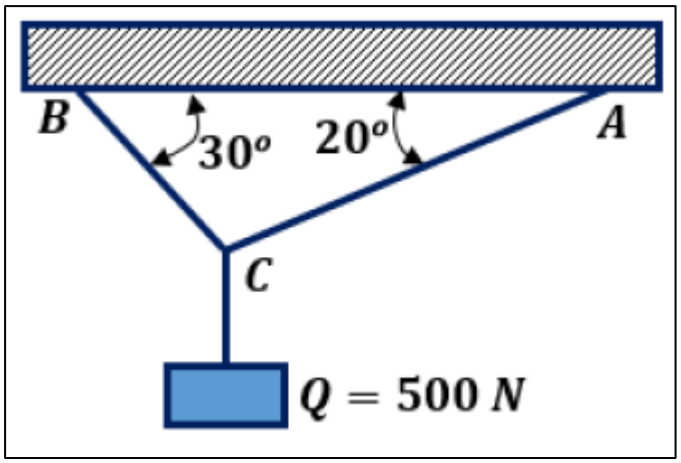
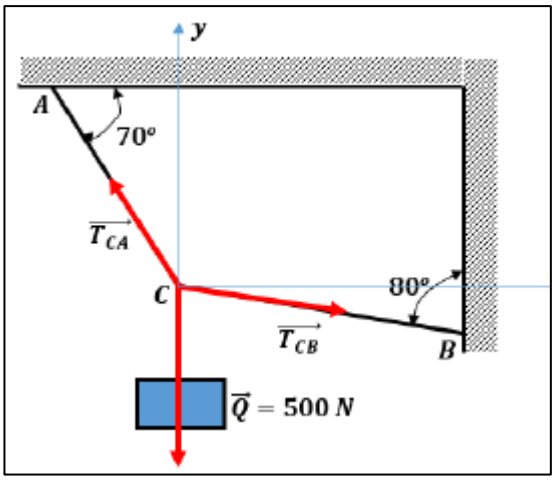
SERIES 02
RATIONAL MECHANICS

Exercise 01:

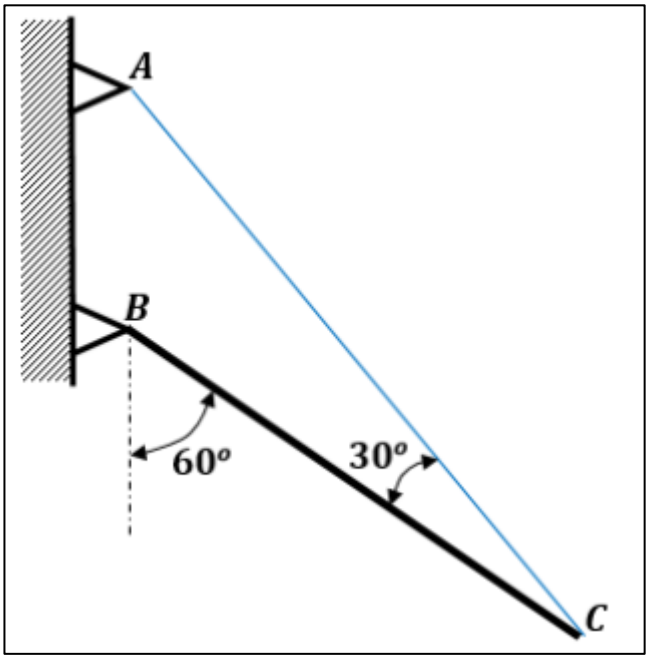
Determine the cable tensions in the following figures:





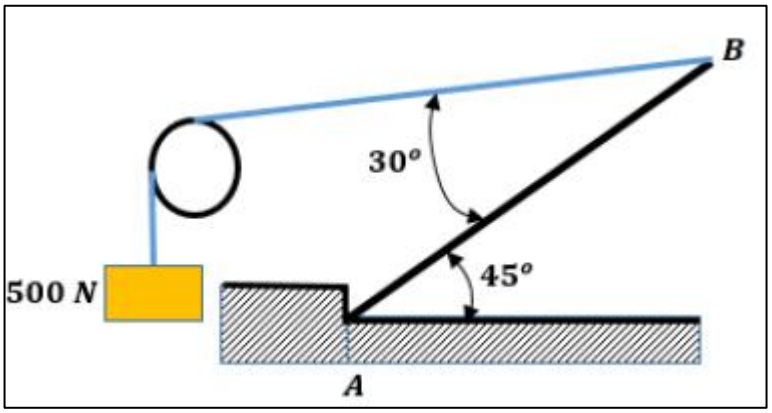
Exercise 02:

A homogeneous bar weighing $\mathbf{80}\ (\boldsymbol{N})$ is connected by a cylindrical joint at its end $\boldsymbol{A}$ to a wall. It is held at an angle of $\mathbf{60}^{\boldsymbol{o}}$ with the vertical by an inextensible cable of negligible mass at the other end $\boldsymbol{B}$. The cable makes an angle of $30o$ with the bar. Determine the tension in the cable and the reaction at point $\boldsymbol{A}$.



Exercise 03:

A beam is maintained in static equilibrium using a load $\vec{\boldsymbol{P}}$ suspended from an inextensible cable of negligible mass, passing through a pulley as shown in the figure. The beam has a length of $\mathbf{8}(\boldsymbol{m})$ and a mass of $\mathbf{50}\ (\boldsymbol{Kg})$ and makes an angle of $\mathbf{45°}$ with the horizontal and $\mathbf{30°}$ with the cable. Determine the tension in the cable as well as the magnitude of the reaction in $\boldsymbol{A}$ as well as its direction relative to the horizontal.



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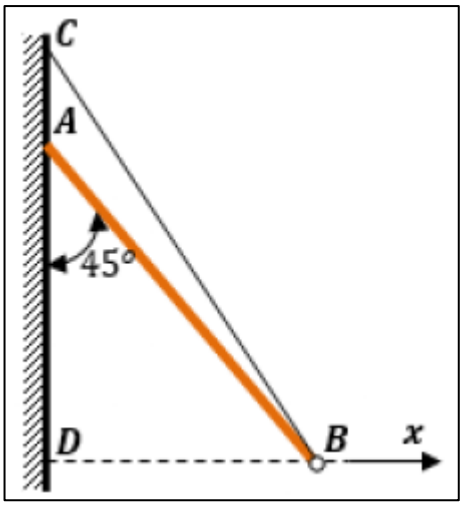
Exercise 04:

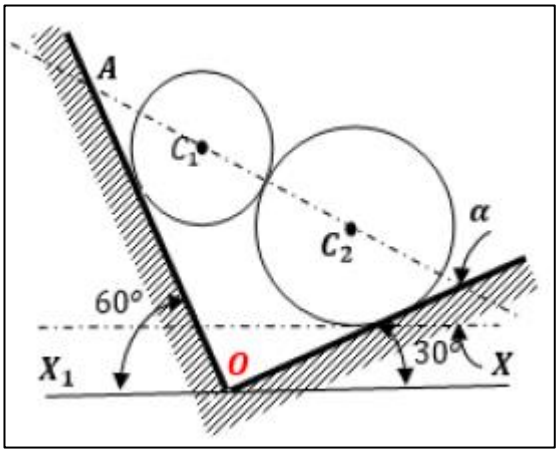


The upper end $\boldsymbol{A}$ of a homogeneous bar $\boldsymbol{AB}$ weighing $\mathbf{5}\ (\boldsymbol{daN})$ and $\mathbf{2}(\boldsymbol{m})$ long rests on a smooth vertical wall. A rope $\boldsymbol{BC}$ is attached to its lower end $\boldsymbol{B}$.

1) Find the distance $\boldsymbol{AC}$ at which the rope must be attached to the wall so that the bar is in equilibrium at an angle of $\mathbf{45}^{\boldsymbol{o}}$ with the vertical.

2) Find the tension $\vec{\boldsymbol{T}}$ in the rope and the reaction $\vec{\boldsymbol{R}}$ in the wall.

Exercise 05:



Two smooth homogeneous tangent cylinders are placed between two smooth inclined planes $\boldsymbol{OA}$ and $\boldsymbol{OB}$; one of them with center $\boldsymbol{C_1}$ weighs $\mathbf{10}\ (\boldsymbol{N})$, the other with center $\boldsymbol{C_2}$ weighs $\mathbf{30}\ (\boldsymbol{N})$.

Determine the angle $\boldsymbol{\alpha}$ formed by the line $\boldsymbol{C_1C_2}$ with the horizontal axis $\boldsymbol{X_1OX}$, the pressures $\boldsymbol{N_1}$ and $\boldsymbol{N_2}$ of the cylinders on the planes as well as the magnitude $\boldsymbol{N}$ of the reciprocal pressure of the cylinders.

Exercise 06:

The bar $\boldsymbol{AB = l}$ is connected at $\boldsymbol{A}$ by a cylindrical joint and at its end $\boldsymbol{B}$, it rests on a roller support. A force of $\mathbf{200}\ (\boldsymbol{N})$ acts at its middle at an angle of $\mathbf{45}^{\boldsymbol{o}}$ in the vertical plane. The bar has a weight of $\mathbf{50}\ (\boldsymbol{N})$. Determine the reactions at the ends $\boldsymbol{A}$ and $\boldsymbol{B}$.