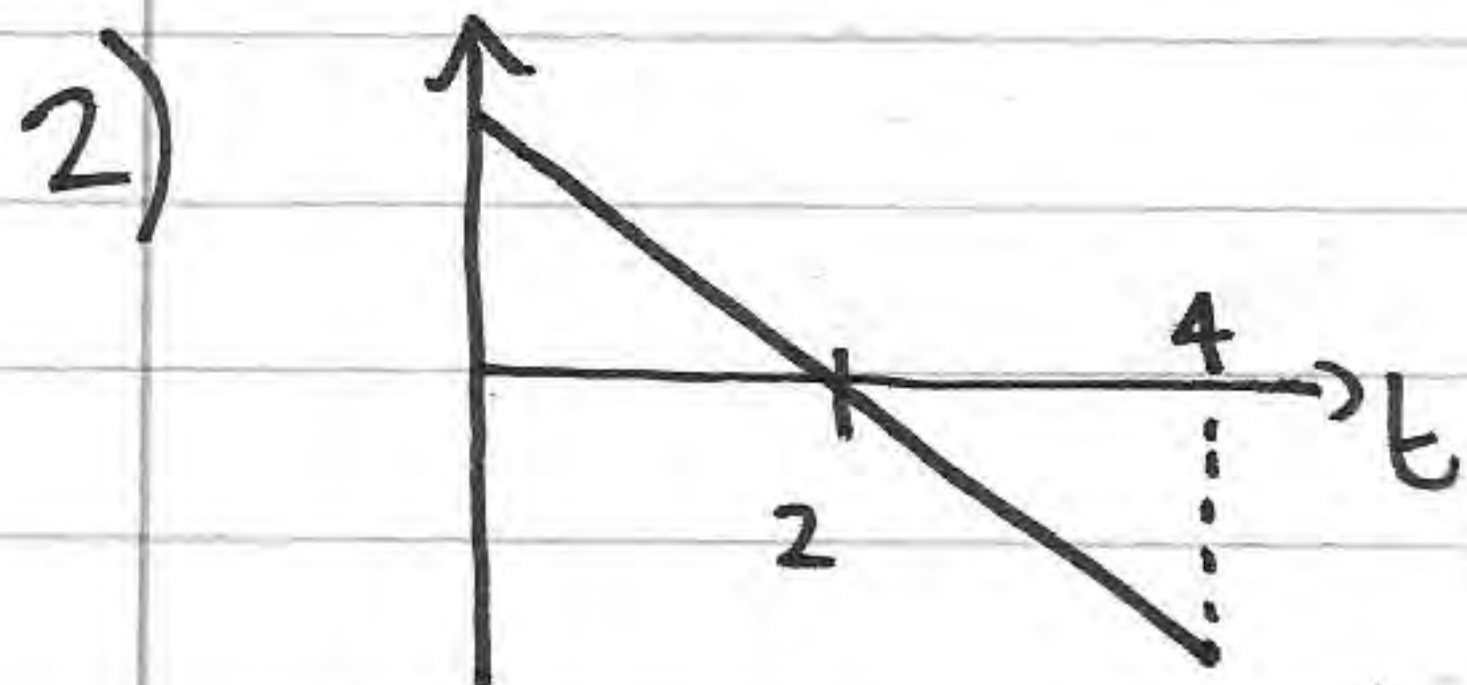


MI JAN 09

1)  $a = (2i - 5j)$   $t = 3$   $v = (-6i + j)$

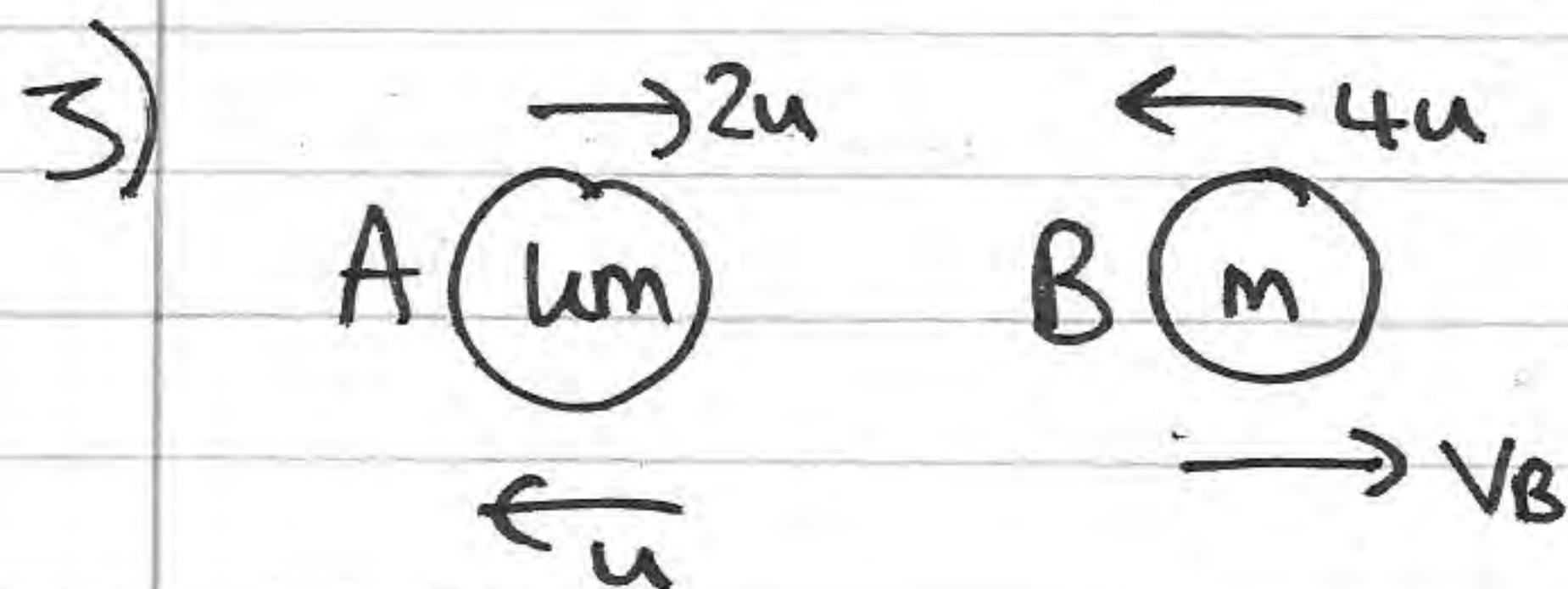
$$v = u + at \quad \begin{pmatrix} -6 \\ 1 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 2 \\ -5 \end{pmatrix} \times 3$$

$$\begin{pmatrix} -6 \\ 1 \end{pmatrix} - \begin{pmatrix} 6 \\ -15 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix} \Rightarrow u = \underline{-12i + 16j}$$



b)  $v \uparrow = 0$   
 $a \uparrow = -9.8$   
 $t = 2$   
 $s = 19.6$

$$v = u + at$$
$$0 = u - 9.8 \times t$$
$$\Rightarrow u = \underline{19.6 \text{ m s}^{-1}}$$



$$\text{CLM} \Rightarrow 2(2mu) - 4mu = -2mu + mv_B$$

$$\Rightarrow 3mu - 4u = v_B$$

$$\Rightarrow v_B = u(3u - 4)$$

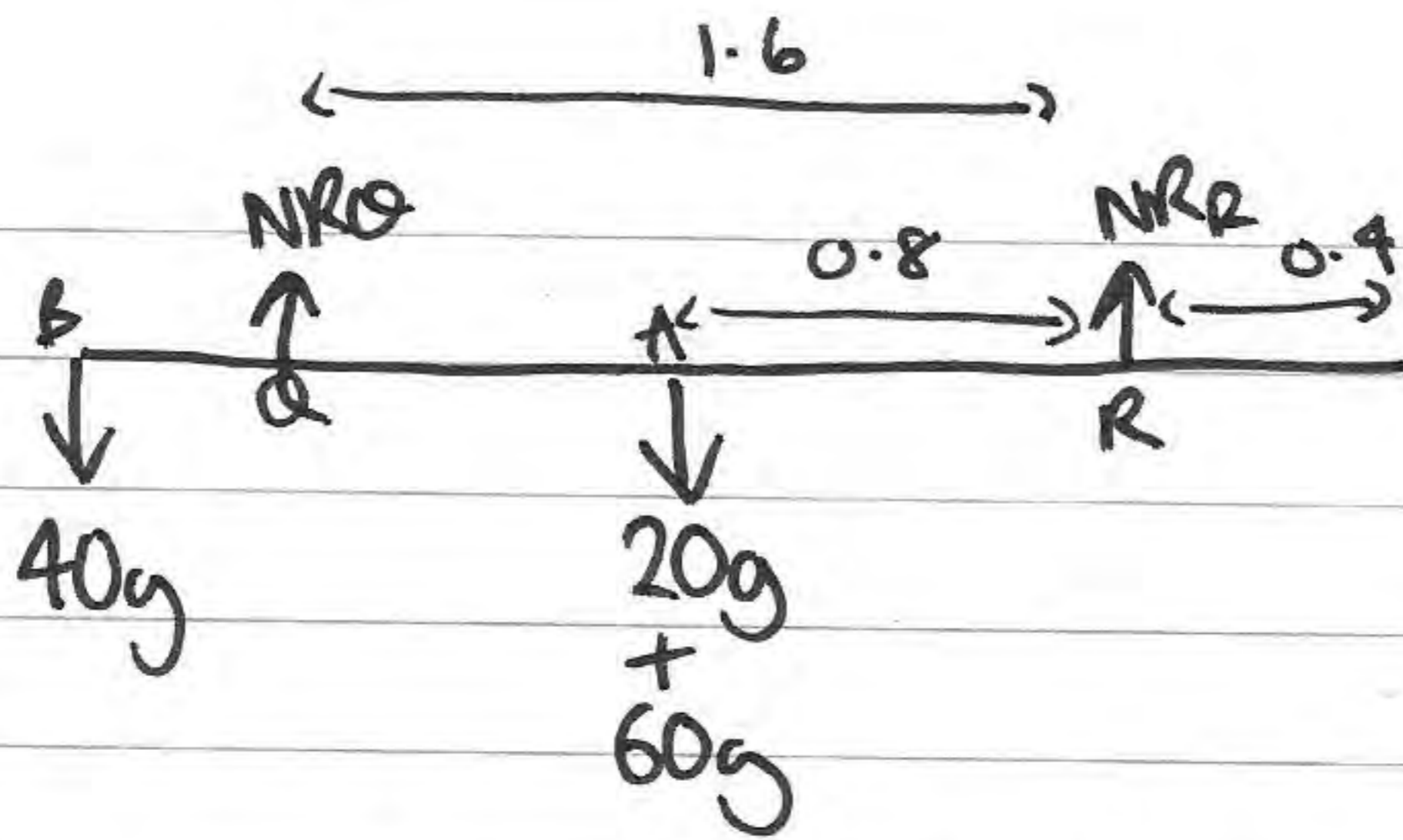
b)  $2 < u < 3 \Rightarrow v_{B \text{ min}} u = 2 \quad v_B > 2u$   
 $v_{B \text{ max}} u = 3 \quad v_B < 5u$   
 $2u < v_B < 5u$

So its motion will be reversed.

c)  $u = \frac{7}{3} \quad v_B = u(3(\frac{7}{3}) - 4) = 3u$

Mom B before =  $m(-4u) = -4mu \Rightarrow \text{Impulse} = \underline{7mu \text{ N s}}$   
Mom B after =  $m(3u) = 3mu$

4)

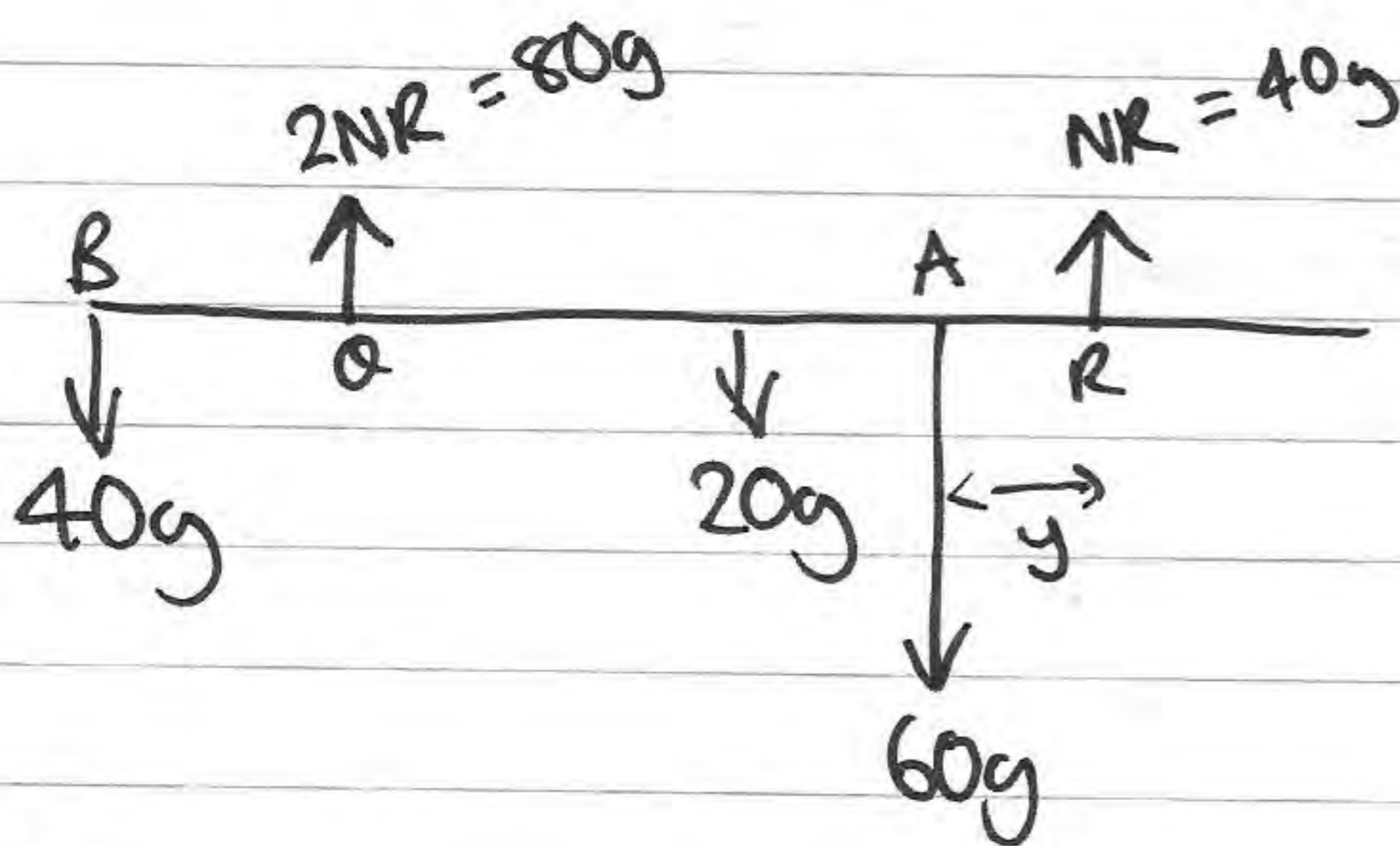


$$R_f \uparrow = 0 \Rightarrow NR_Q + NR_R = 120g$$

$$R \curvearrowright \quad 80g \times 0.8 + 40g \times 2 = NR_Q \times 1.6$$

$$\Rightarrow 144g = 1.6 NR_Q \Rightarrow NR_Q = \underline{90g N}$$

$$NR_R = \underline{30g N}$$



$$R_f \uparrow = 0 \Rightarrow 3NR = 120g$$

$$\Rightarrow NR = 40g$$

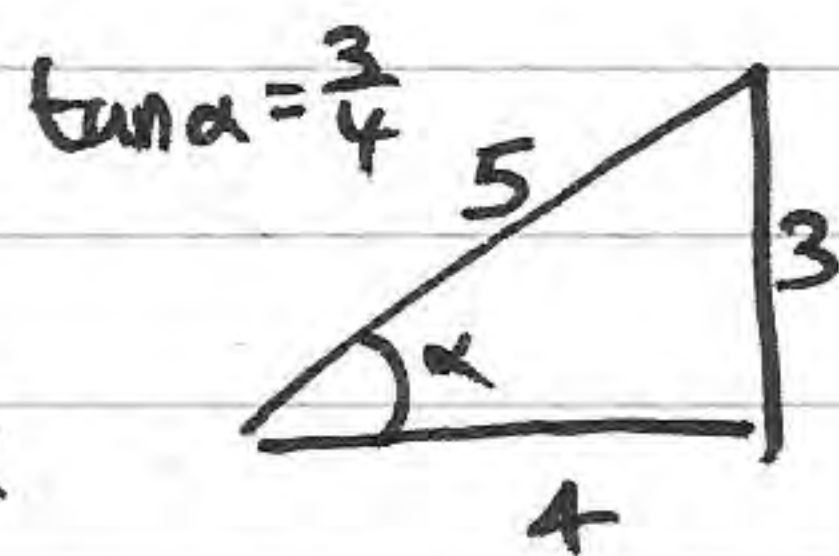
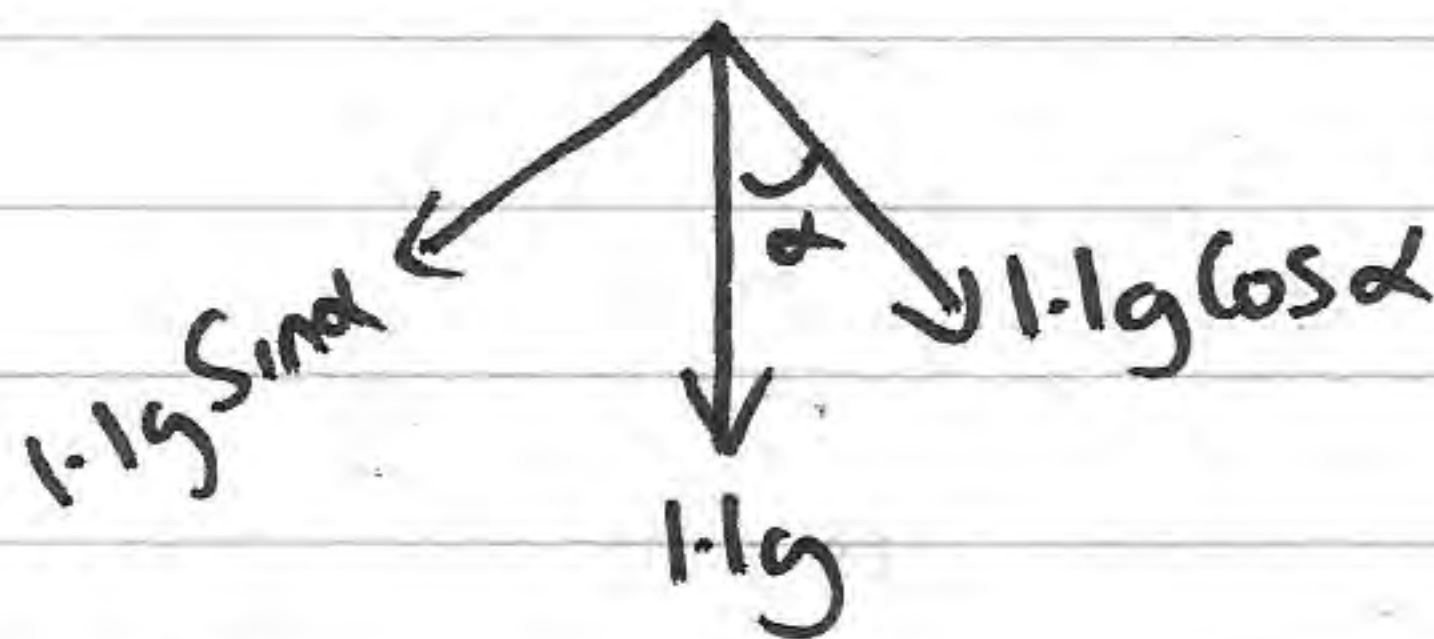
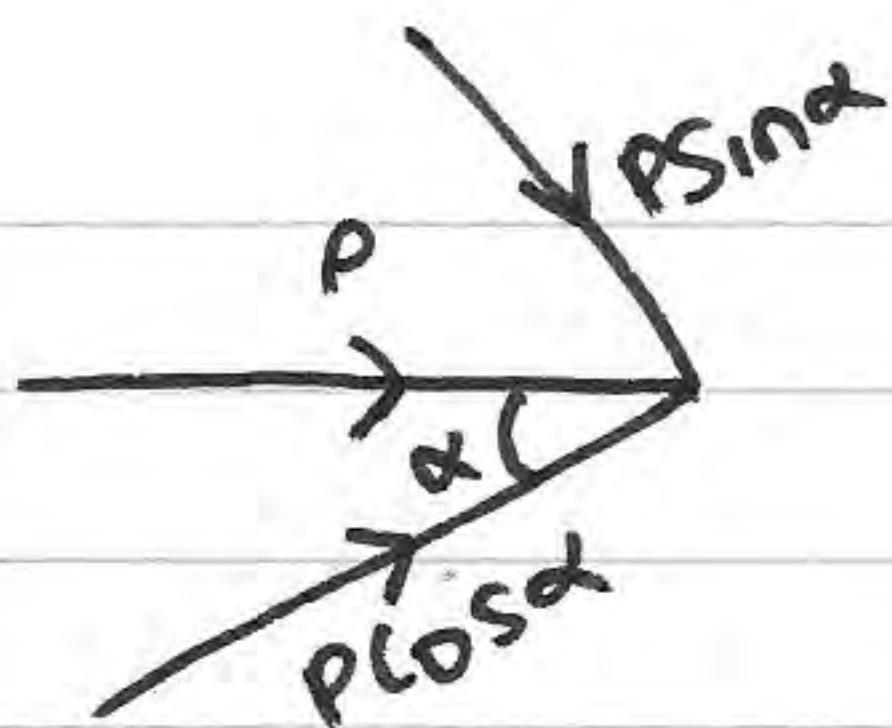
$$R \curvearrowright \quad 60g \times y + 20g \times 0.8 + 40g \times 2 = 80g \times 1.6$$

$$60g y = 32g$$

$$\bar{y} = \frac{8}{15} \Rightarrow QX = 1.6 - \frac{8}{15}$$

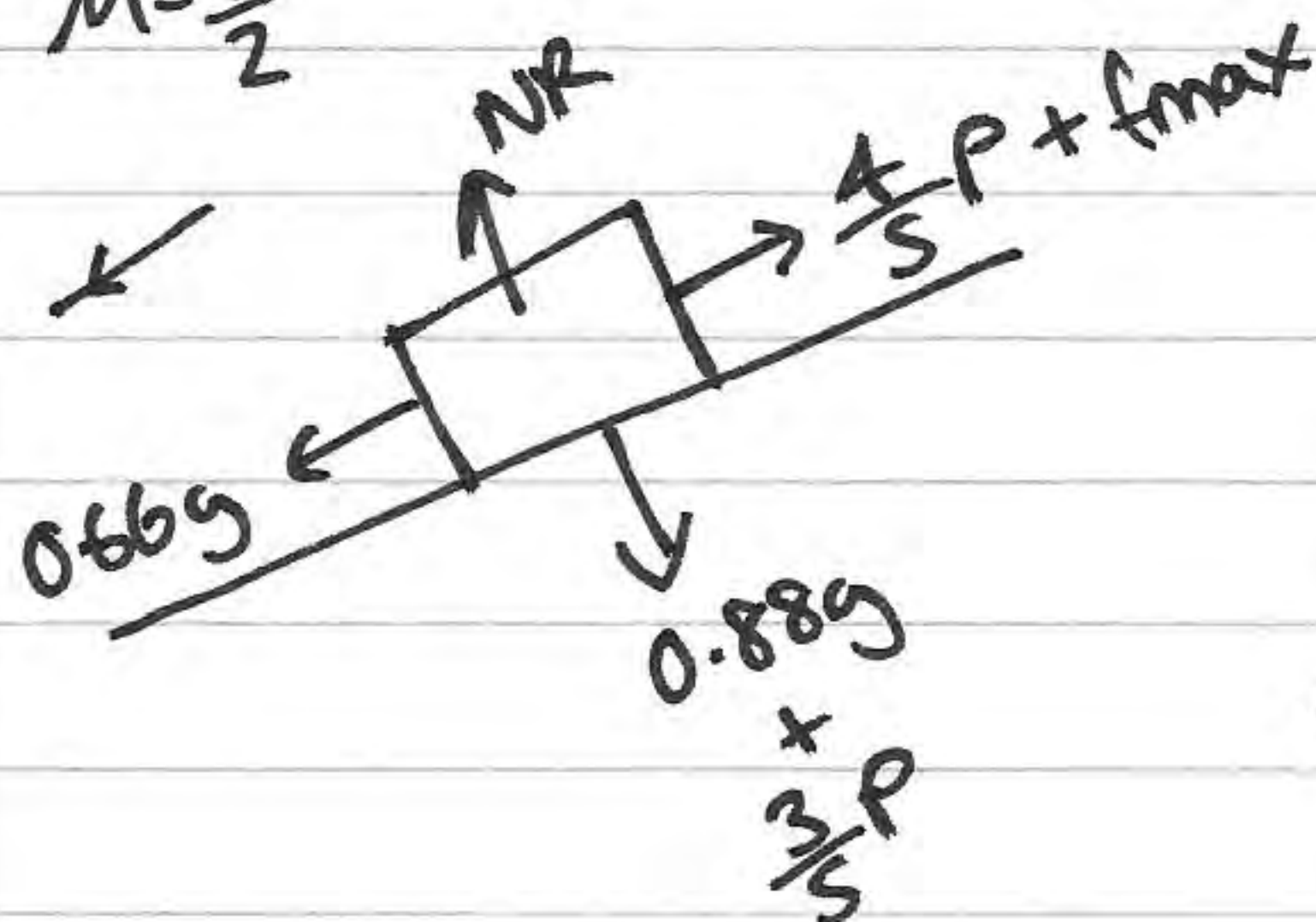
$$QX = \frac{16}{15} m$$

5)



$$\sin \alpha = \frac{3}{5} \quad \cos \alpha = \frac{4}{5}$$

$$\mu = \frac{1}{2}$$



$$R_f \uparrow = 0 \Rightarrow NR = \frac{3}{5}P + 0.88g$$

$$f_{\max} = \mu NR \Rightarrow f_{\max} = \frac{3}{10}P + 0.44g$$

$$R_f = 0 \Rightarrow \frac{4}{5}P + \frac{3}{10}P + 0.44g = 0.66g$$

$$\Rightarrow \frac{11}{10}P = 0.22g \Rightarrow P = \underline{0.2g \text{ N}}$$

$$NR = \frac{3}{5}(0.2g) + 0.88g = \underline{1g \text{ N}}$$

$$6) \quad R_f = \begin{pmatrix} 4+p \\ -5+q \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ -2 \end{pmatrix} \quad | \times -2$$

$$(4+p)x - 2 = -5+q \Rightarrow -8-2p = -5+q$$

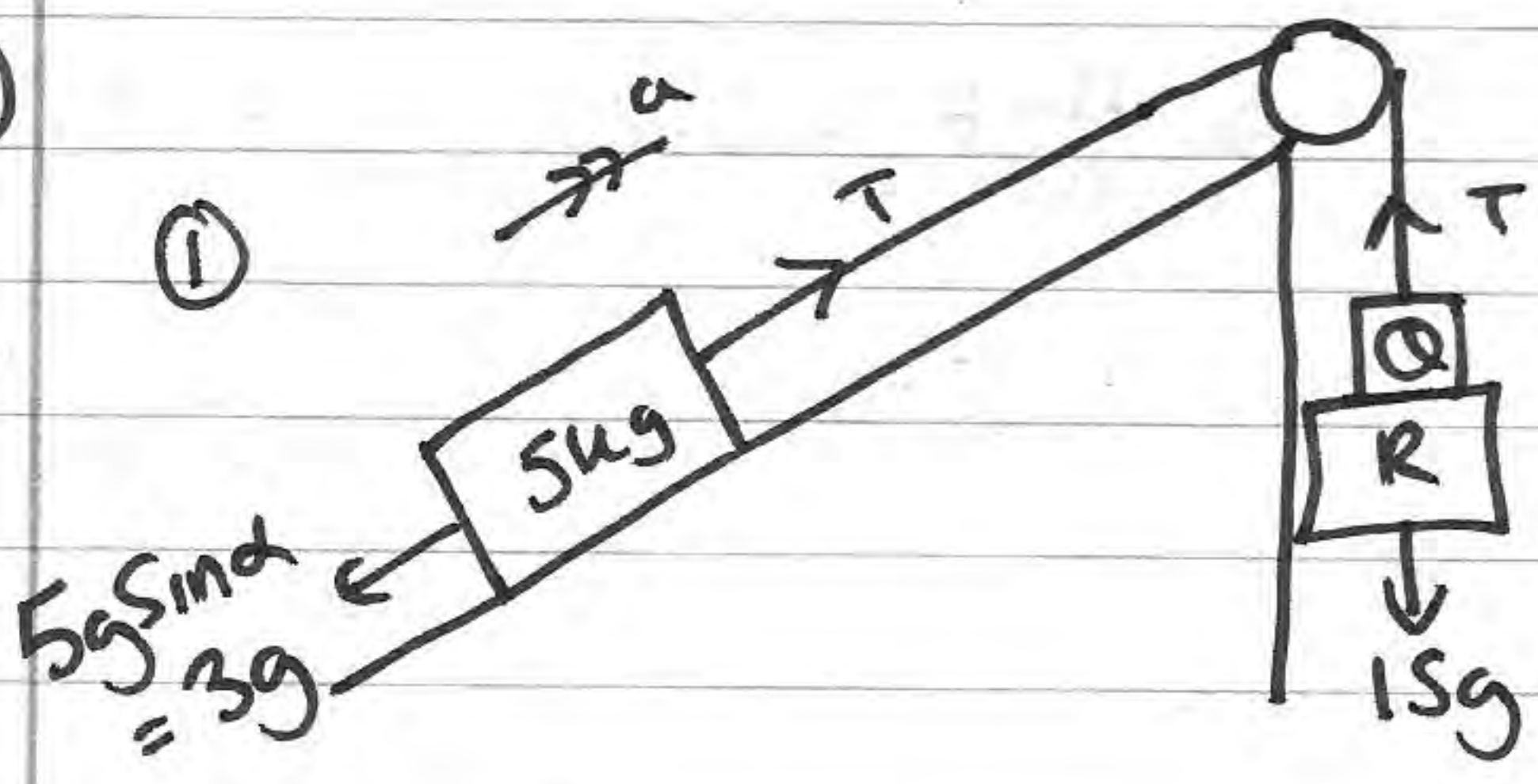
$$\Rightarrow \underline{2p+q+3=0} \quad \#$$

$$b) \quad 2p+1+3=0 \Rightarrow p=-2 \Rightarrow R_f = \begin{pmatrix} 4-2 \\ -5+1 \end{pmatrix} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

$$R_f = \sqrt{2^2+4^2} = \sqrt{20} = 2\sqrt{5}$$

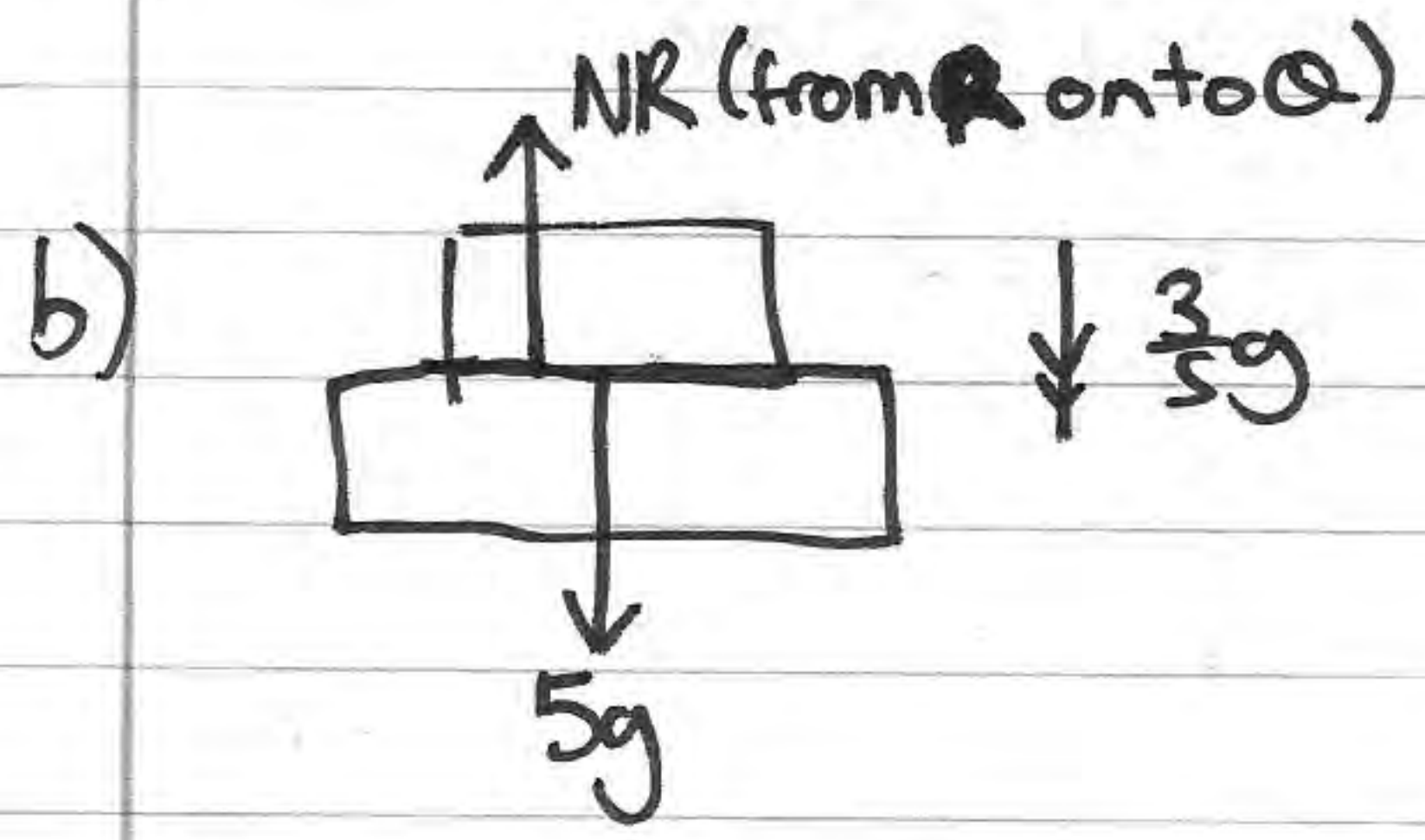
$$R_f = ma \Rightarrow 2\sqrt{5} = m \times 8\sqrt{5} \quad m = \frac{2}{8} = \underline{\frac{1}{4} \text{ kg}}$$

7

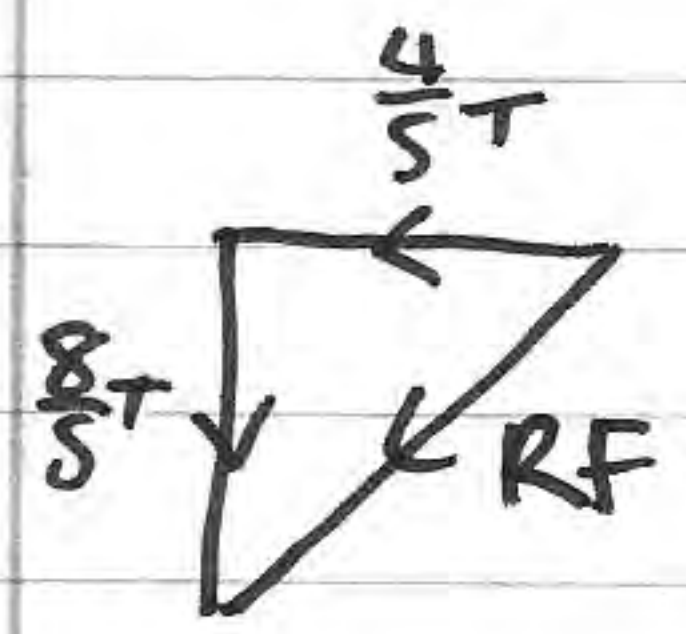
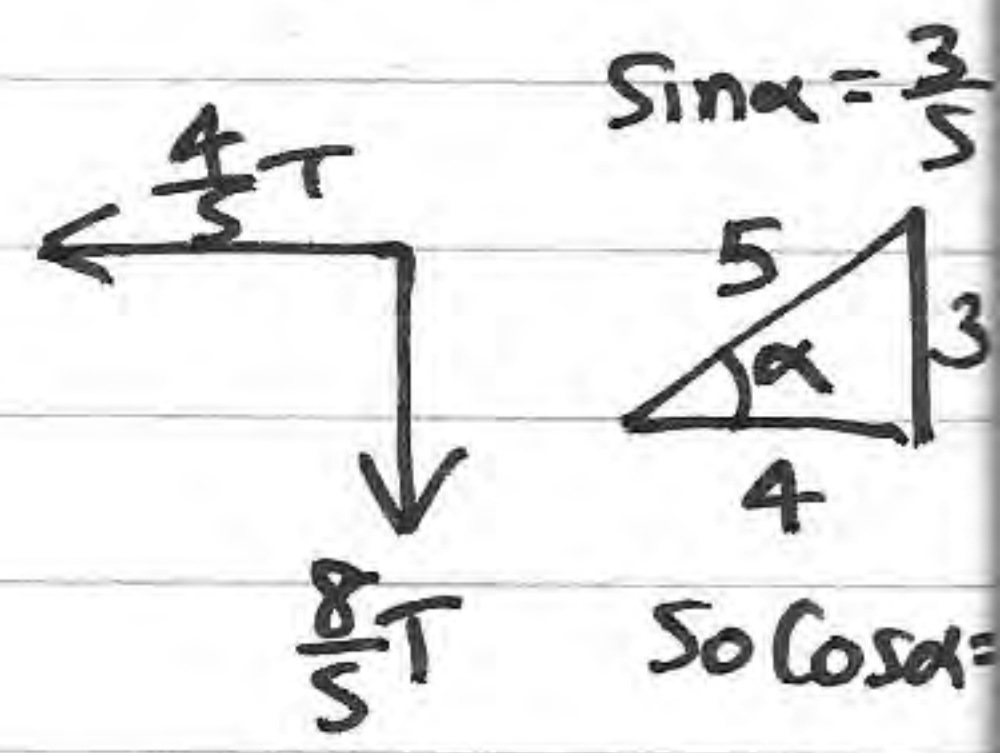
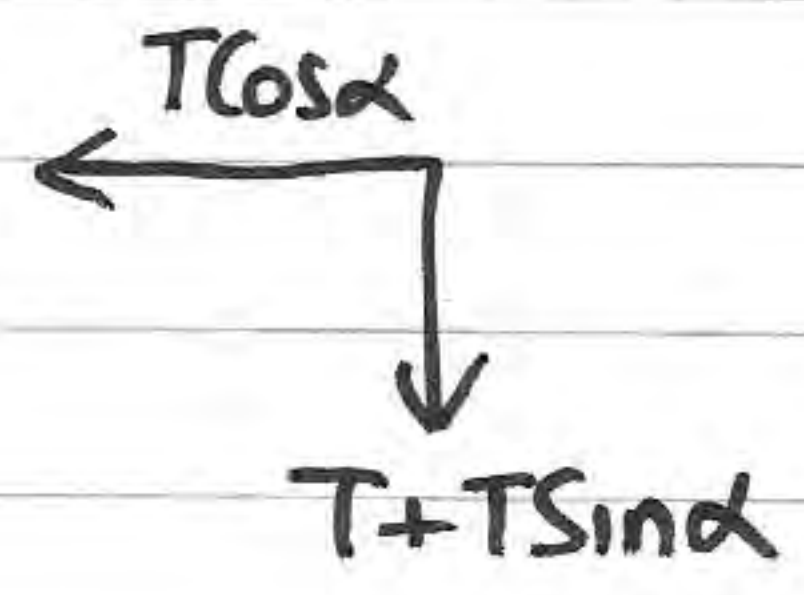
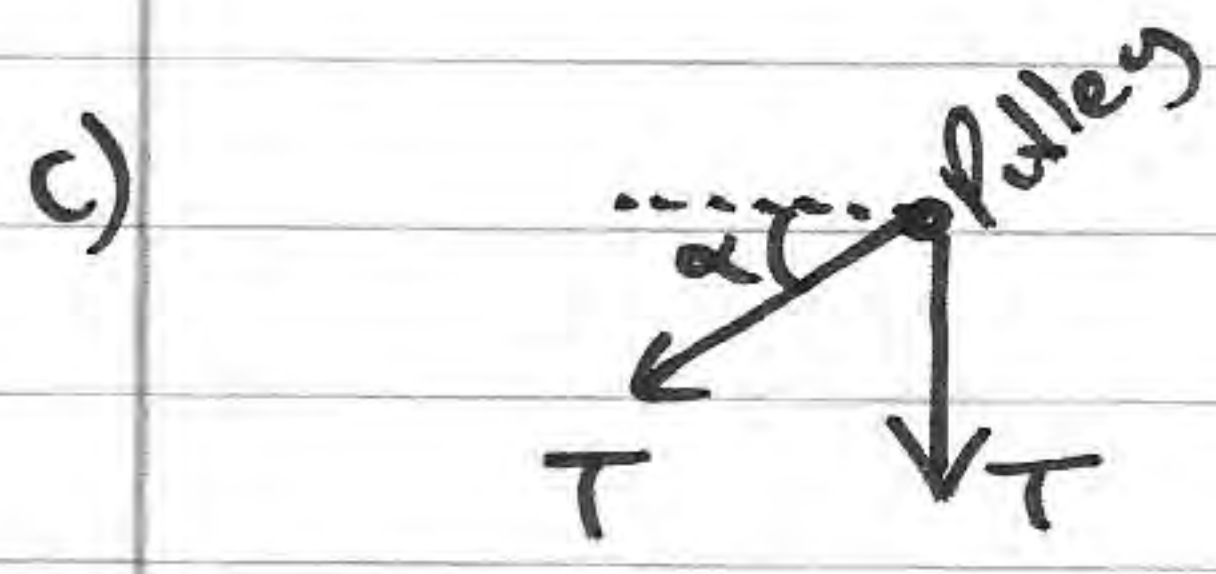


①  $T - 3g = 5a$  +  
 ②  $1g - T = 15a$   
 $12g = 20a$   
 $\Rightarrow a = \frac{3}{5}g \text{ ms}^{-2}$

①  $T = 5(\frac{3}{5}g) + 3g = \underline{6g \text{ N}}$



$R_{\text{on } Q} \downarrow = 5g - NR = 5(\frac{3}{5}g)$   
 $5g - 3g = NR$   
 $\Rightarrow \underline{NR = 2g \text{ N}}$



$R_F^2 = (\frac{4}{5}T)^2 + (\frac{8}{5}T)^2 = \frac{80}{25}T^2 \Rightarrow R_F = \frac{\sqrt{80}}{5}T$

$R_F = \frac{4\sqrt{5}}{5}(6g) = \underline{\underline{\frac{24\sqrt{5}}{5}g \text{ N}}}}$