

Equilibrium of rigid bodies

Rigid body: a body whose size & shape must be taken into account in the description or prediction of its condition of rest or motion.

Necessary & sufficient conditions of equilibrium for a rigid body:

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

To make sure that the rigid body is not being accelerated to translate.

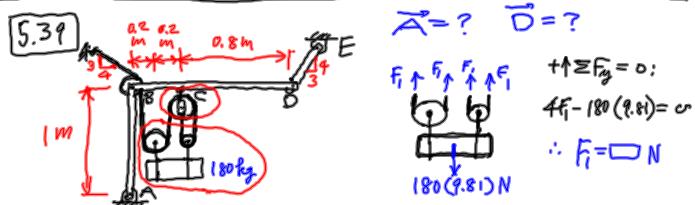
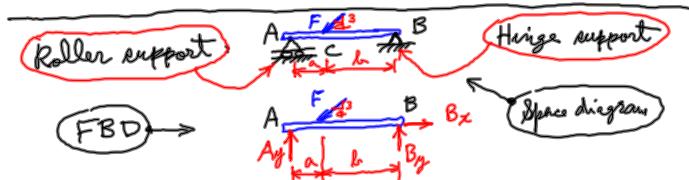
$$\sum \vec{M}_p = \vec{0}$$

To make sure that the rigid body is not being accelerated to rotate.

Reactions at supports or connections of a rigid body:

They are simply the restrictions of movements of the rigid body at the points of its supports.

Free-body diagram (FBD) should be an integral part of the solution of any equilibrium problem.



Pulley at B: $\sum F_x = 0: -\frac{4}{5}F_i + B_x = 0$
 $\therefore B_x = \frac{4}{5}F_i = \square$
 $\sum F_y = 0: B_y + \frac{3}{5}F_i - F_i = 0$
 $\therefore B_y = \frac{2}{5}F_i = \square$

Pulley at C: $\sum F_y = 0: C_y - 3F_i = 0$
 $\therefore C_y = 3F_i = \square$

Member DE is a short link. The force in a short link is directed along the link.

