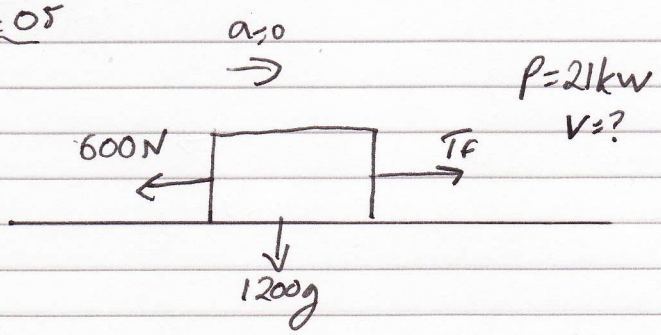
M2 - JUNE 05

(1) (a)



N2L : $T_F - 600 = 1200 \times 0$

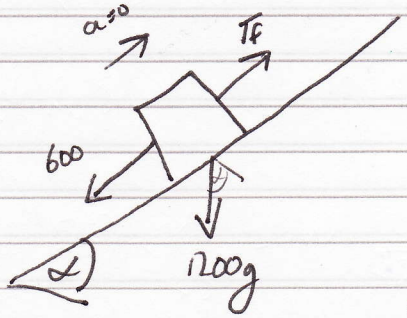
$T_F = 600$

$P = T_F \times V$

$21000 = 600 \times V$

$V = 35 \text{ ms}^{-1}$

(b)



N2L: $T_F - 1200g \sin\alpha - 600 = 0$

$T_F = 1200g \times \frac{1}{14} + 600 = 1440N$

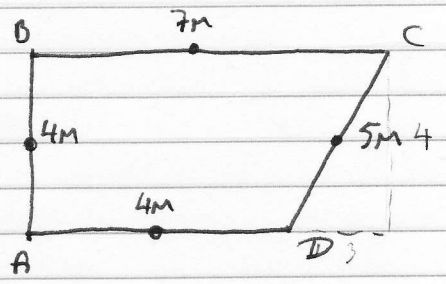
$P = T_F \times V$

$21000 = 1440 \times V$

$V = 14.6 \text{ ms}^{-1}$

M2 - Jun 07

(2)

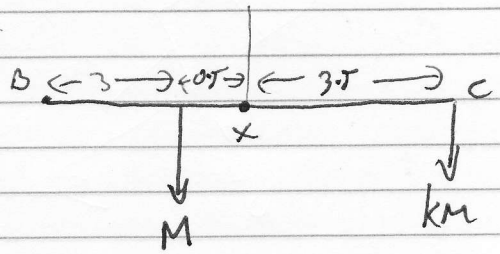


(a) $20m\begin{pmatrix}\bar{x}\\ \bar{y}\end{pmatrix} = 4m\begin{pmatrix}0\\2\end{pmatrix} + 4m\begin{pmatrix}2\\0\end{pmatrix} + 7m\begin{pmatrix}3.5\\4\end{pmatrix} + 5m\begin{pmatrix}5.5\\2\end{pmatrix}$

$20m\begin{pmatrix}\bar{x}\\ \bar{y}\end{pmatrix} = \begin{pmatrix}60\\46\end{pmatrix}$

$\begin{pmatrix}\bar{x}\\ \bar{y}\end{pmatrix} = \begin{pmatrix}60/20\\46/20\end{pmatrix} = \begin{pmatrix}3\\2.3\end{pmatrix}$ * only $\bar{x}$ actually required *

(b)

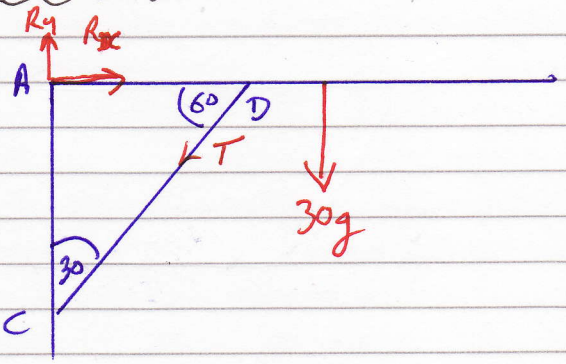


In equilibrium about X $\quad 0.5M = 3.5km$

$k = \frac{0.5}{3.5} = \frac{1}{7}$

M2 - June 07

Q6



(a) ΣG_A : $-T\sin 60 \times 0.5 - 30g \times 1.5 = 0$

$$-T\frac{\sqrt{3}}{4} = 441$$

$$T = -1018$$

$\therefore$ Thrust of $1018\ N$

(b) Σf_y: $R_y - 30g - T\sin 60 = 0$

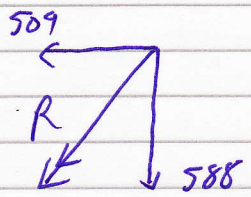
$$R_y = 30g + \frac{\sqrt{3}}{2} \times -1018$$

$$R_y = 294 - 882$$

$$R_y = -588\ N$$

Σf_x: $R_x - T\cos 60 = 0$

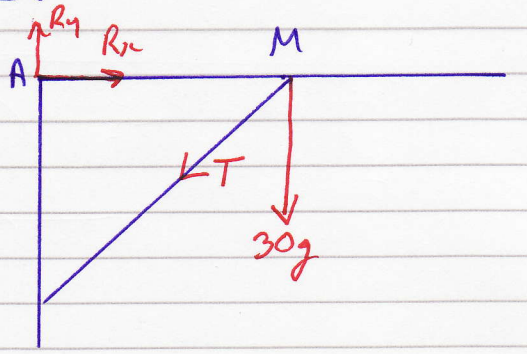
$$R_x = T\cos 60 = -1018 \times \frac{1}{2} = -509\ N$$



$$R = \sqrt{509^2 + 588^2} = 778\ N$$

M2 - JUNE 05

Q6(c)



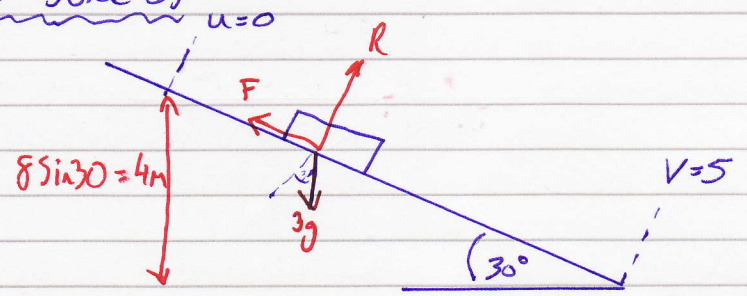
$\Sigma_{(A)} M \quad R_y \times 1.5 = 0$

$\therefore R_y = 0$

Hence reaction force @ A acting entirely horizontally.

M2 - JUNE 05

Q7



(a) PE Lost = $3 \times g \times 4 = 117.6 = 118$ Joules

(b) PE Lost = KE gained + wd v's Res

$117.6 = \frac{1}{2} \times 3 \times 5^2 + F \times 8$

$117.6 = 37.5 + 8F$

$F = 10.0\ N$

(c) $F = \mu R_n$

ΣF_y: $R_n - 3g\cos 30 = 0$

$R_n = 3g\cos 30$

$\therefore 10 = \mu \times 3g\cos 30$

$\mu = \frac{10}{3g\cos 30} = 0.39$

(d) PE lost = KE gained + wd v's Res

$117.6 = \frac{1}{2} \times 3(V^2 - 2^2) + 10 \times 8$

$117.6 - 80 = 1.5V^2 - 6$

$1.5V^2 = 43.6$

$V = 5.4\ ms^{-1}$