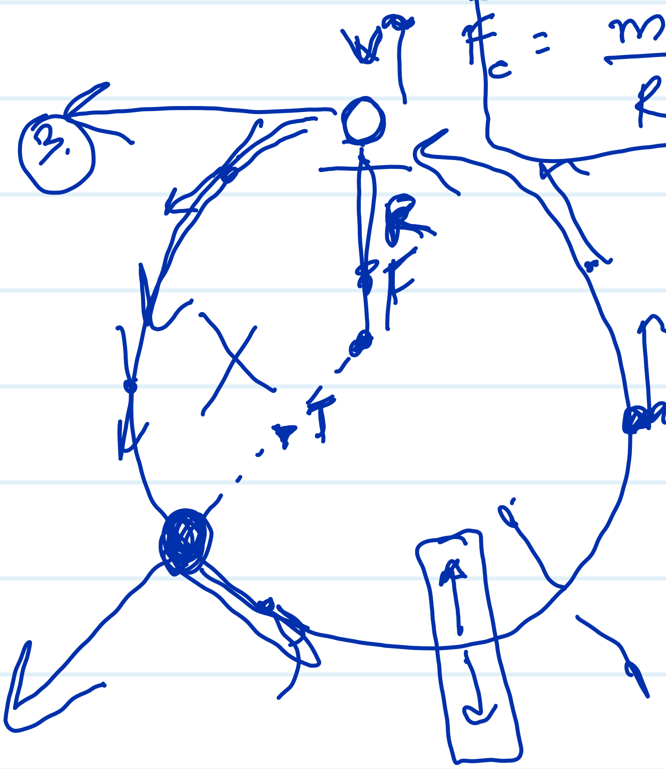
$$\frac{mv_1 - mu_1}{\Delta t} + \frac{mv_2 - mu_2}{\Delta t} = ?$$

$$\cancel{\frac{m(v_1+v_2) - m(u_1+u_2)}{\Delta t} = 0}$$



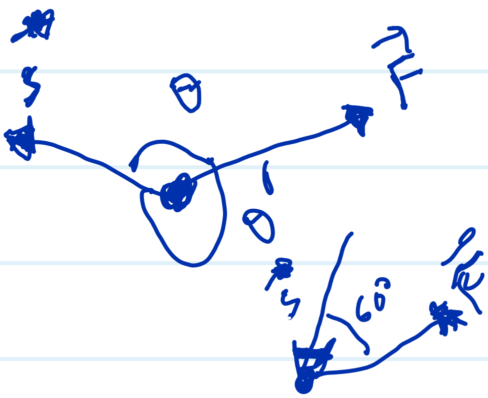


$$\boxed{F_c = \frac{mv^2}{R}}$$ (away from centre)

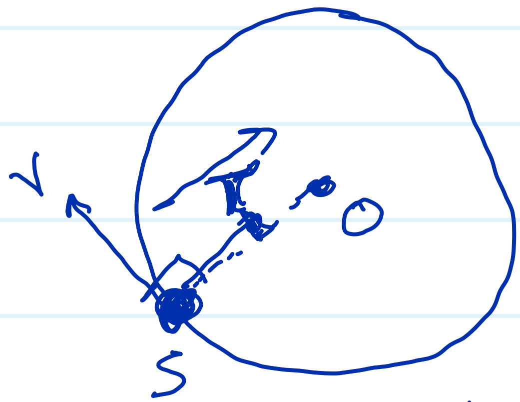


$$T = \frac{mv^2}{R}$$

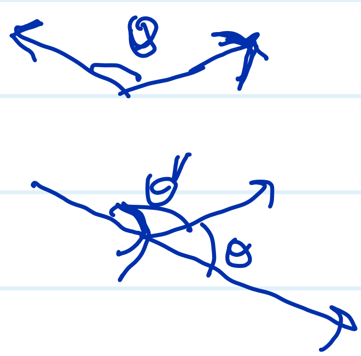
(towards the centre)

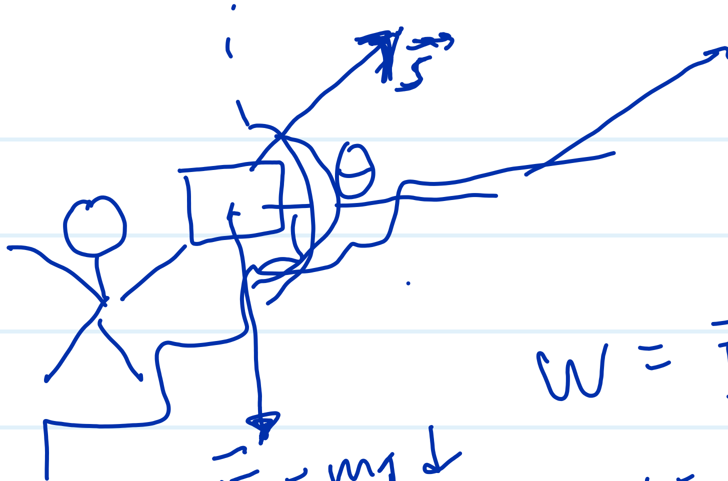


$$W = \vec{F}\cdot\vec{S}$$



$$\vec{W} = |T||V|\cos(90) = 0$$





$\vec{F} = mg \downarrow$

$W = \vec{F} \cdot \vec{s}$

$W = mg \cdot |\vec{s}| \cos(\theta)$

$|(+)| \cos(120$

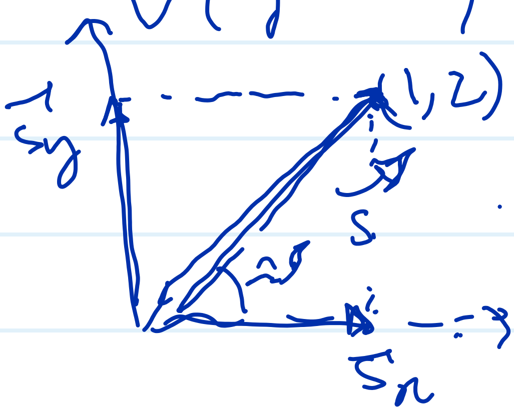
(π)

θ°	0	30	45	60	90	120	135	150	180
$\sin\theta$	0	$1/2$	$\frac{1}{\sqrt{2}}$	$\sqrt{3}/2$	1	$\sqrt{3}/2$	$\frac{1}{\sqrt{2}}$	$1/2$	0
$\cos\theta$	1	$\sqrt{3}/2$	$\frac{1}{\sqrt{2}}$	$1/2$	0	$-1/2$	$\frac{-1}{\sqrt{2}}$	$-\sqrt{3}/2$	-1

$\cos(\pi) = \cos(180^{\circ}) = -1$

$\sin\left(\frac{\pi}{2}\right) = \sin(90^{\circ}) = 1$

$$\boxed{\begin{aligned} \cos(\pi-\theta) &= -\cos\theta \\ \sin(\pi-\theta) &= \sin\theta \end{aligned}}$$



$(1,2) = 1\hat{i} + 2\hat{j}$

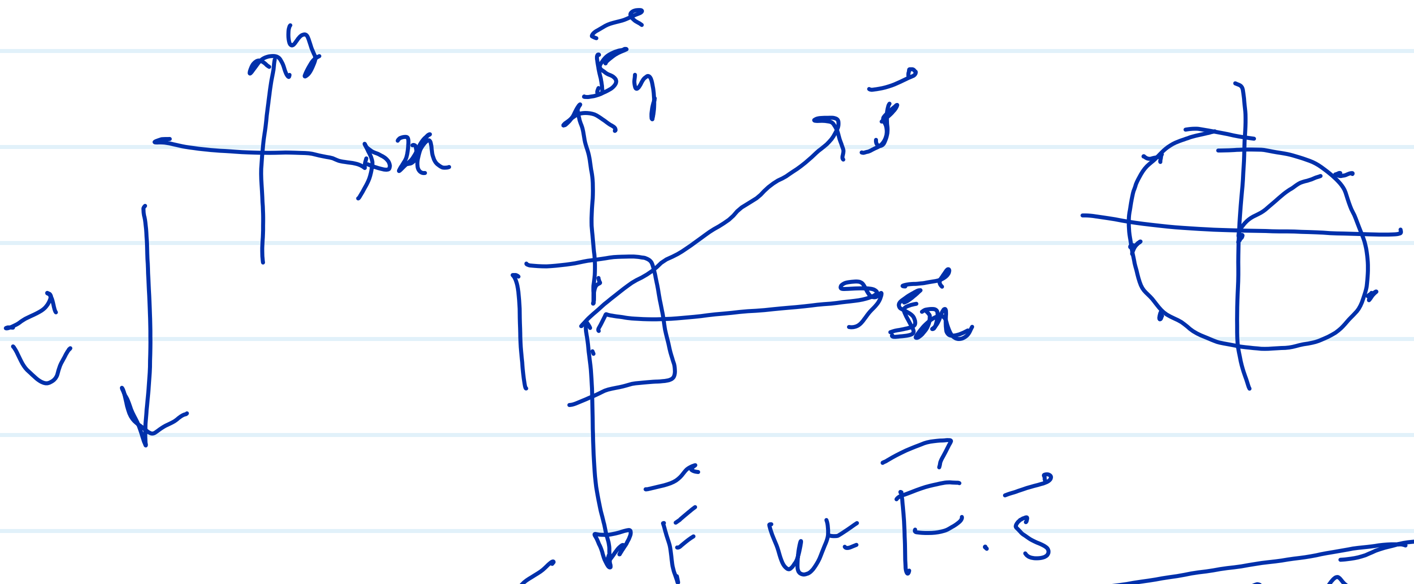
$(1, 2)$

$1\hat{i} + 2\hat{j}$

$\vec{s} = \vec{s}_x + \vec{s}_y$

1 right
+2 up

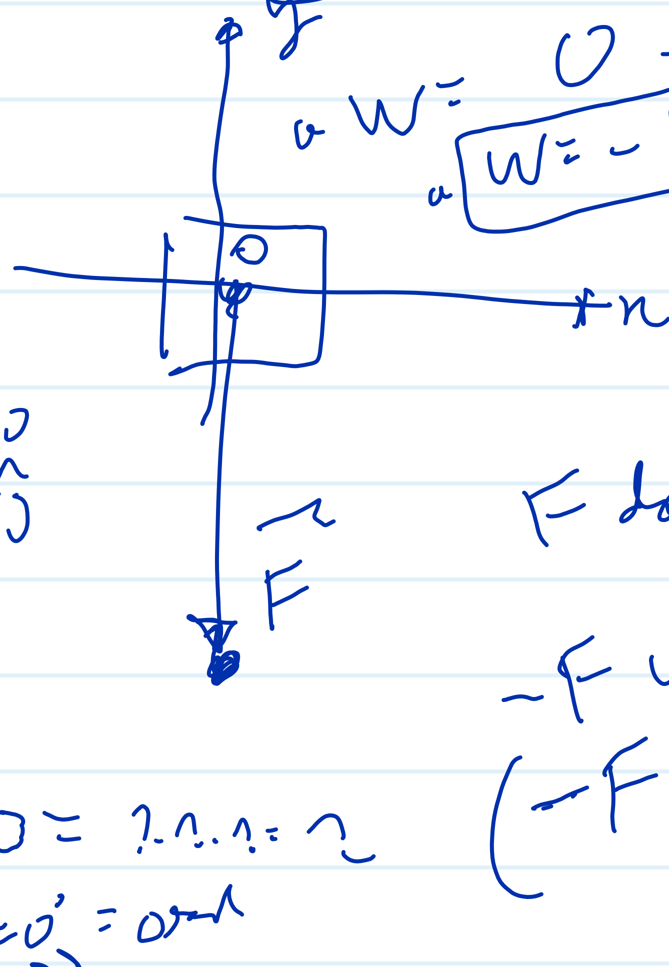
$\vec{s} = (s_x \hat{i} + s_y \hat{j})$



$W = \vec{F} \cdot \vec{s}$

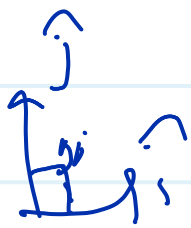
$(0\hat{i} - F\hat{j})$

$\boxed{W = (-F\hat{j}) \cdot (s_x\hat{i} + s_y\hat{j})}$



$W = 0 - F s_y$

$\boxed{W = -F s_y}$



$\hat{i} \cdot \hat{j} = 0$

$|\hat{i}|\,|\hat{j}| \cos 90 = 0$

$-F\hat{j}$

F down

$-F$ up

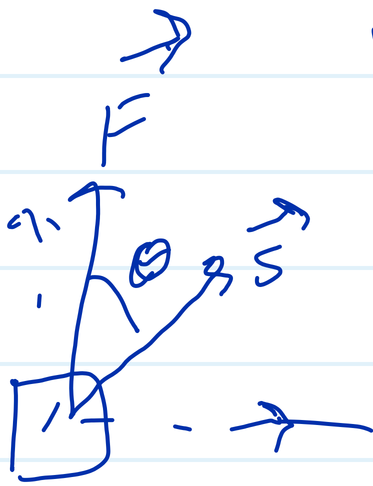
$(-F\hat{j})$

$\hat{i} \cdot \hat{i} = ?$

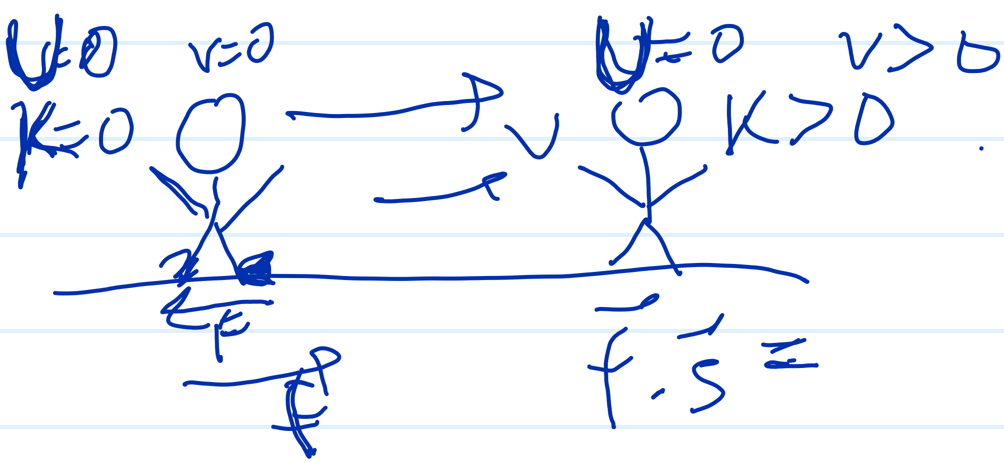
$|\hat{i}|\,|\hat{i}| \cos 0 = 1 \cdot 1 \cdot 1 = 1$

$\theta = 0^\circ = 0$ rad

$$\boxed{W = -|F||s_y|}$$



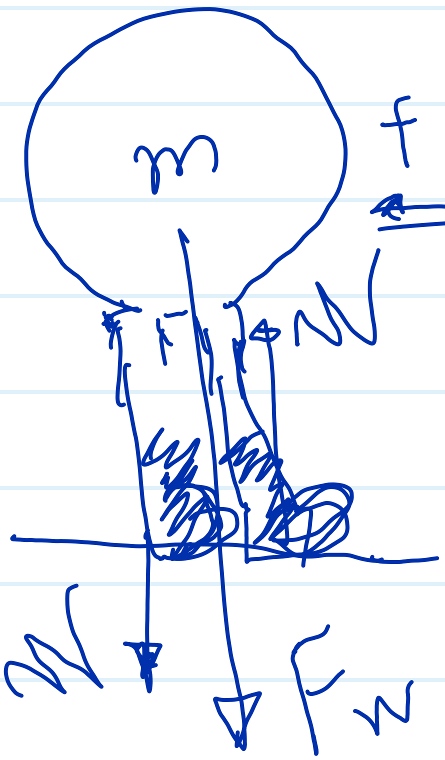
$\vec{F} \cdot \vec{s} = +ve$

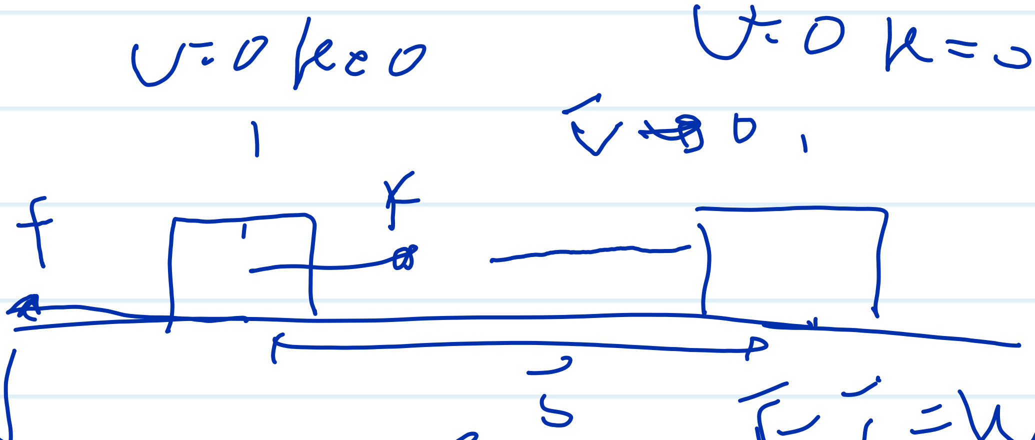


$\vec{F} \cdot \vec{s} =$

$\theta = 0^\circ$

$\vec{F} \cdot \vec{s} > 0$



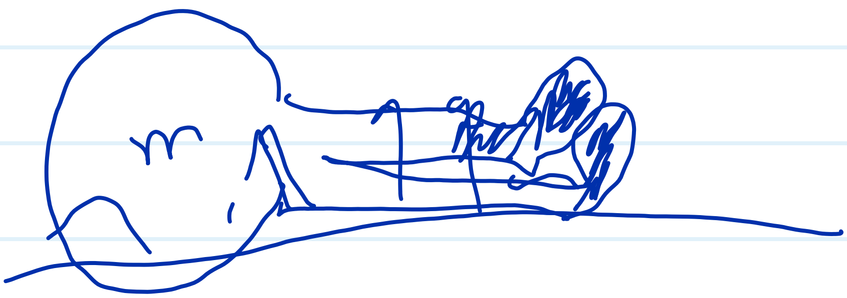


$$F - f = 0$$

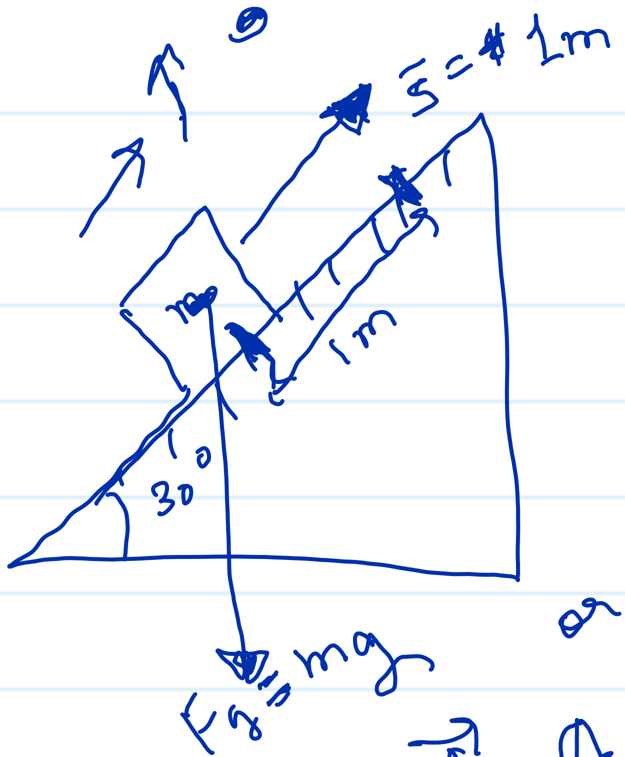
$$F \cdot s = W$$

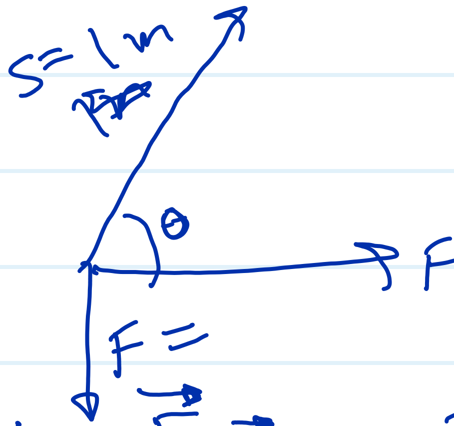
$$F \cdot s = -W$$

$$\boxed{W_{net} = \Delta E}$$



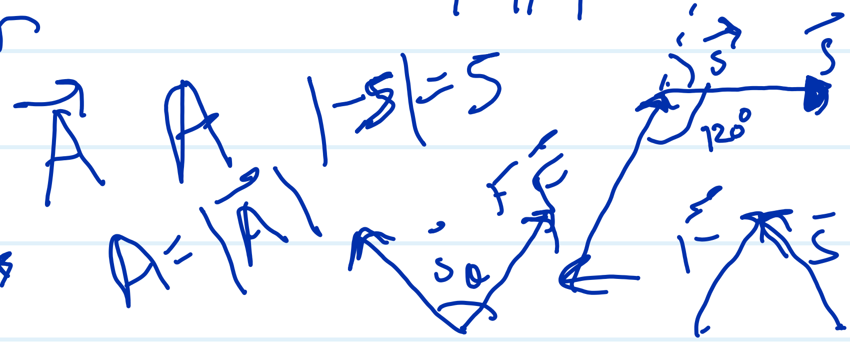
2.

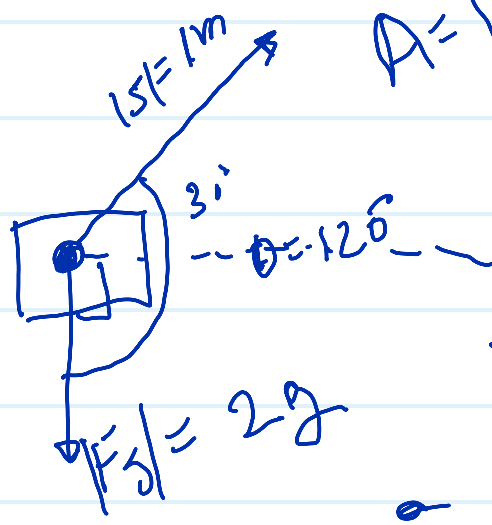




$$W = \vec{F} \cdot \vec{s}$$

or $$W = |\vec{F}||\vec{s}|\cos\theta$$





$$W = |\vec{F_g}||\vec{s}|\cos\theta$$

$$W = (2g)(1m)\cos(120°)$$

θ	0	30	60	90	120	150	180
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	−1

$$W = \left(2g \times -\tfrac{1}{2}\right) J$$

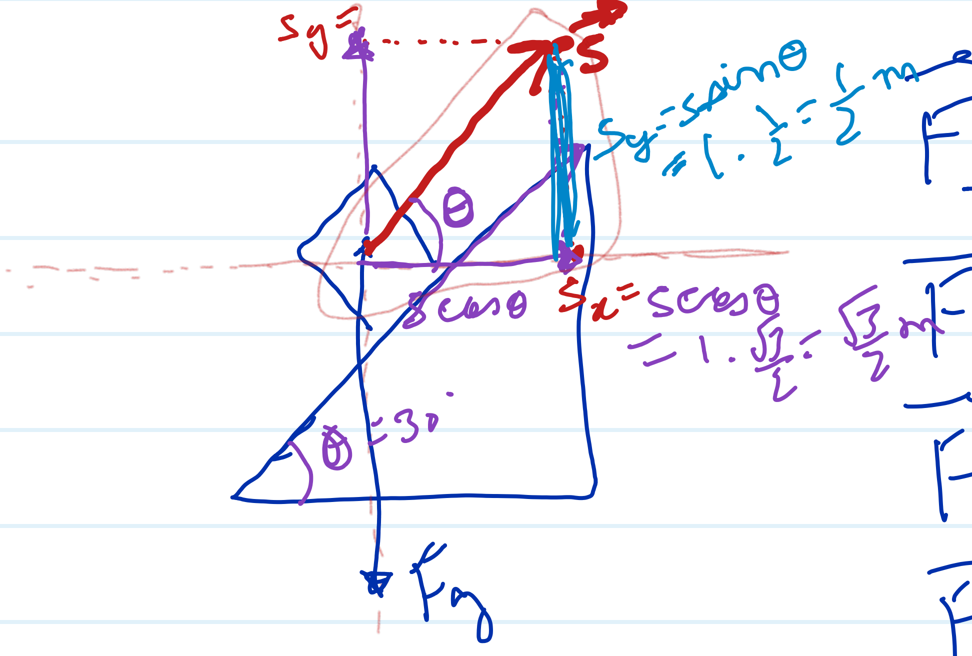
$$W = -g\ J$$

$\cos(-\theta) = \cos(\theta)$

$\cos(-30) = \cos(30) = \frac{\sqrt{3}}{2}$

$W = -9.8 J$

$W = -10 J$

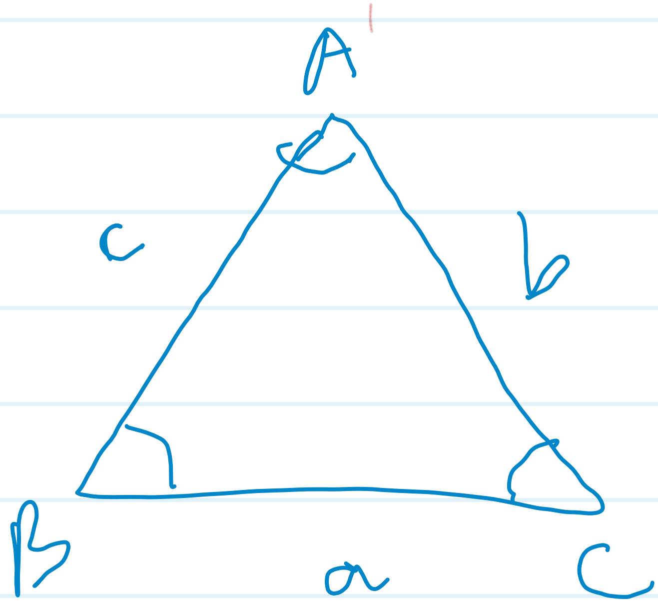


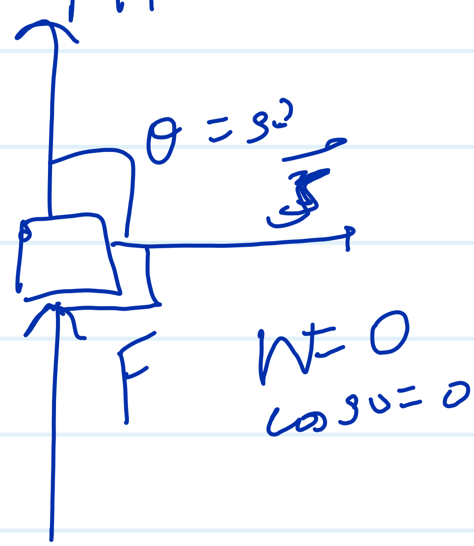
$\vec{F}_\perp \cdot \vec{s}_\parallel = 0$

$\cancel{\vec{F}_\perp \cdot \vec{s}_\perp = 0}$

$\vec{F}_\parallel \cdot \vec{s}_\perp = 0$

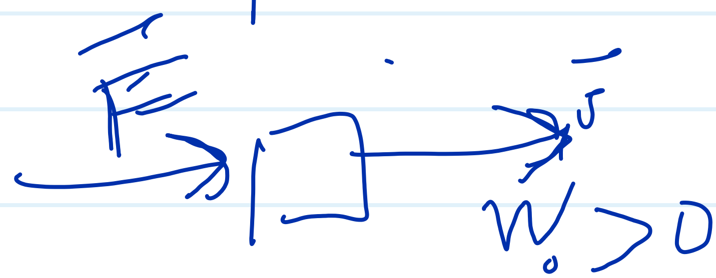
$\cancel{\vec{F}_\parallel \cdot \vec{s}_\parallel = 0}$





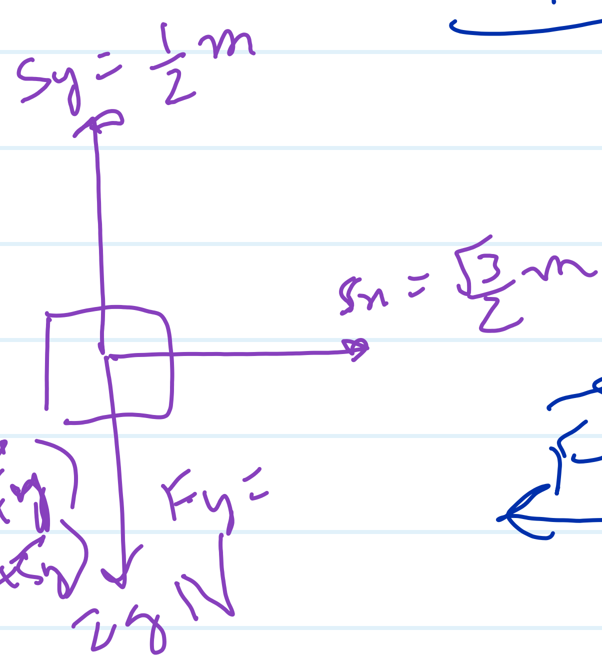
$W = 0$

$\cos 90 = 0$



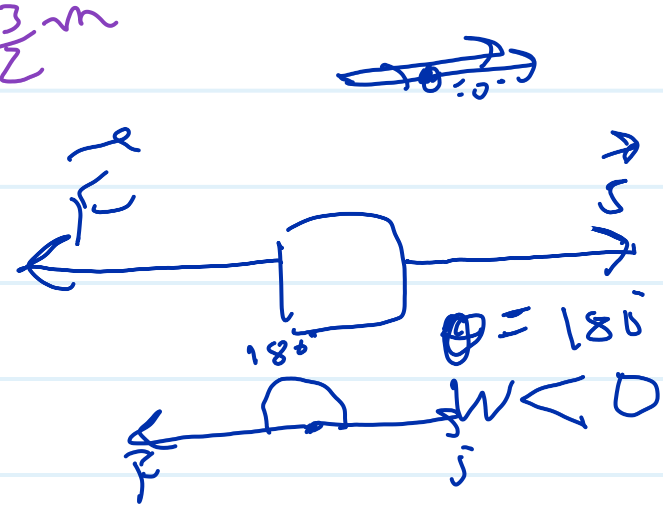
$W > 0$

$\theta = 0^\circ$



$W = \vec{F} \cdot \vec{s}$

$W = (\vec{F}_x + \vec{F}_y) \cdot (\vec{s}_x + \vec{s}_y)$

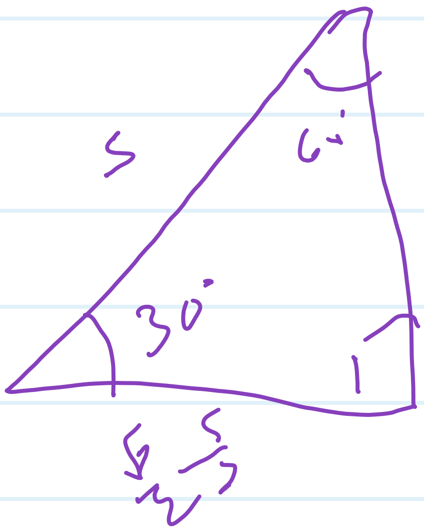


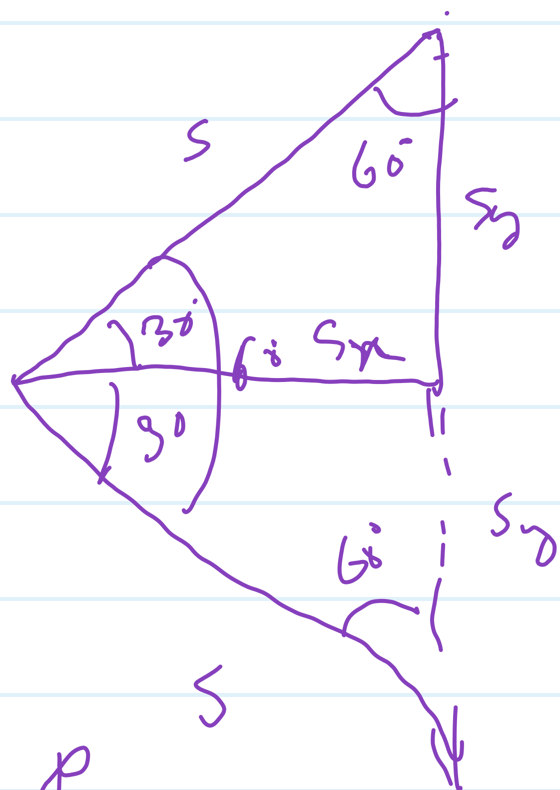
$\theta = 180^\circ$

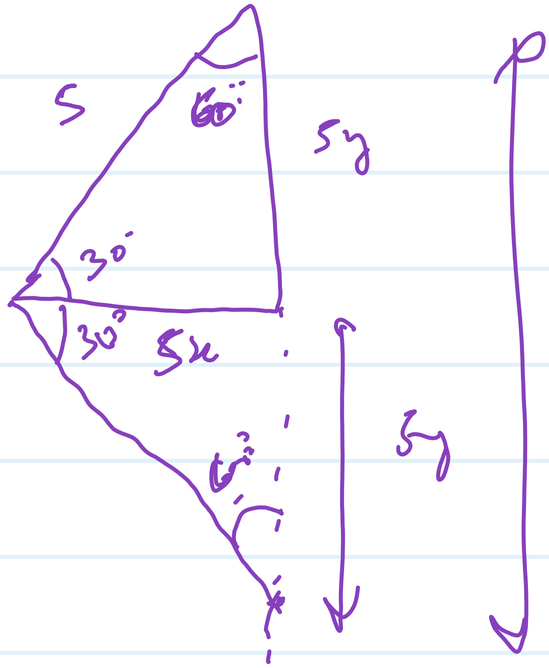
$W < 0$

$$W = F_x S_x + F_y S_y$$

$$2g \times \frac{1}{2} \times -1 = -g\,J$$



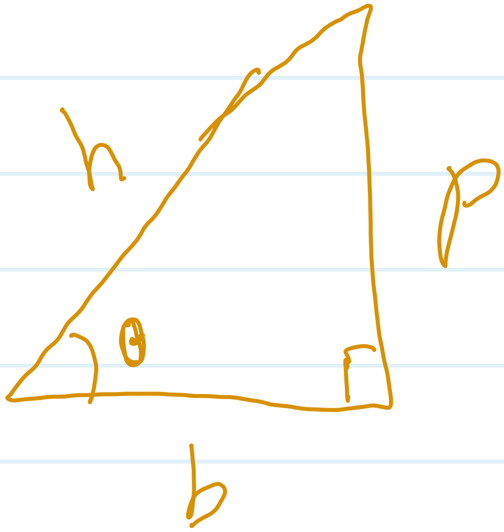




$$2S_y = S$$

$$\Rightarrow S_y = \frac{1}{2}S$$

$$S_x = \frac{\sqrt{3}}{2}S$$



$\sin\theta = \frac{\text{opp. side}}{\text{Hypotenuse}}$

or $\boxed{\sin\theta = \frac{p}{h}}$

$\cos\theta = \frac{\text{adj. side}}{\text{Hypotenuse}}$

or $\boxed{\cos\theta = \frac{b}{h}}$

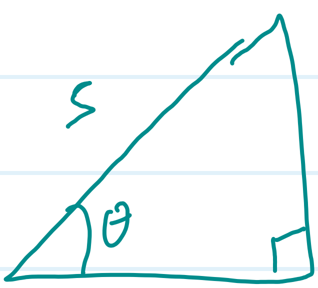
$\sin^2\theta + \cos^2\theta = \left(\frac{p}{h}\right)^2 + \left(\frac{b}{h}\right)^2$

$(\sin\theta)^2$

or $LHS = \left(\frac{p^2+b^2}{h^2}\right)$

or $LHS = \frac{h^2}{h^2} = 1 = RHS$

or $\boxed{\sin^2\theta + \cos^2\theta = 1}$



$s_y = s\sin\theta$

$s_x = s\cos\theta$

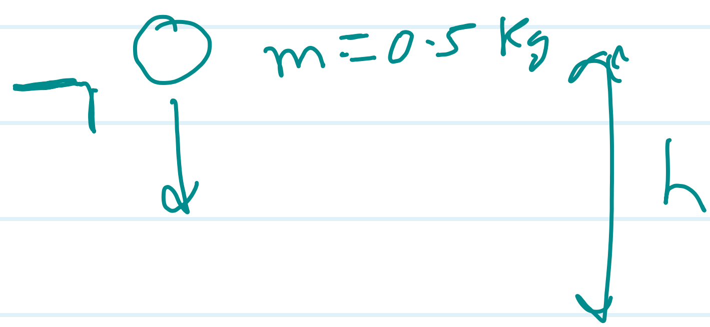
$\cos\theta = \frac{s_x}{s}$

or $\boxed{s_x = s\cos\theta}$

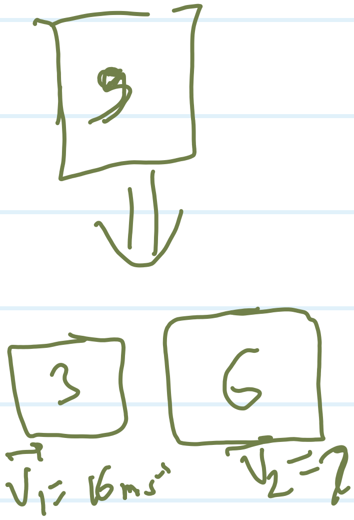
$\sin\theta = \frac{s_y}{s}$

or $\boxed{s_y = s\sin\theta}$

$\boxed{9.}$



$\boxed{3.}$



$v_2 =$

$\vec{F}_{net} = 0$

$\Rightarrow \Delta \vec{p}_{net} = 0$

$$\vec{F}_{net} = \frac{\Delta \vec{p}_{net}}{\Delta t}$$

$3 \times 16 + 6 \times v_2 = 0$

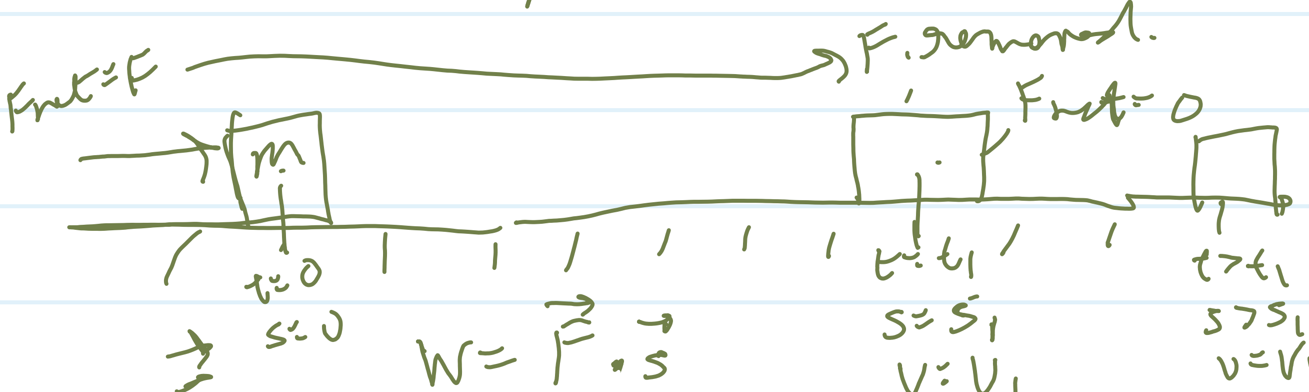
$\boxed{v_2 = -8\,ms^{-1}}$

$\boxed{11}$

$\Delta KE = W_{net}$

(assuming $PE/U \rightarrow c$)

$\frac{1}{2} \times 6 \times 8^2 = 192$



$W = \vec{F} \cdot \vec{s}$

$\vec{F}$, $\vec{s}$: $\theta = 0$, $\cos\theta = 1$

$W = |F||s|\cos\theta$

$\Rightarrow W = |F||s| . 1$

$KE_0 = 0$ $\quad W(s=0 \text{ to } s=s_1) = Fs_1$ $\quad KE_1 = \frac{1}{2}mv_1^2$

$$v_1^2 - \cancel{u^2}^{\,0} = 2as_1$$

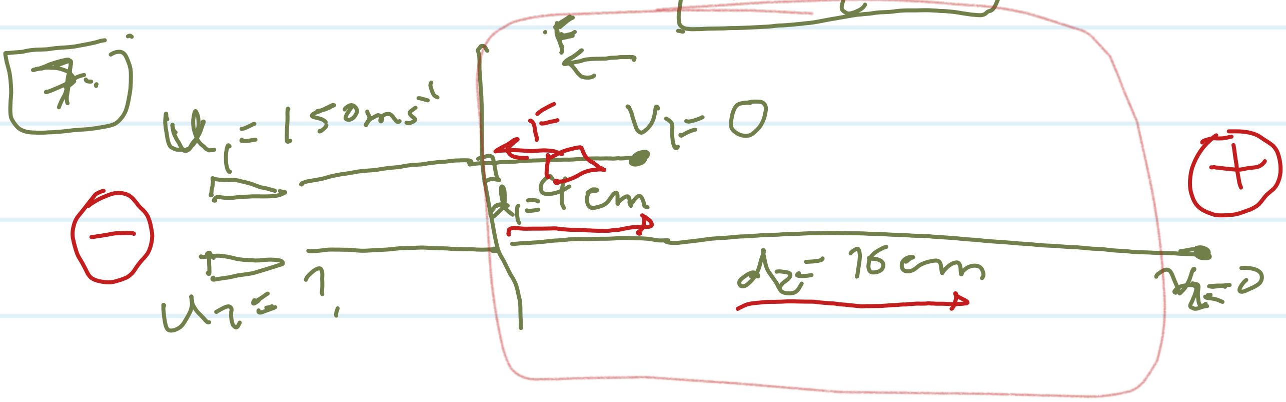
$$\text{or } v_1^2 = 2as_1$$

$$\text{or } v_1^2 = 2\frac{F}{m}s_1$$

$$\text{or } \frac{1}{2}\frac{m}{F}\cdot v_1^2 = s_1$$

$$W = Fs_1 = F\cdot\frac{1}{2}\frac{m}{F}v_1^2$$

$$\text{or } \boxed{W = \frac{1}{2}mv_1^2}$$



$$2ad_1 = 0 - u_1^2$$

$$\text{or } a = \boxed{\frac{-u_1^2}{2d_1}}$$

$$\text{or } a = \frac{-150^2}{2\times 0.04}$$

$$\text{or } a = \frac{-150^2\times 25}{2}$$

$$\text{or } a = -225\times 25\times 50$$

$$\text{or } a = -225\times 1250$$

$$\Rightarrow \quad a = \frac{-225^2}{10 \times 2 \times 125}$$

$$\boxed{a = 281250\ \mathrm{m\,s^{-2}}}$$

$$\Rightarrow \quad a = \boxed{\frac{-u_1^2}{2d_1}}$$

$\Rightarrow$ $u_2 = ??$ $d_2 = 16\ \mathrm{cm}$

$$2 \times \frac{-u_1^2}{2d_1} \times d_2 = 0 - u_2^2$$

$$\Rightarrow \quad u_1^2 \times \frac{d_2}{d_1} = u_2^2$$

$$\Rightarrow \quad 4u_1^2 = u_2^2$$

$$\Rightarrow \quad u_2 = 2u_1$$

$\Rightarrow$ $\boxed{u_2 = 300\ \mathrm{m\,s^{-1}}}$ Ans

Using W & E concepts

u_1 F_{net} d_1 $F_{net} = 0$

$\boxed{\Delta KE = W_{net}}$ ② only if $\Delta U = 0$ or $U \to C$

$\boxed{\Delta E = W_{net}}$ ①

$|F||d|(-1)$

$W_{net} = \vec{F}_{net} \cdot \vec{d}_1$

$\Rightarrow$ $\boxed{W_{net} = -F \times d_1}$

$$\Delta KE_1 = 0 - \frac{1}{2} m u_1^2$$

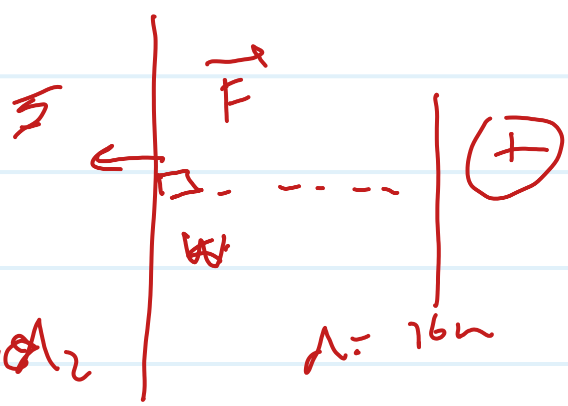
or $$\Delta KE_1 = -\frac{1}{2} m u_1^2$$

or $$\Delta W_{net1} = \Delta KE_1$$

or $$-F \times d_1 = -\frac{1}{2} m u_1^2$$

or $$\boxed{F = \frac{\frac{1}{2} m u_1^2}{d_1}}$$

$$\Delta KE_2 = W_{net2}$$



or $$\Delta KE_2 = -F \times d_2$$

or $$-\frac{1}{2} m u_2^2 = -F \times d_2$$

or $$u_2^2 = \frac{-2}{m} \times -F \times d_2$$

or $$u_2^2 = \frac{\cancel{2}}{\cancel{m}} \times \frac{\cancel{\frac{1}{2}} \cancel{m} u_1^2}{d_1} \times d_2$$

or $$u_2^2 = \frac{d_2}{d_1} u_1^2 \Rightarrow \boxed{u_2 = 2 u_1 = 300 ms^{-1}}$$

$$\boxed{F = \frac{\frac{1}{2} m u_1^2}{d_1}}$$

$\Delta p = F_{net} \Delta t$

$m(0-150)$

F_{net} ?, $\Delta t = ?$

a_{net}

u_1	0
u_2	0

$s_1 = u_1 \times t_1 + \frac{1}{2} a t_1^2$

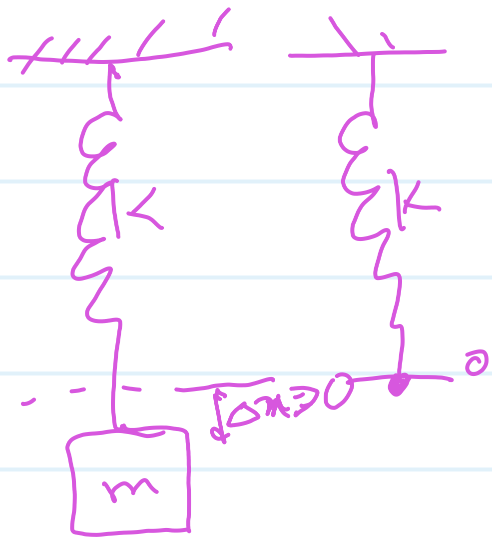
$v_1 = u_1 + a t_1$

$0 = u_1 + a t_1$

$t_1 = \frac{-u_1}{a}$

$t_2 = \frac{-u_2}{a}$

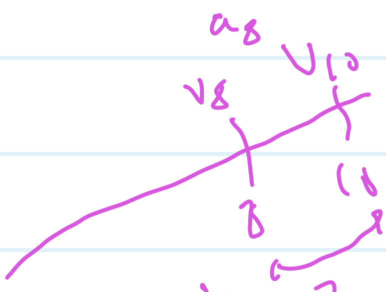
$\boxed{5)}$



$-k\Delta x = F_{spring}$

$\boxed{F = -kx}$ Hooke's law

$\vec{v} = \frac{\Delta \vec{x}}{\Delta t} = \frac{dx}{dt} = \dot{x}$



$a_8 = \frac{v_{10} - v_8}{10 - 8}$

$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{dv}{dt} = \dot{v}$

$F = -kx$

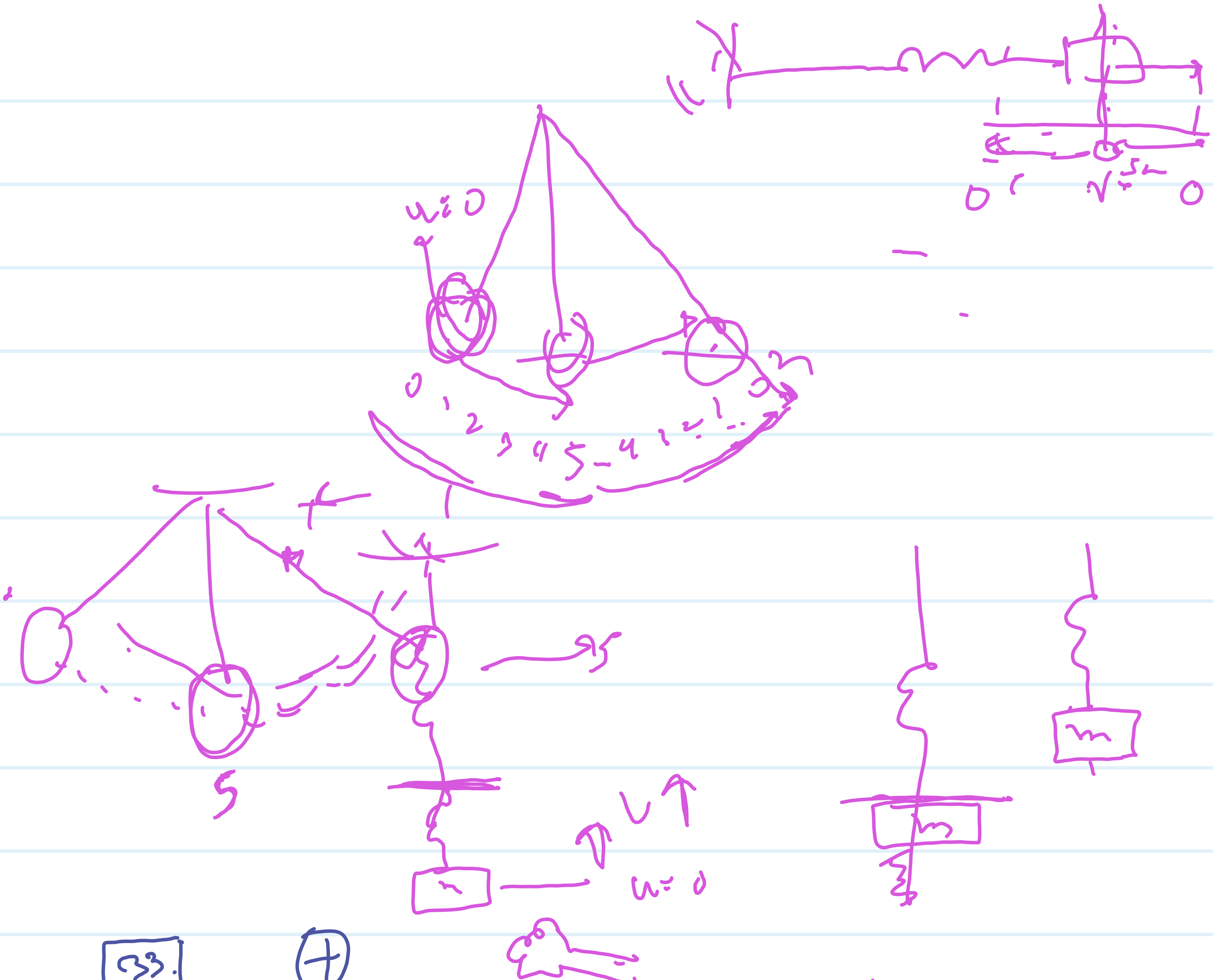
$a = \dot{v}$ $\quad \frac{d^2x}{dt^2}$

$F = ma$

$m\ddot{x} = -kx$

$a = (\dot{x})^{\cdot}$

$a = \ddot{x}$



33.

$0 = V_{100}$ $\quad S_{100} = 100\,m$

$t_2 = V_{60}$ $\quad S_{60} = ?$ $\quad a = -g$

$m\ddot{x} = -kx$

$x = A\cos(\omega x + \phi) + B\sin(\omega x + \phi)$

V_0 $\quad KE_0 = \frac{1}{2} m V_0^2$

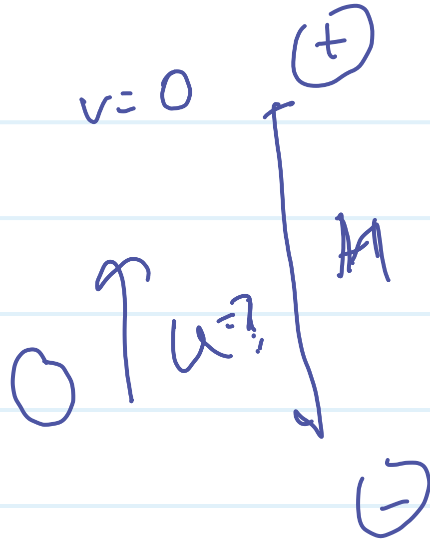
$KE_{60} = 0.60 \times KE_0$

$\Rightarrow \frac{1}{2} m V_{60}^2 = 0.60 \times \frac{1}{2} m V_0^2$

$\Rightarrow \boxed{V_{60} = \sqrt{0.60}\, V_0}$

$2 \times a \times S_{60} = V_{60}^2 - V_0^2$

$\Rightarrow 2 \times -g \times S_{60} = 0.60 V_0^2 - V_0^2$



$0^2 - u^2 = 2\times -g\times H$

or $u = \sqrt{2gH}$

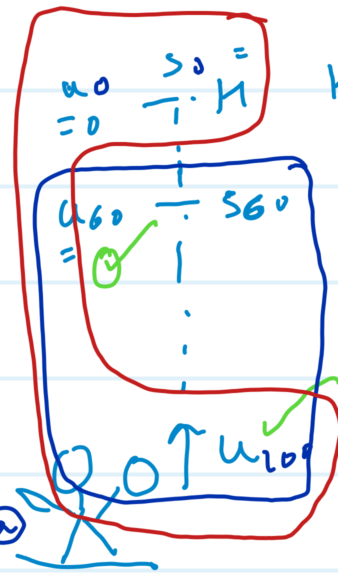
$u^2 = 2gH$

$\boxed{u_{60}^2 = 1.2gH}$

$H = 100m$

$u_{100} = ?$

$S_{60} = ?$



KE = 0

KE = 0.60 KE_0

KE = 1.00 KE_0

$\boxed{u_{100} = \sqrt{2gH}}$

$KE_{100} = \frac{1}{2} m u_{100}^2$ (a)

$KE_{60} = 0.6\times\frac{1}{2} m u_{100}^2$ (b)

But $KE_{60} = \frac{1}{2} m u_{60}^2$

$2\times -g\times S_{60} = u_{60}^2 - u_{100}^2$

or $2\times -\cancel{g}\times S_{60} = 0.6\times 2\cancel{g}H - 2\cancel{g}H$

or $-2S_{60} = -0.8H$

or $S_{60} = 0.4H$

or $\boxed{S_{60} = 40m}$

Using (a) = (b)

$\Rightarrow \boxed{u_{60}^2 = 0.6\, u_{100}^2}$

or $\boxed{u_{60} = \sqrt{0.6}\, u_{100}}$

$2as = v^2 - u^2$

or $2\times -g\times$