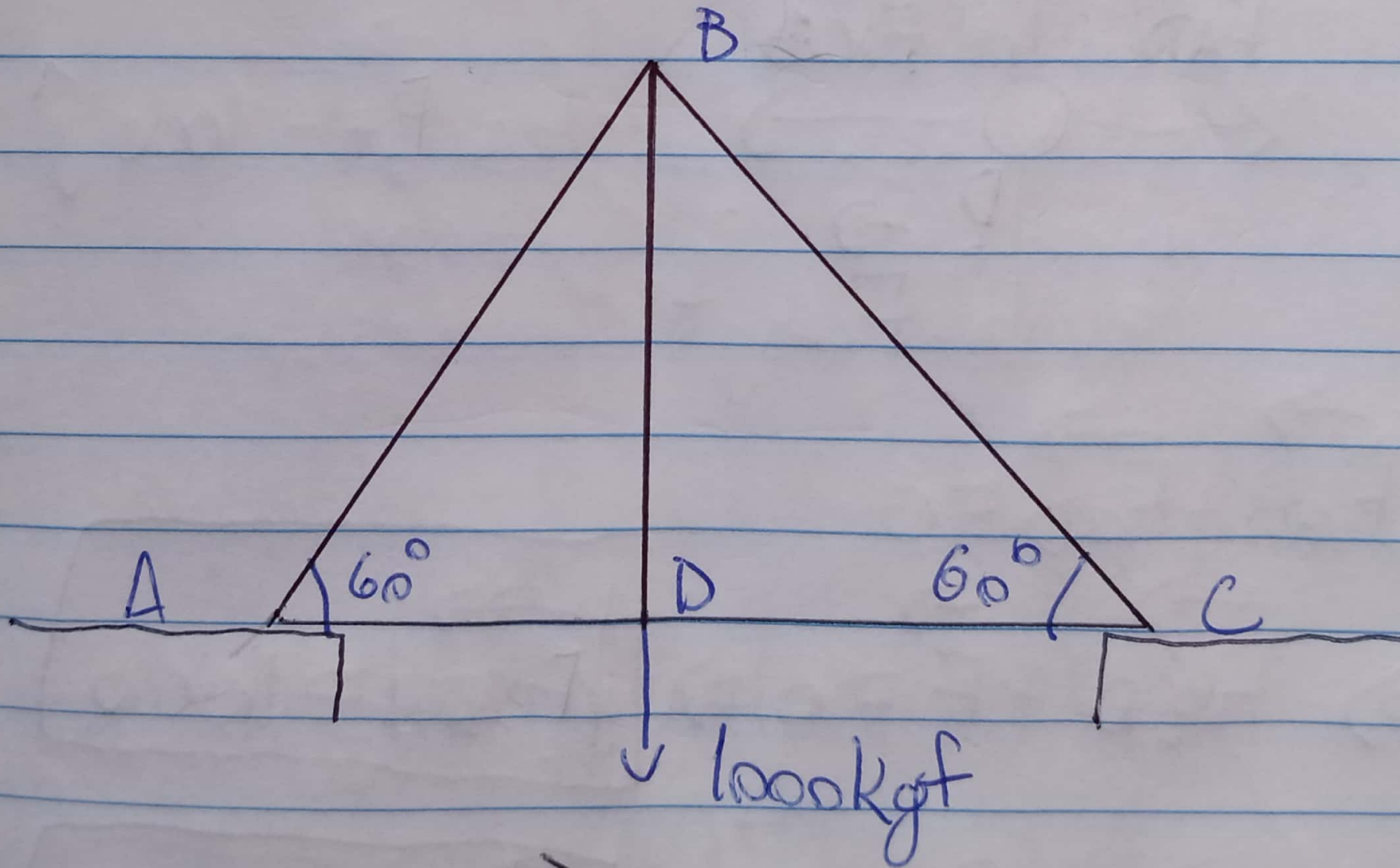


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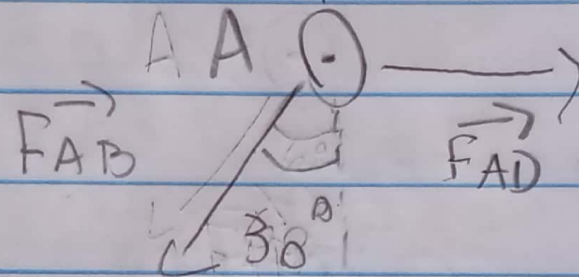
①



Equilibrium: $\sum \vec{F} = 0$

Nº A:

$$\vec{F} = -1000\hat{j}$$



$$\vec{F}_{AD} + \vec{F}_{AB} - \frac{\vec{F}}{2} = 0$$

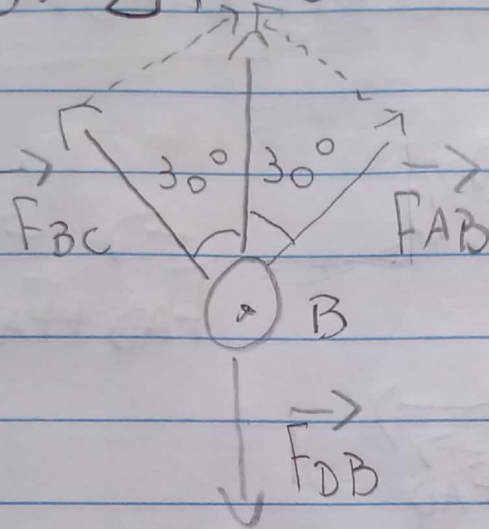
$$\sum \vec{F}_x = 0 \Rightarrow \vec{F}_{AD} + \vec{F}_{AB}_x = 0 \Rightarrow |\vec{F}_{AD}| - |\vec{F}_{AB}| \sin(30^\circ) = 0$$

$$|\vec{F}_{AD}| = 577,35 \sin(30^\circ) = 288,38$$

$$\sum \vec{F}_y = 0 \Rightarrow |\vec{F}_{AB}_y| + \left| \frac{\vec{F}}{2} \right| = 0 \Rightarrow 500 - |\vec{F}_{AB}| \cos(30^\circ) = 0$$

$$|\vec{F}_{AB}| = 577,35 \quad |\vec{F}_{AD}| = 288,38$$

№ 3 :



$$\vec{F}_{AB} + \vec{F}_{AC} + \vec{F}_{DB} = 0$$

$$\sum F_x = 0 \Rightarrow \vec{F}_{BC} + \vec{F}_{AB} = 0 \Rightarrow |\vec{F}_{AB}| \cos(60^\circ) - |\vec{F}_{BC}| \cos(60^\circ) = 0$$

$$|\vec{F}_{AB}| = |\vec{F}_{BC}|$$

$$\sum F_y = 0 \Rightarrow \vec{F}_{BC} + \vec{F}_{AB} + \vec{F}_{DB} = 0 \quad |\vec{F}_{BC}|$$

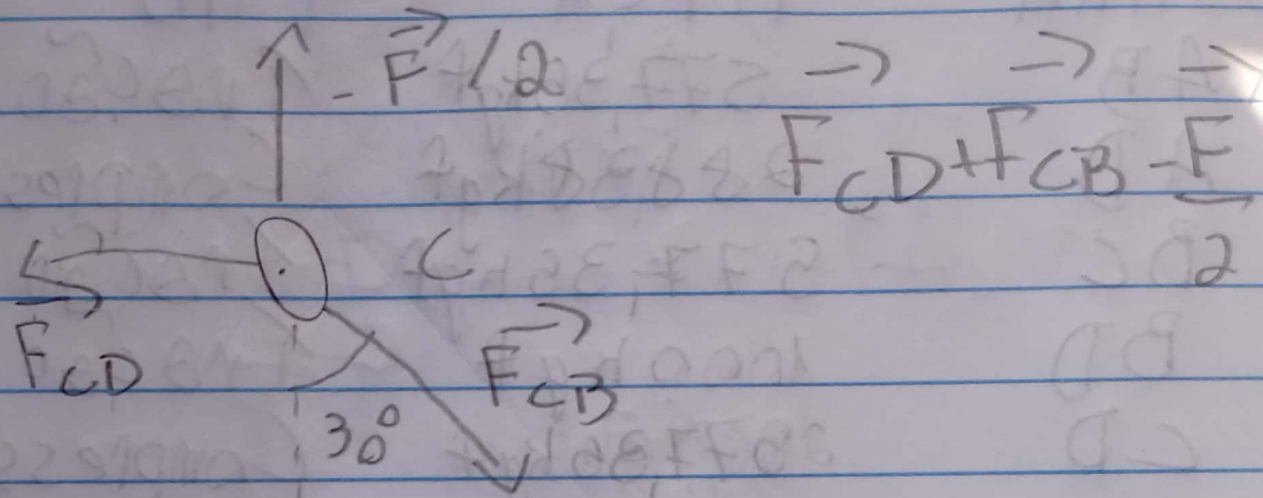
$$|\vec{F}_{BC}| \sin(60^\circ) + |\vec{F}_{AB}| \sin(60^\circ) - 1000 = 0$$

$$2 |\vec{F}_{BC}| \sin(60^\circ) = 1000$$

$$|\vec{F}_{BC}| = \frac{500}{\sin(60^\circ)}$$

$$|\vec{F}_{AB}| = |\vec{F}_{BC}| = 577,35$$

Nó C:



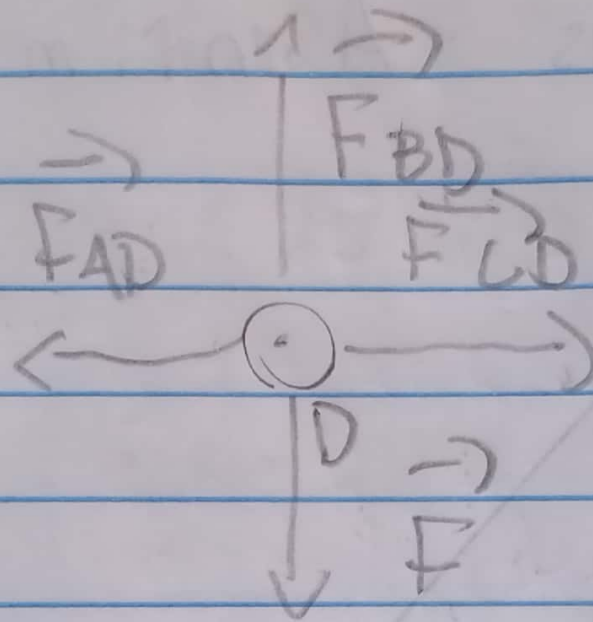
$$\sum \vec{F}_x = 0 \Rightarrow F_{CD} + F_{CBx} = |F_{CD}| - |F_{CB}| \sin(30^\circ) = 0$$

$$|F_{CD}| = |F_{CB}| \sin(30^\circ) = 288,38$$

$$\sum \vec{F}_y = 0 \Rightarrow F_{CB_y} - \frac{F}{2} = |F_{CB}| \cos(30^\circ) + 500 = 0$$

$$\boxed{|F_{CB}| = 577,35 \quad |F_{CD}| = 288,38}$$

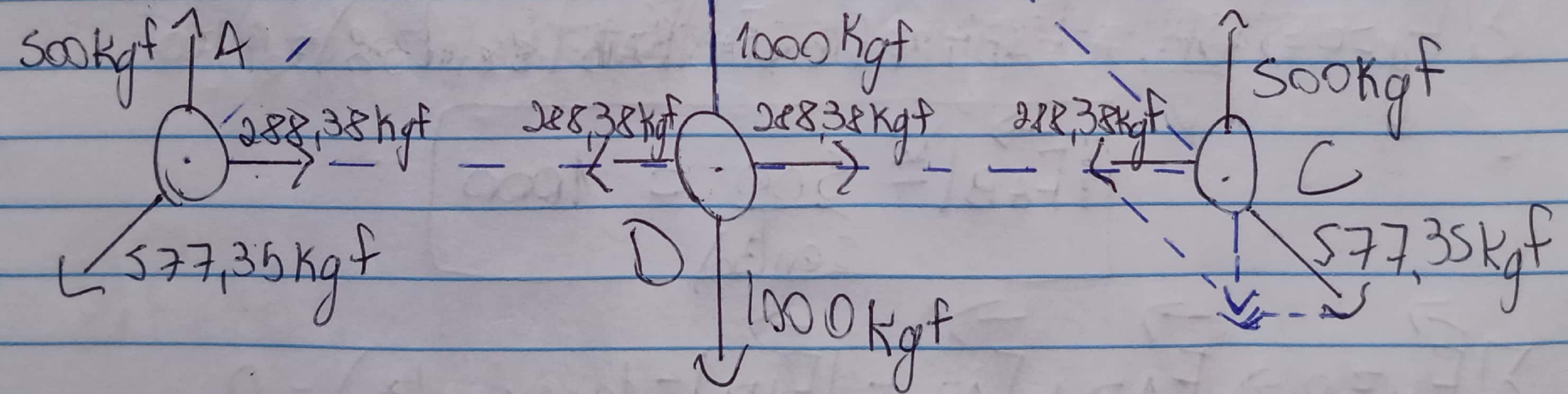
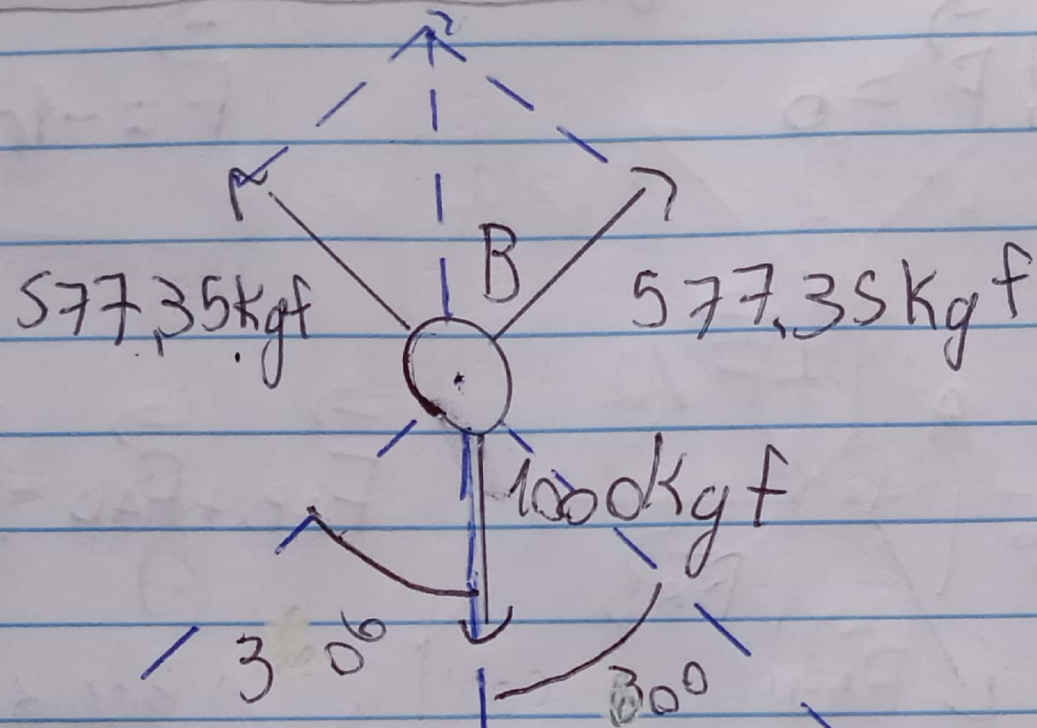
Nó D:



$$\vec{F} + \vec{F}_{BD} + \vec{F}_{AD} + \vec{F}_{CD} = 0$$

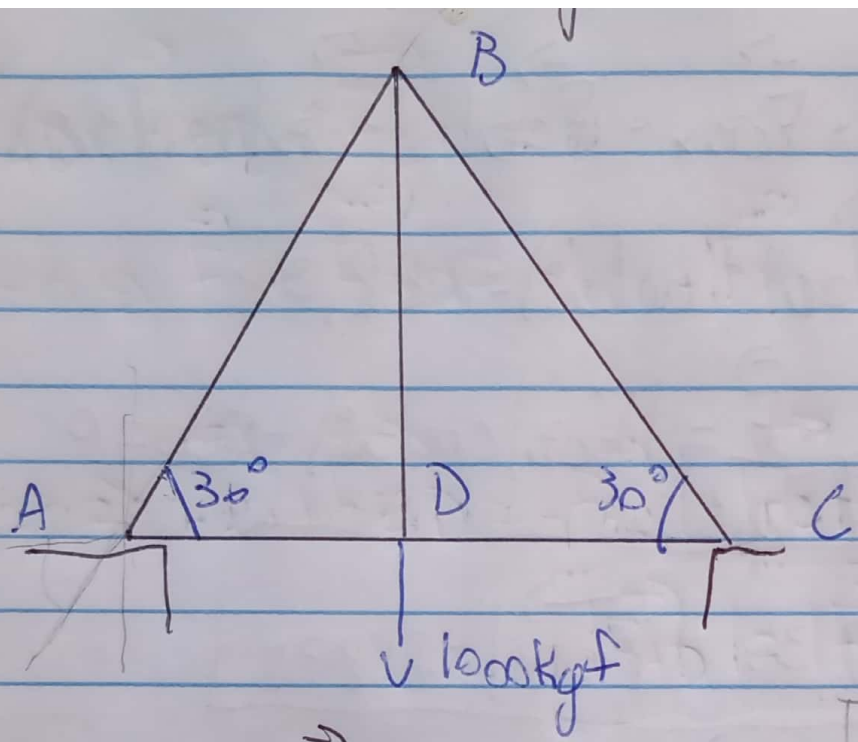
$$\sum \vec{F}_y = 0 \Rightarrow \vec{F}_{BD} + \vec{F} = 0 \Rightarrow |\vec{F}_{BD}| = 1000$$

$$\sum \vec{F}_x = 0 \Rightarrow \vec{F}_{AD} + \vec{F}_{CD} = 0 \Rightarrow |\vec{F}_{AD}| = |\vec{F}_{CD}|$$



BARRA	FORÇA	TIPO
AB	577,35 kgf	Tração
AD	288,38 kgf	Compressão
BC	577,35 kgf	Tração
BD	1000 kgf	Tração
CD	288,38 kgf	Compressão

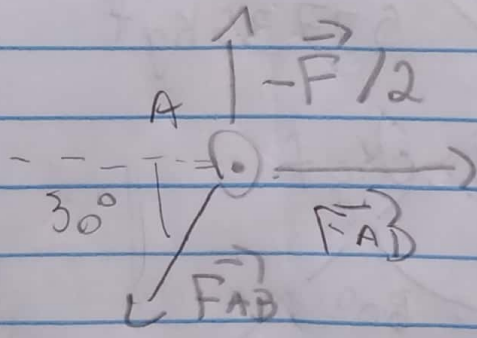
2



Equilíbrio: $\sum \vec{F} = 0$

$$\vec{F} = -1000 \hat{j}$$

No A:



$$\vec{F}_{AB} + \vec{F}_{AD} - \frac{\vec{F}}{2} = 0$$

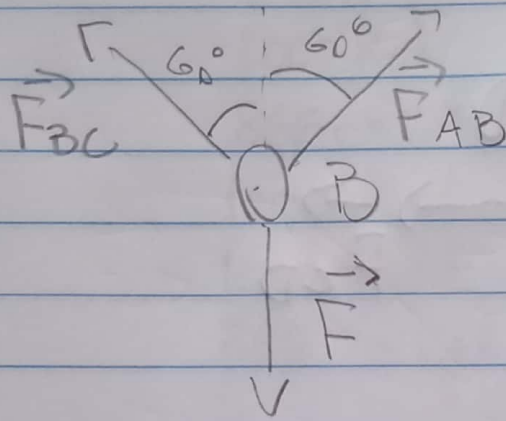
$$\sum F_y = 0 \Rightarrow -\frac{F}{2} + F_{AB} \sin(30^\circ) = 0 \Rightarrow 500 - |F_{AB}| \sin(30^\circ) = 0$$

$$|F_{AB}| = \frac{500}{\sin(30^\circ)} = 1000$$

$$\sum F_x = 0 \Rightarrow F_{AD} + F_{AB} \cos(30^\circ) = 0 \Rightarrow |F_{AD}| - 1000 \cos(30^\circ) = 0$$

$$|F_{AD}| = 866.03$$

Nó B:



$$\vec{F} + \vec{F}_{AB} + \vec{F}_{BC} = 0$$

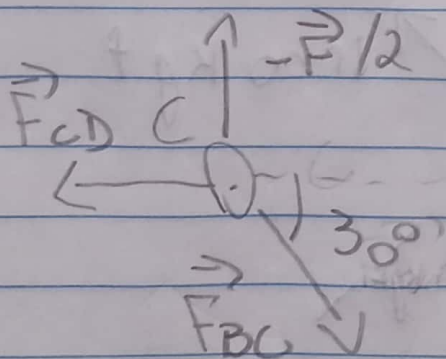
$$\sum \vec{F}_x = 0 \Rightarrow \vec{F}_{AB}_x + \vec{F}_{BC}_x = |\vec{F}_{AB}| \sin(60) - |\vec{F}_{BC}| \sin(60) = 0$$

$$|\vec{F}_{AB}| = |\vec{F}_{BC}|$$

$$\sum \vec{F}_y = 0 \Rightarrow \vec{F} + \vec{F}_{BC}_y + \vec{F}_{AB}_y = -1000 + 2|\vec{F}_{AB}| \cos(60) = 0$$

$$|\vec{F}_{AB}| = |\vec{F}_{BC}| = 1000$$

Nó C:



$$\vec{F} + \vec{F}_{BC} + \vec{F}_{CD} = 0$$

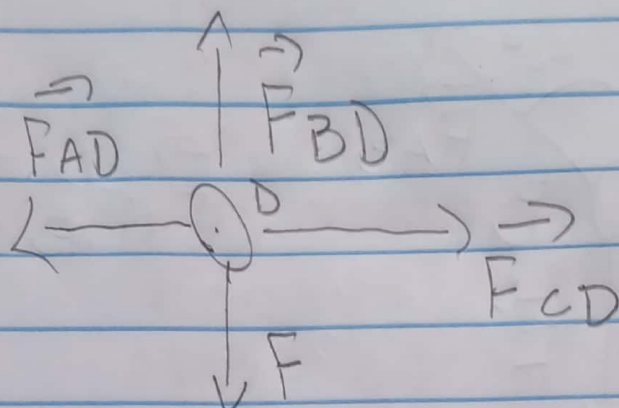
$$\sum \vec{F}_y = 0 \Rightarrow \frac{\vec{F}}{2} + \vec{F}_{BC}_y = 500 - |\vec{F}_{BC}| \sin(30) = 0$$

$$|\vec{F}_{BC}| = \frac{500}{\sin(30)} = 1000$$

$$\sum \vec{F}_x = 0 \Rightarrow \vec{F}_{CD} + \vec{F}_{BC}_x = -|\vec{F}_{CD}| + |\vec{F}_{BC}| \cos(30) = 0$$

$$|\vec{F}_{BC}| = 866.03$$

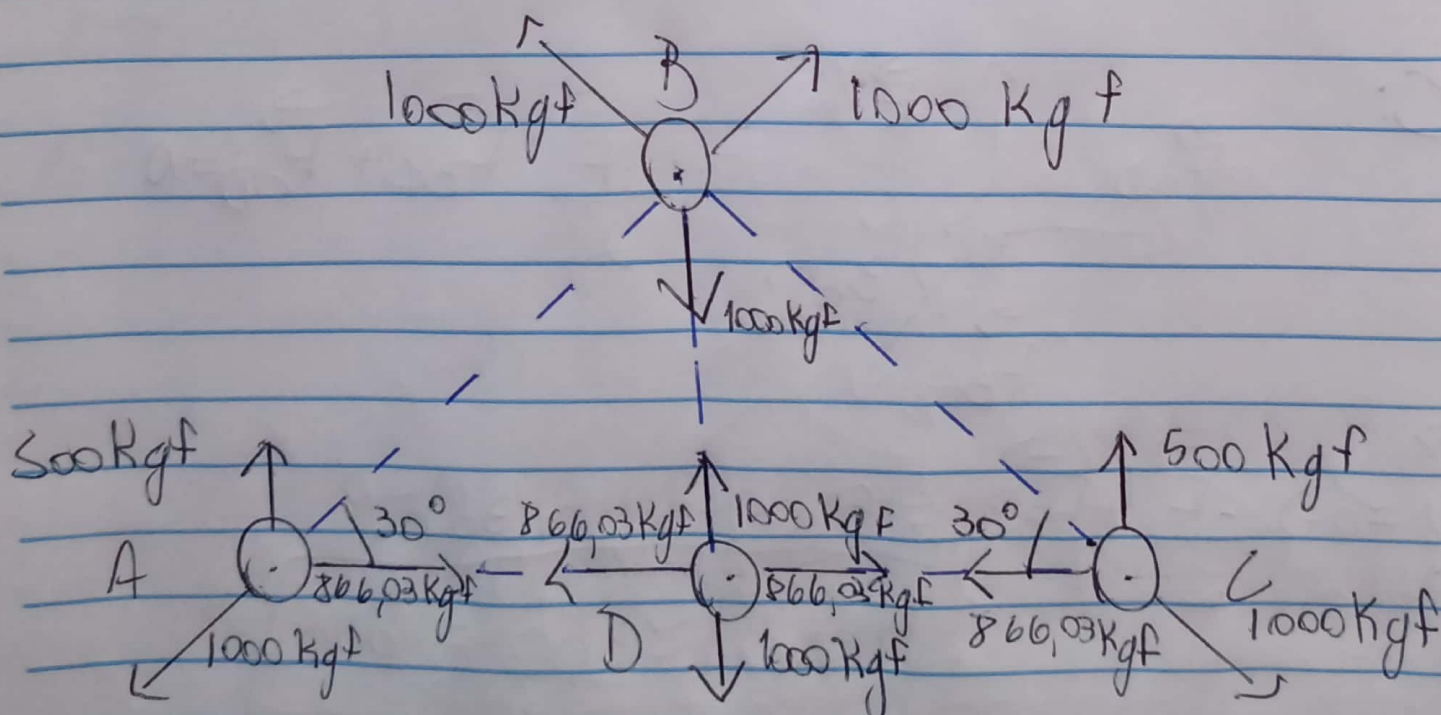
Nó D:



$$\vec{F} + \vec{F}_{AD} + \vec{F}_{BD} + \vec{F}_{CD} = 0$$

$$\sum F_y = 0 \Rightarrow \vec{F} + \vec{F}_{BD} = -1000 + |\vec{F}_{BD}| = 0 \Rightarrow |\vec{F}_{BD}| = 1000$$

$$\sum F_x = 0 \Rightarrow \vec{F}_{AD} + \vec{F}_{CD} = -|\vec{F}_{AD}| + |\vec{F}_{CD}| = 0 \Rightarrow |\vec{F}_{AD}| = |\vec{F}_{CD}|$$



BARRA

AB

AD

BC

BD

CD

FORÇA

1000 Kgf

866,03 Kgf

1000 Kgf

1000 Kgf

866,03 Kgf

TIPO

Tração

Compressão

Tração

Tração

Compressão