

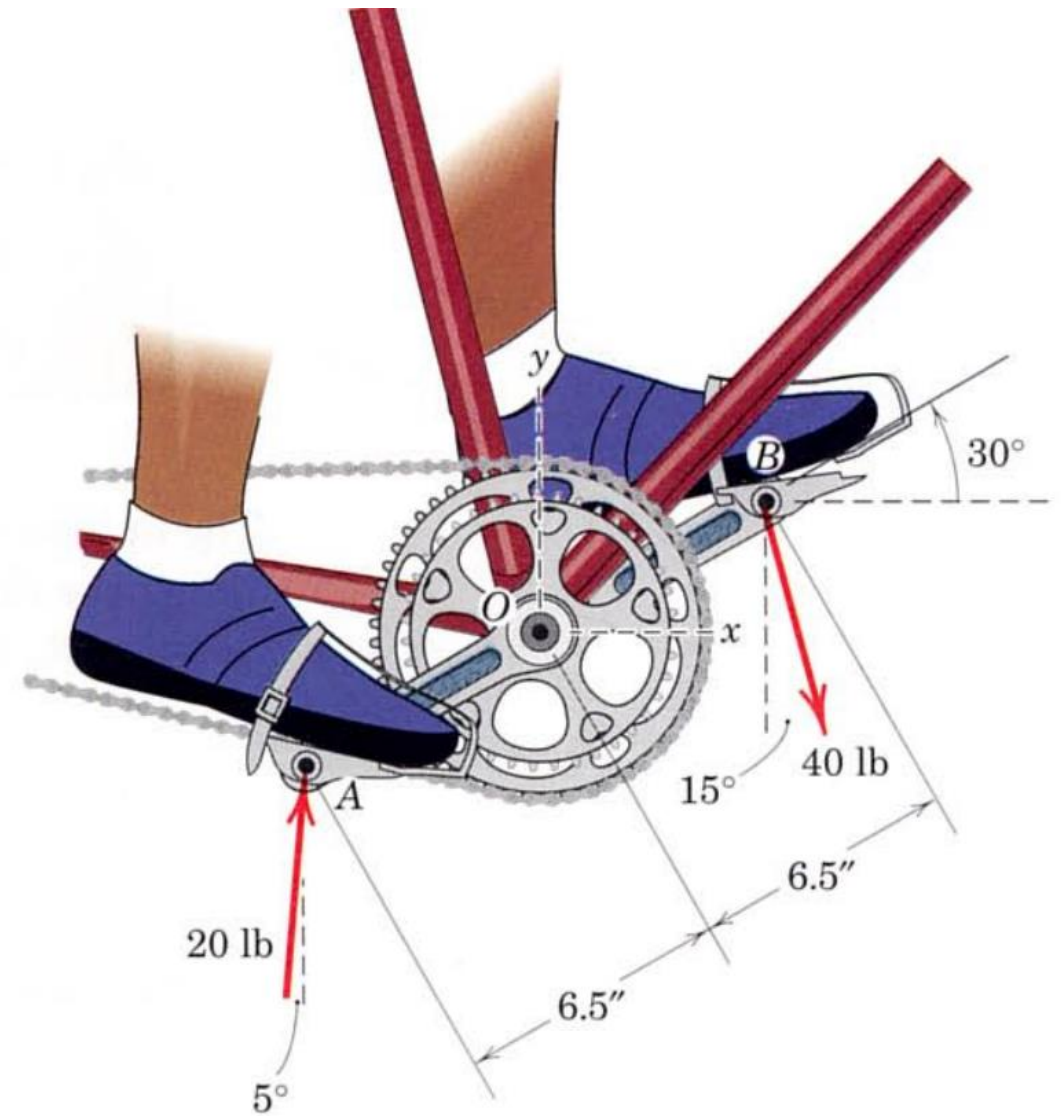
2024-2025 Spring AE104 PH-1

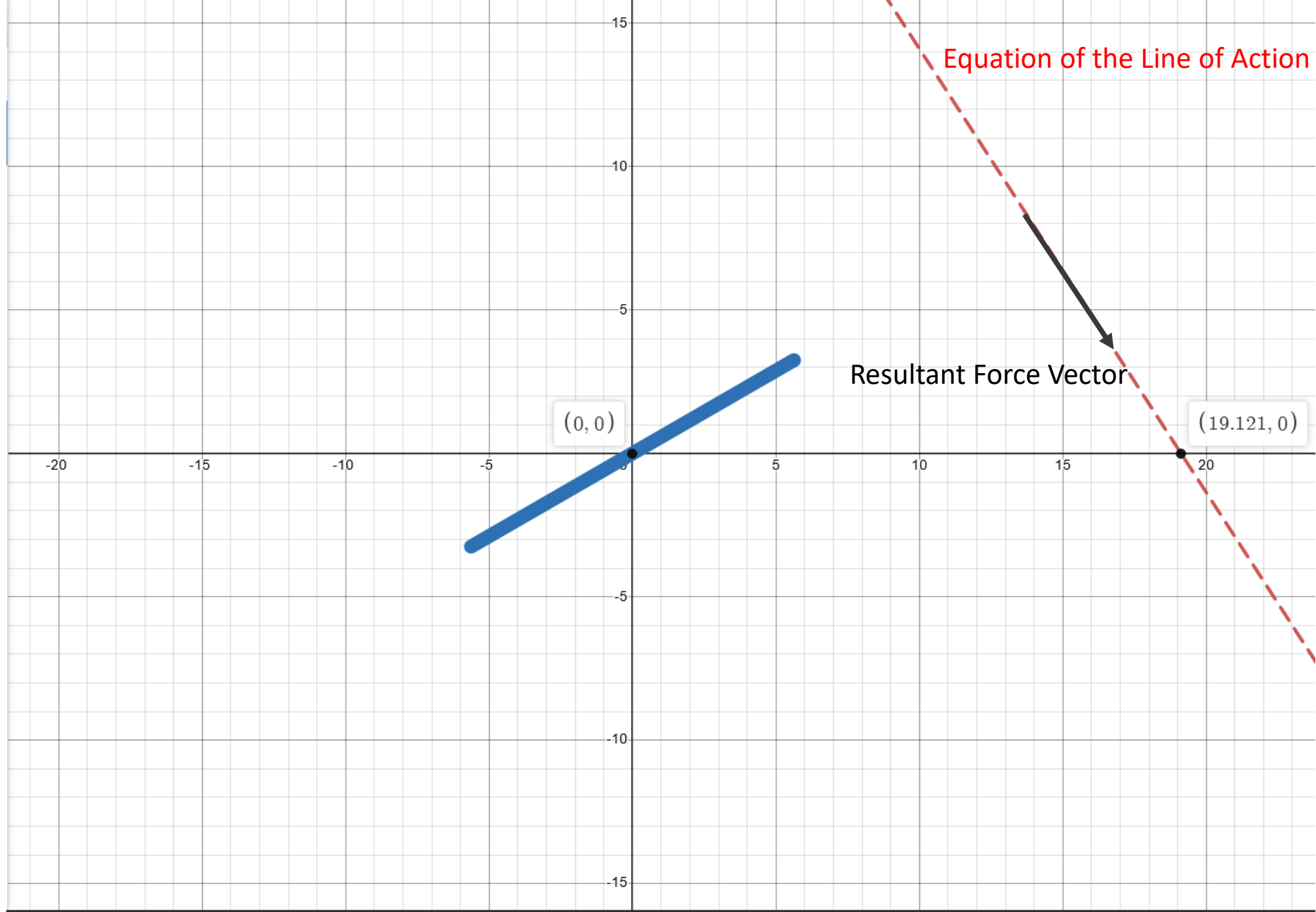
Res. Asst. Burak ÇİFTÇİOĞLU

17.04.2025

The pedal-chainwheel unit of a bicycle is shown in the figure. The left foot of the rider exerts the 40-lb force, while the use of toe clips allows the right foot to exert the nearly upward 20-lb force. Determine the equivalent force–couple system at point O . Also, determine the equation of the line of action of the system resultant treated as a single force \mathbf{R} . Treat the problem as two-dimensional.

Ans. $\mathbf{R} = 12.09\mathbf{i} - 18.71\mathbf{j}$ lb
 $M_o = -357.6\mathbf{k}$ lb.in
 $y = -1.547x + 29.58$

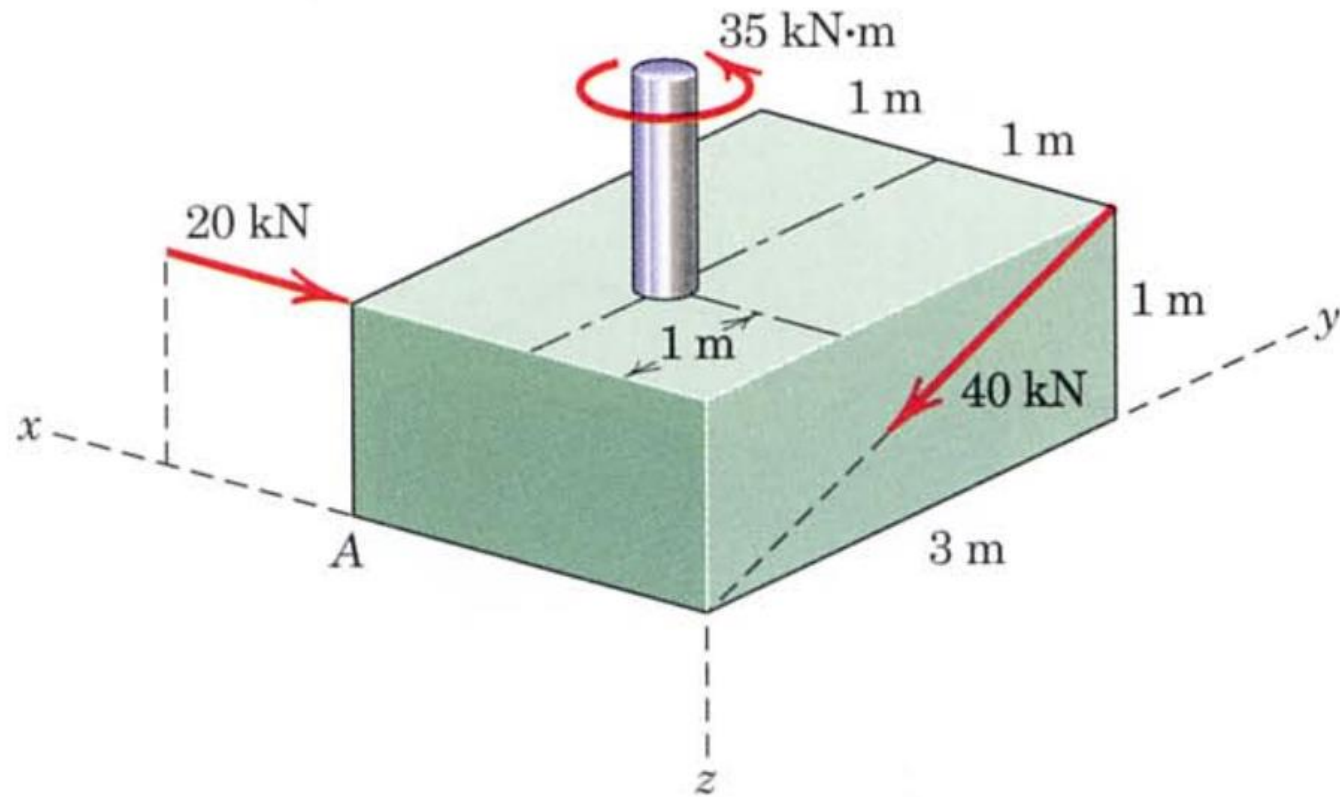




Replace the two forces and single couple by an equivalent force-couple system at point A.

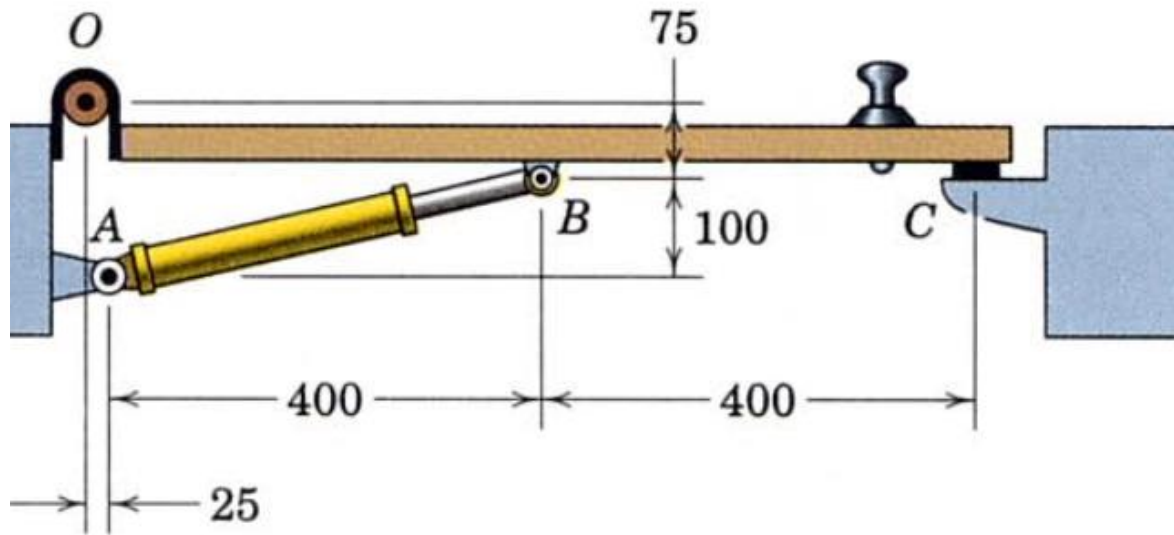
$$\text{Ans. } \mathbf{R} = -20\mathbf{i} - 37.9\mathbf{j} + 12.65\mathbf{k} \text{ kN}$$

$$\mathbf{M} = 45.3\mathbf{j} + 40.9\mathbf{k} \text{ kN}\cdot\text{m}$$



The force exerted by the plunger of cylinder AB on the door is 40 N directed along the line AB , and this force tends to keep the door closed. Compute the moment of this force about the hinge O . What force F_C normal to the plane of the door must the door stop at C exert on the door so that the combined moment about O of the two forces is zero?

$$\text{Ans. } M_O = 7.034\text{ N}\cdot\text{m (CW)}$$
$$F_C = 8.527\text{ N (up)}$$



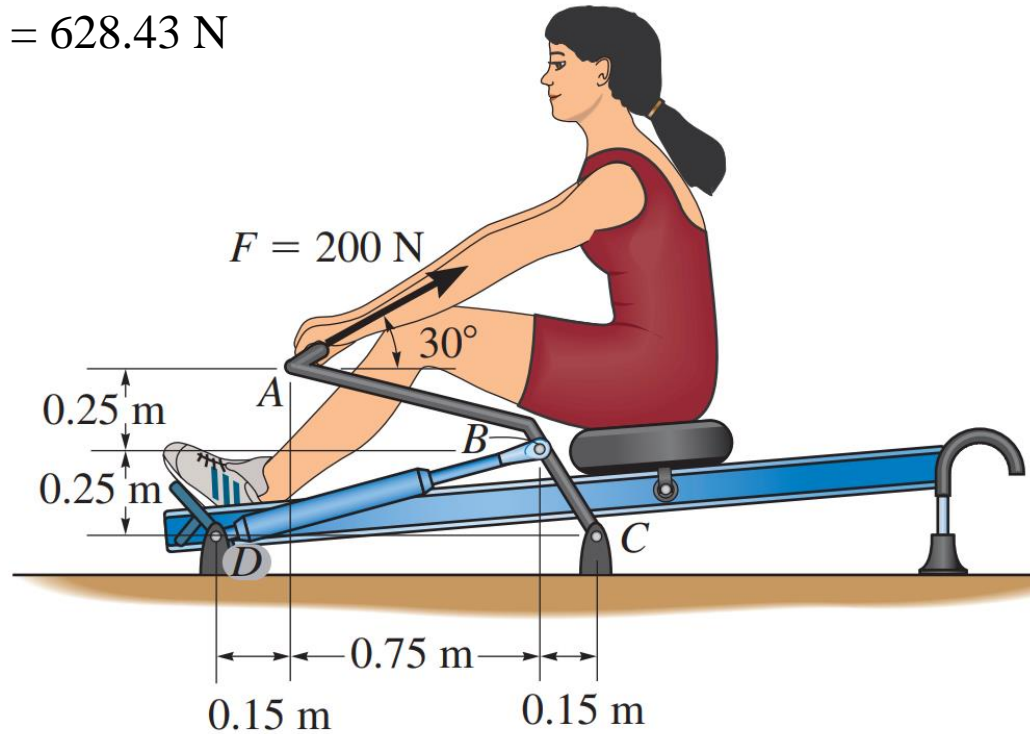
Dimensions in millimeters

The woman exercises on the rowing machine. If she exerts a holding force of $F = 200\text{ N}$ on handle ABC , determine the horizontal and vertical components of reaction at pin C and the force developed along the hydraulic cylinder BD on the handle.

Ans. $C_x = 432.31\text{ N}$

$C_y = 68.15\text{ N}$

$BD = 628.43\text{ N}$

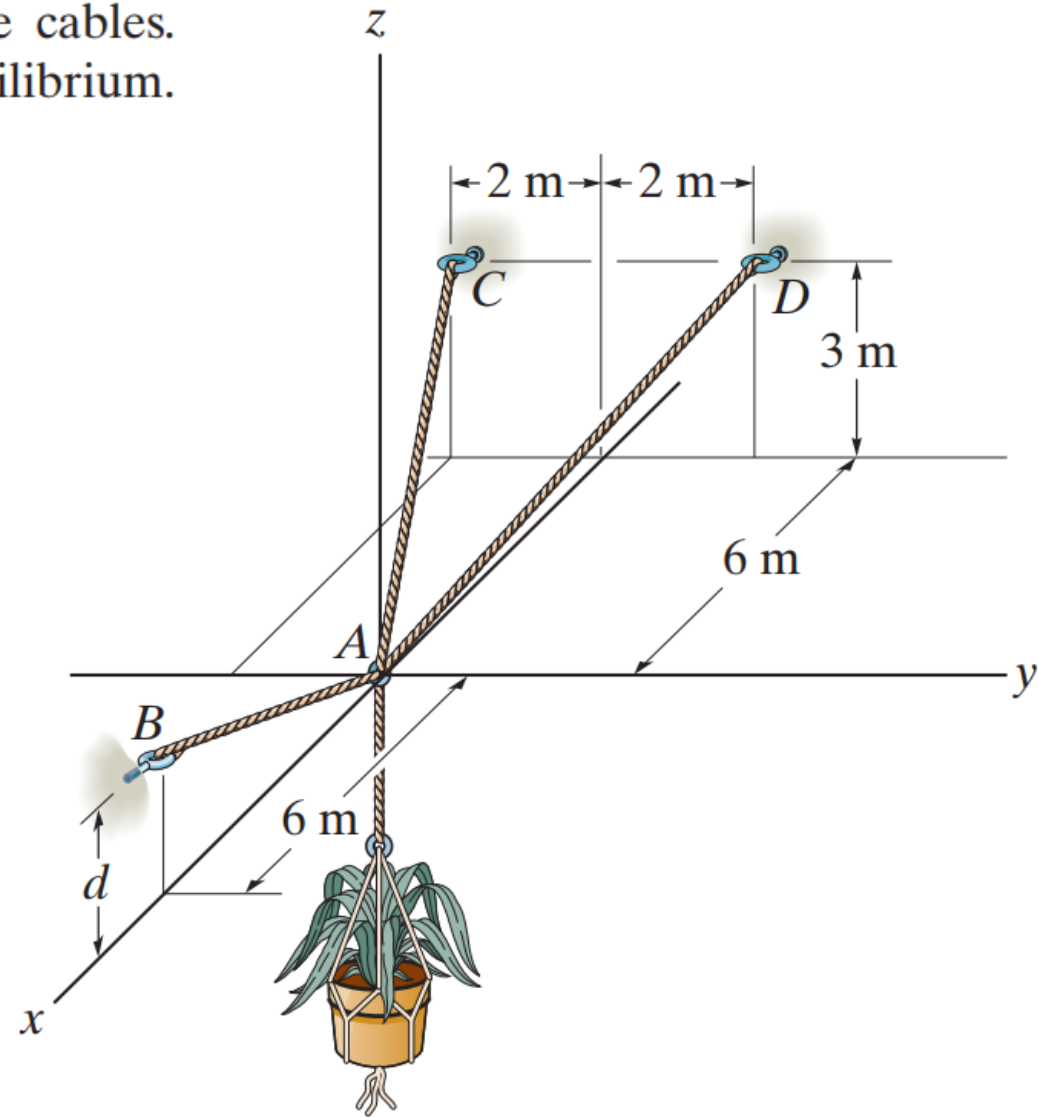


The 50-kg pot is supported from A by the three cables. Determine the force acting in each cable for equilibrium. Take $d = 2.5$ m.

Ans. $AB = 579.68$ N

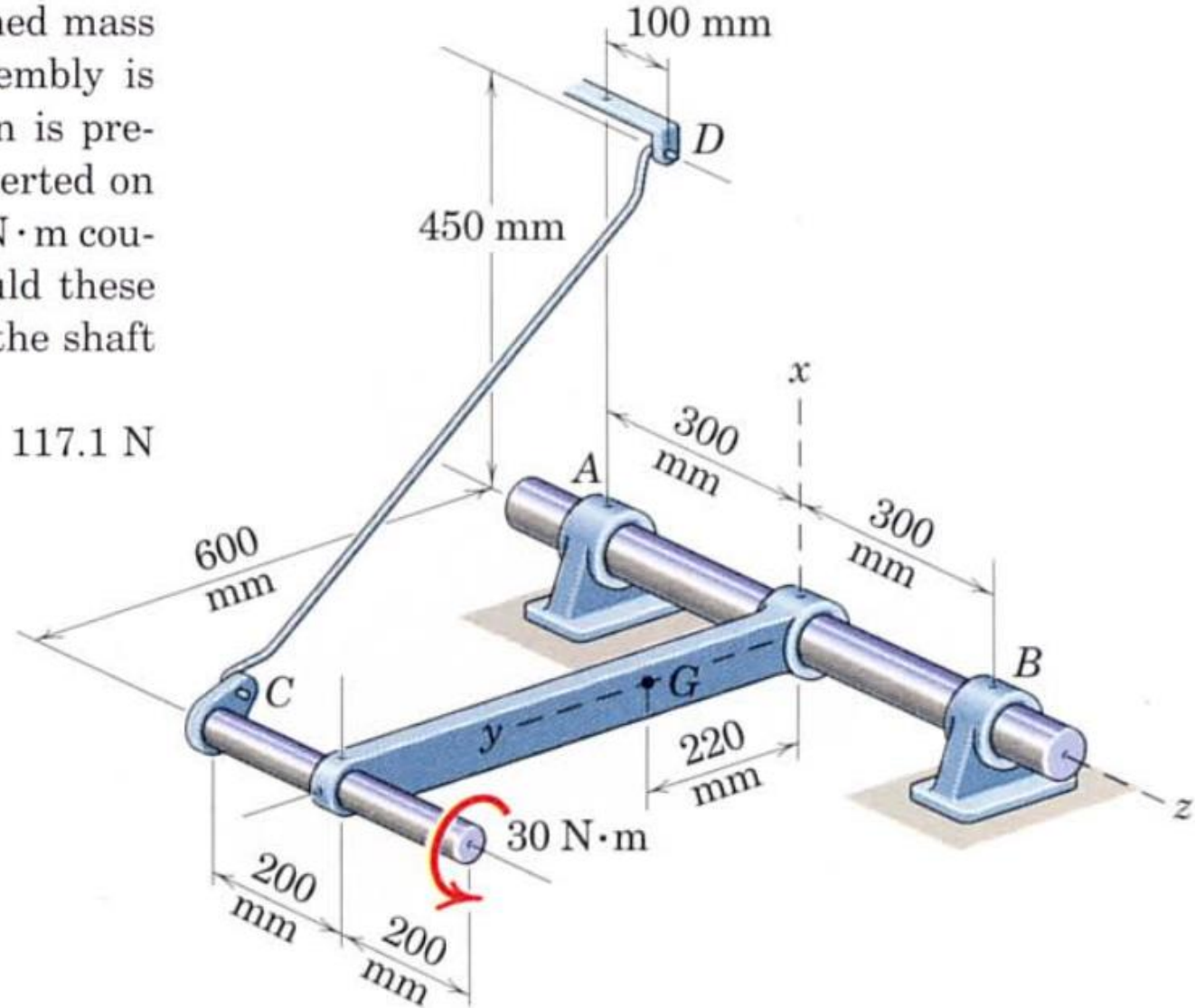
$AC = 312.13$ N

$AD = 312.13$ N



The shaft, lever, and handle are welded together and constitute a single rigid body. Their combined mass is 28 kg with mass center at G . The assembly is mounted in bearings A and B , and rotation is prevented by link CD . Determine the forces exerted on the shaft by bearings A and B while the $30\text{-N}\cdot\text{m}$ couple is applied to the handle as shown. Would these forces change if the couple were applied to the shaft AB rather than to the handle?

Ans. $A = 167.9\text{ N}$, $B = 117.1\text{ N}$



Thanks for listening.

You can contact with me via e-mail: ciftcioglu@gantep.edu.tr
or by visiting my office: HUBF/Room 105