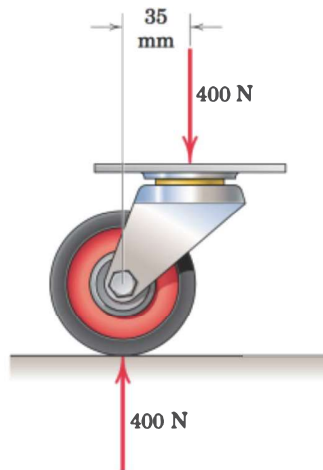


PROBLEMS

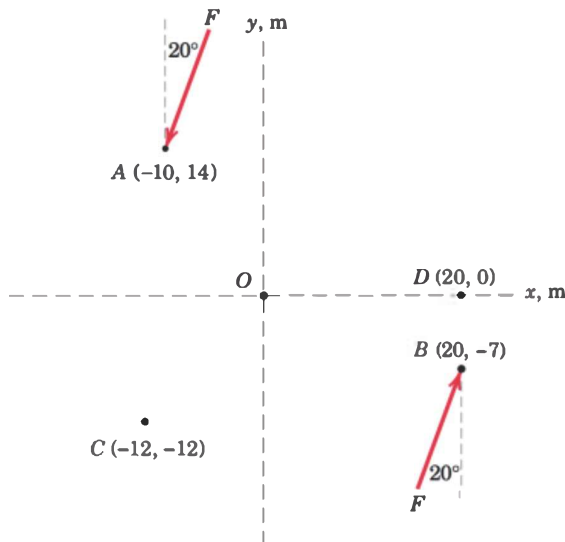
Introductory Problems

- 2/59** The caster unit is subjected to the pair of 400-N forces shown. Determine the moment associated with these forces.



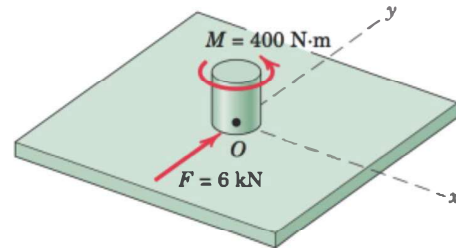
Problem 2/59

- 2/60** For $F = 300$ N, compute the combined moment of the two forces about (a) point O , (b) point C , and (c) point D .



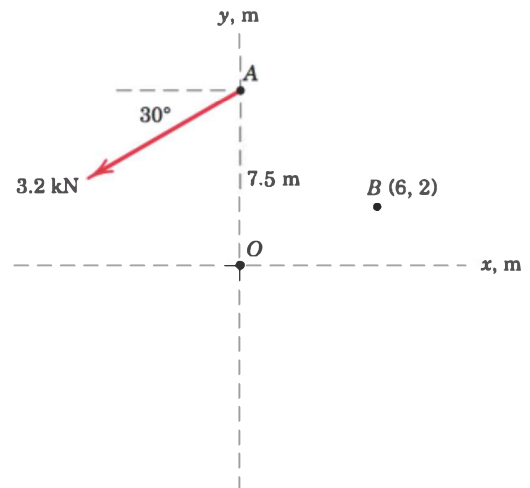
Problem 2/60

- 2/61** The indicated force-couple system is applied to a small shaft at the center of the plate. Replace this system by a single force and specify the coordinate of the point on the x -axis through which the line of action of this resultant force passes.



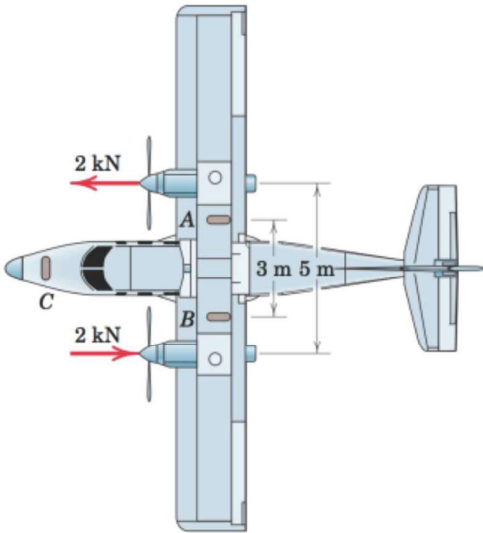
Problem 2/61

- 2/62** Replace the 3.2-kN force by an equivalent force-couple system at (a) point O and (b) point B . Record your answers in vector format.



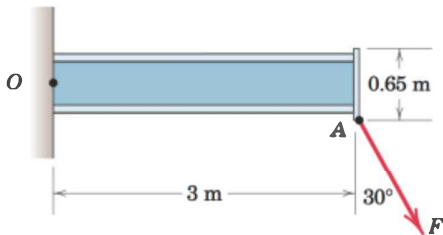
Problem 2/62

- 2/63** As part of a test, the two aircraft engines are revved up and the propeller pitches are adjusted so as to result in the fore and aft thrusts shown. What force F must be exerted by the ground on each of the main braked wheels at A and B to counteract the turning effect of the two propeller thrusts? Neglect any effects of the nose wheel C , which is turned 90° and unbraked.



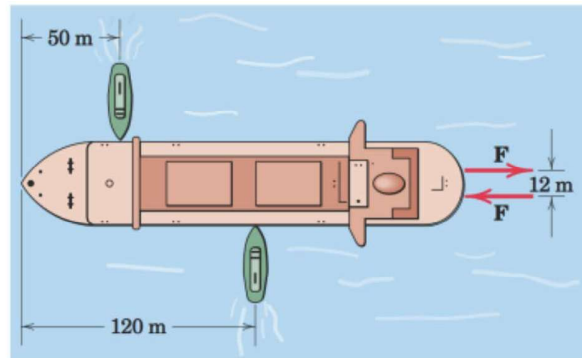
Problem 2/63

- 2/64** The cantilevered W530 \times 150 beam shown is subjected to an 8-kN force F applied by means of a welded plate at A . Determine the equivalent force-couple system at the centroid of the beam cross section at the cantilever O .



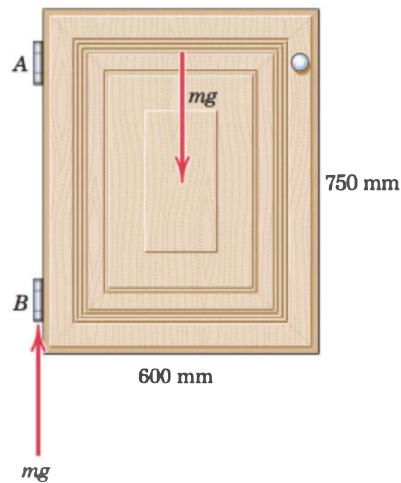
Problem 2/64

- 2/65** Each propeller of the twin-screw ship develops a full-speed thrust of 300 kN. In maneuvering the ship, one propeller is turning full speed ahead and the other full speed in reverse. What thrust P must each tug exert on the ship to counteract the effect of the ship's propellers?



Problem 2/65

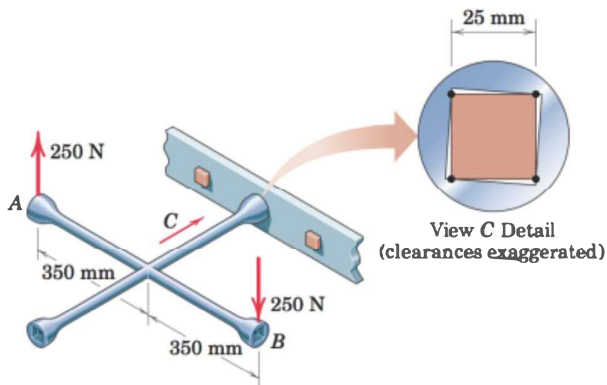
- 2/66** The upper hinge A of the uniform cabinet door has malfunctioned, causing the entire weight mg of the 5-kg door to be carried by the lower hinge B . Determine the couple associated with these two forces. You may neglect the slight offset from the edge of the cabinet door to the hinge centerline.



Problem 2/66

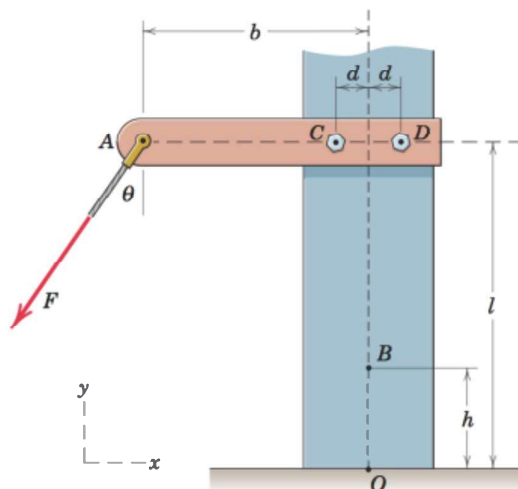
Representative Problems

- 2/67** A lug wrench is used to tighten a square-head bolt. If 250-N forces are applied to the wrench as shown, determine the magnitude F of the equal forces exerted on the four contact points on the 25-mm bolt head so that their external effect on the bolt is equivalent to that of the two 250-N forces. Assume that the forces are perpendicular to the flats of the bolt head.



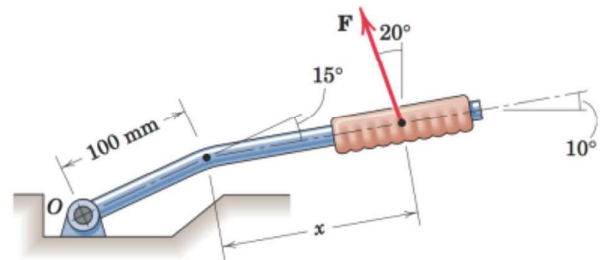
Problem 2/67

- 2/68** The force F is applied at the end of arm ACD , which is mounted to a vertical post. Replace this single force F by an equivalent force-couple system at B . Next, redistribute this force and couple by replacing it with two forces acting in the same direction as F , one at C and the other at D , and determine the forces supported by the two hex-bolts. Use values of $F = 425$ N, $\theta = 30^\circ$, $b = 1.9$ m, $d = 0.2$ m, $h = 0.8$ m, and $l = 2.75$ m.



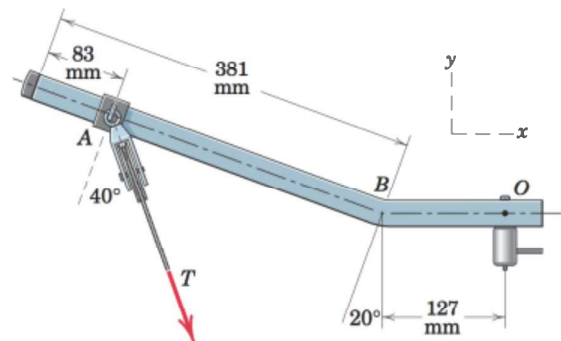
Problem 2/68

- 2/69** A force F of magnitude 50 N is exerted on the automobile parking-brake lever at the position $x = 250$ mm. Replace the force by an equivalent force-couple system at the pivot point O .



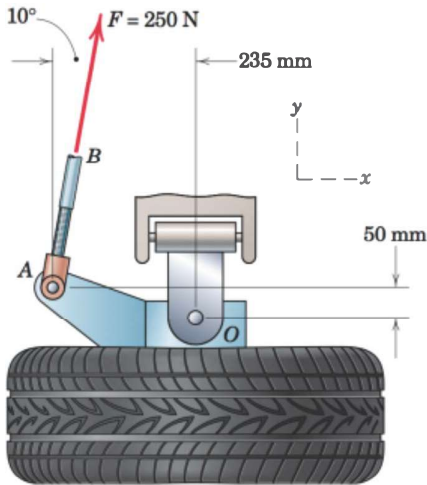
Problem 2/69

- 2/70** An overhead view of a portion of an exercise machine is shown. If the tension in the cable is $T = 780$ N, determine the equivalent force-couple system at (a) point B and at (b) point O . Record your answers in vector format.



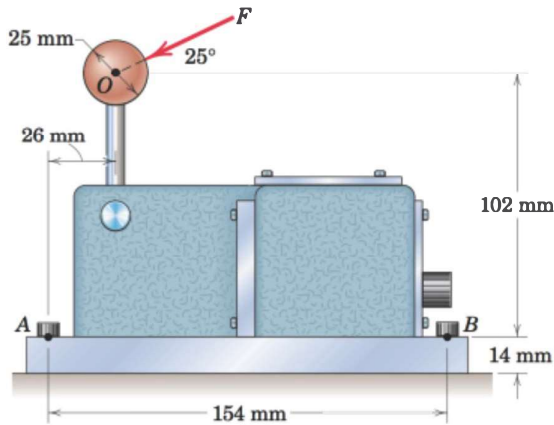
Problem 2/70

- 2/71** The tie-rod AB exerts the 250-N force on the steering knuckle AO as shown. Replace this force by an equivalent force-couple system at O .



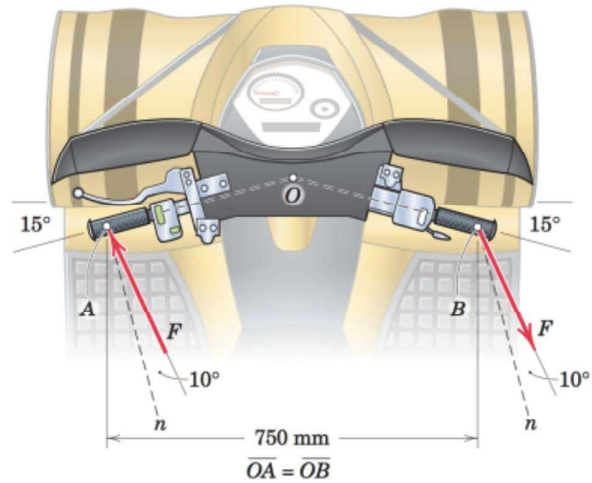
Problem 2/71

- 2/72** The 20-N force F is applied to the handle of the directional control valve as shown. Compute the equivalent force-couple system at point B .



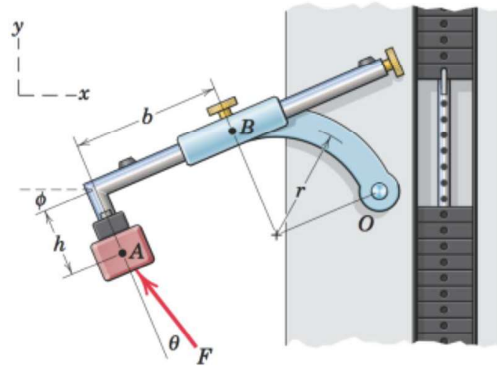
Problem 2/72

- 2/73** An overhead view of the handlebars on an all-terrain vehicle is shown. If the indicated forces have a magnitude of $F = 150$ N, determine the moment created by the two forces about the vertical steering axis through point O . Both n -axes are perpendicular to the left handlebar. Treat the problem as two-dimensional.



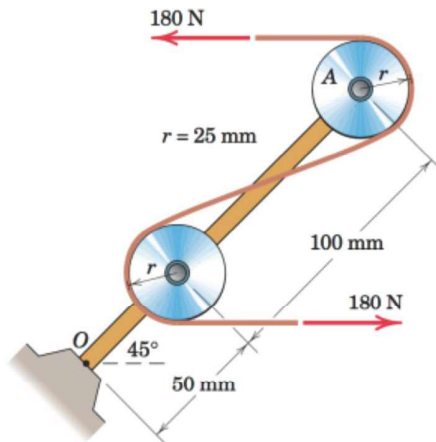
Problem 2/73

- 2/74** The force F is applied to the leg-extension exercise machine as shown. Determine the equivalent force-couple system at point O . Use values of $F = 520$ N, $b = 450$ mm, $h = 215$ mm, $r = 325$ mm, $\theta = 15^\circ$, and $\phi = 10^\circ$.



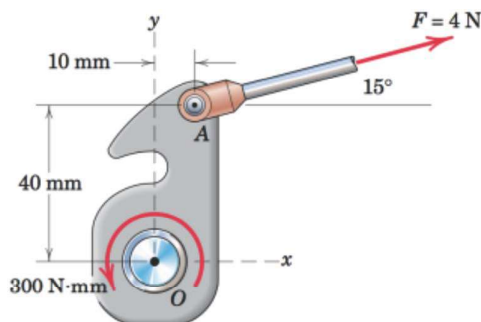
Problem 2/74

- 2/75** The system consisting of the bar OA , two identical pulleys, and a section of thin tape is subjected to the two 180-N tensile forces shown in the figure. Determine the equivalent force-couple system at point O .



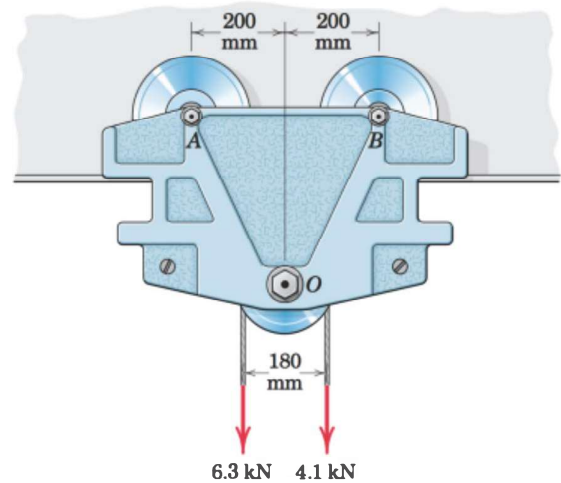
Problem 2/75

- 2/76** The device shown is a part of an automobile seat-back-release mechanism. The part is subjected to the 4-N force exerted at A and a 300-N·mm restoring moment exerted by a hidden torsional spring. Determine the y -intercept of the line of action of the single equivalent force.



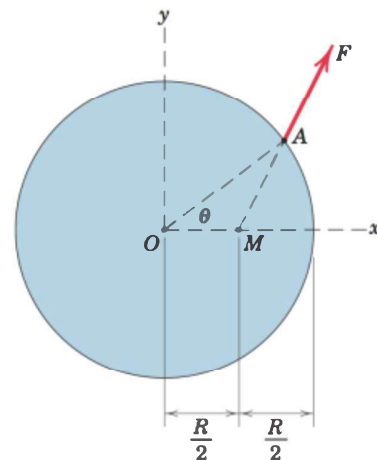
Problem 2/76

- 2/77** Replace the two cable tensions which act on the pulley at O of the beam trolley by two parallel forces which act at the track-wheel connections A and B .



Problem 2/77

- 2/78** The force F acts along line MA , where M is the midpoint of the radius along the x -axis. Determine the equivalent force-couple system at O if $\theta = 40^\circ$.



Problem 2/78