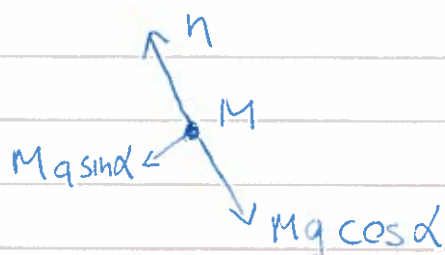
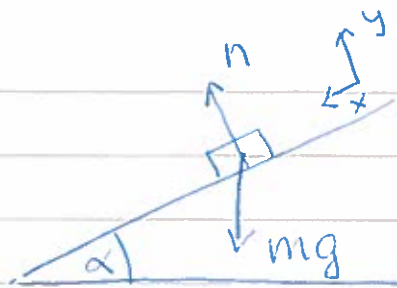


4

a) $\alpha = 20^\circ$ 

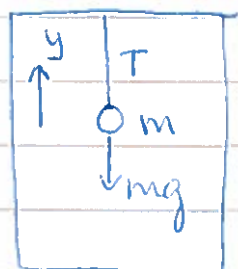
Along \hat{x} -direction \rightarrow non-equilibrium ($a \neq 0$)

$$\sum F_x = Ma_x \Rightarrow \underline{Mg \sin \alpha = Ma_x}$$

Along \hat{y} -direction \rightarrow equilibrium

$$\sum F_y = 0 \Rightarrow \underline{n - Mg \cos \alpha = 0}$$

b)

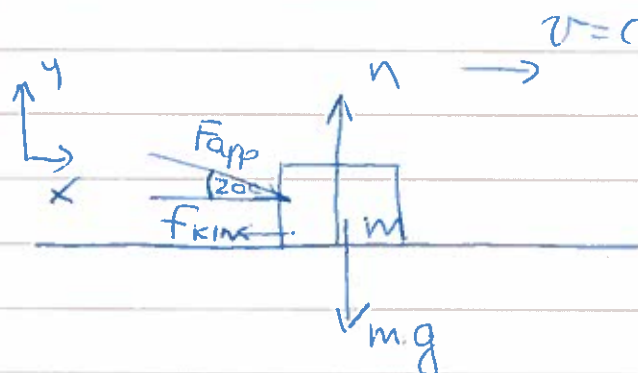
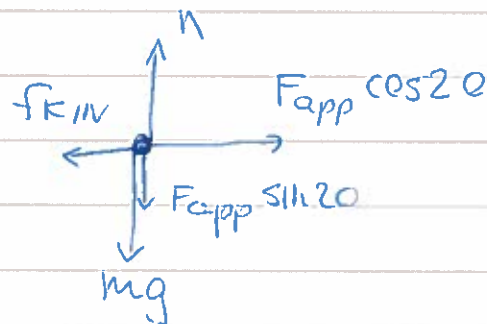
 $\uparrow a$

non-equilibrium ($a \neq 0$)

$$\sum F_y = ma$$

$$\underline{T - mg = ma}$$

c)

 $v = \text{const}$ 

Since $v = \text{const} \Rightarrow a = 0 \Rightarrow$ Equilibrium!

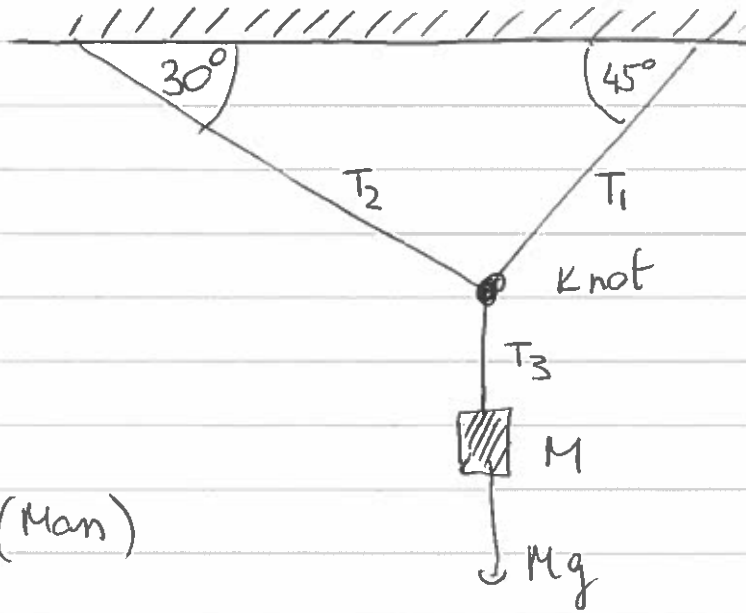
$$\sum F_x = 0$$

$$\underline{F_{app} \cos 20^\circ - f_{kin} = 0}$$

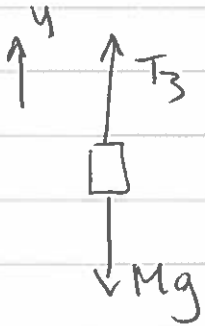
$$\sum F_y = 0$$

$$\underline{n - mg - F_{app} \sin 20^\circ = 0}$$

d)



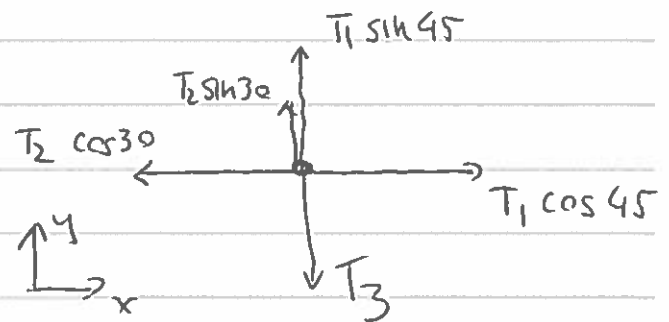
FBD 1 (Mass)



$$\sum F_y = 0$$

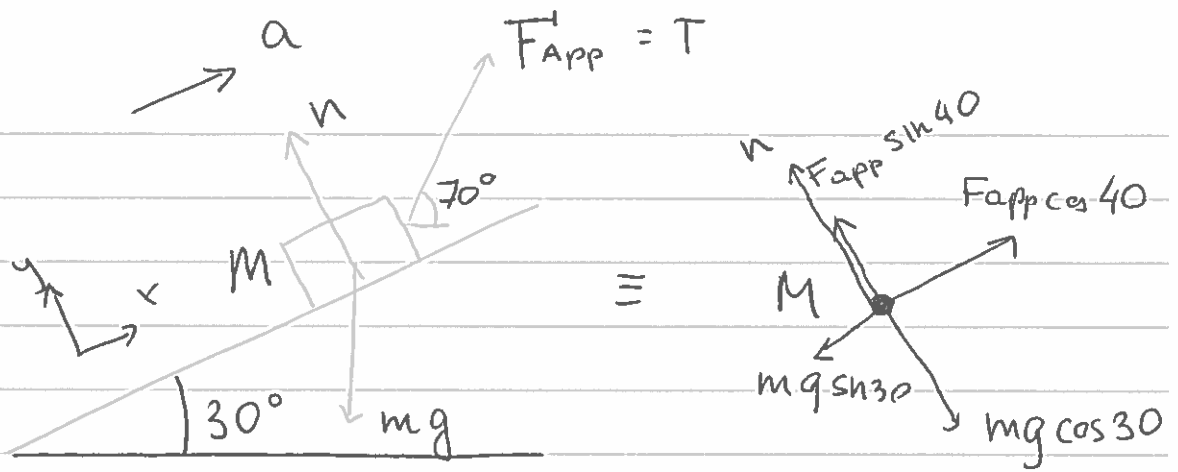
$$\underline{T_3 - Mg = 0}$$

FBD (2) (Knot)



$$\left. \begin{aligned} T_1 \sin 45^\circ + T_2 \sin 30^\circ - T_3 &= 0 \\ T_1 \cos 45^\circ - T_2 \cos 30^\circ &= 0 \end{aligned} \right\}$$

7b



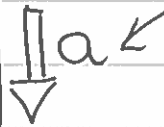
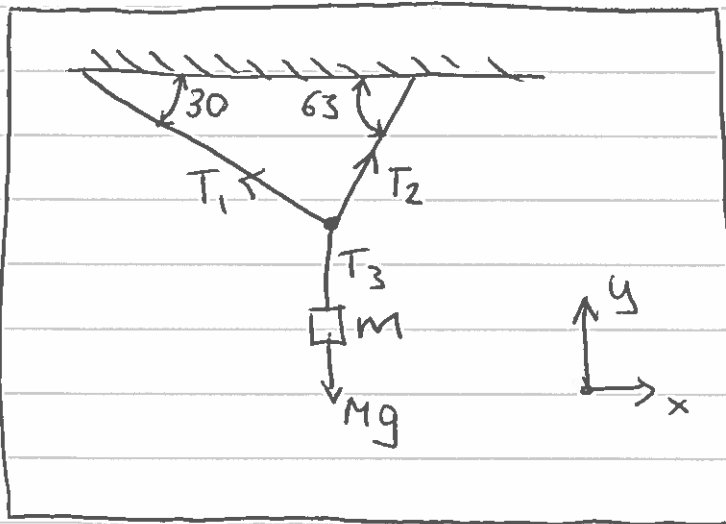
$$\sum F_x = ma$$

$$F_{app} \cos 40 - mg \sin 30 = ma$$

$$\sum F_y = 0$$

$$n + F_{app} \sin 40 - mg \cos 30 = 0$$

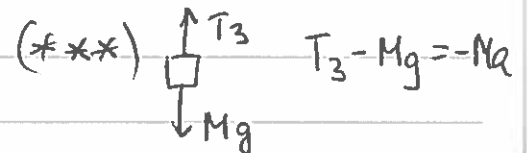
7a



I picked
a to be
down

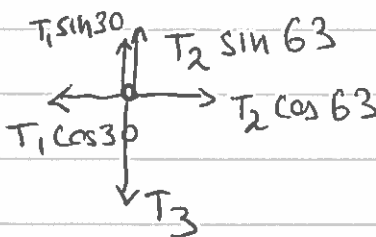
it could
have been up
as well!

FBD: Mass



FBD

Knot



$$\sum F_y = -Ma$$

$$(*) \quad T_1 \sin 30 + T_2 \sin 63 - T_3 = -Ma$$

$$\sum F_x = 0$$

$$(**) \quad T_2 \cos 63 - T_1 \cos 30 = 0$$

When
a
is
down

$$\text{When } a \uparrow (*) \Rightarrow T_1 \sin 30 + T_2 \sin 63 - T_3 = Ma (***) \Rightarrow T_3 - Mg = Ma$$