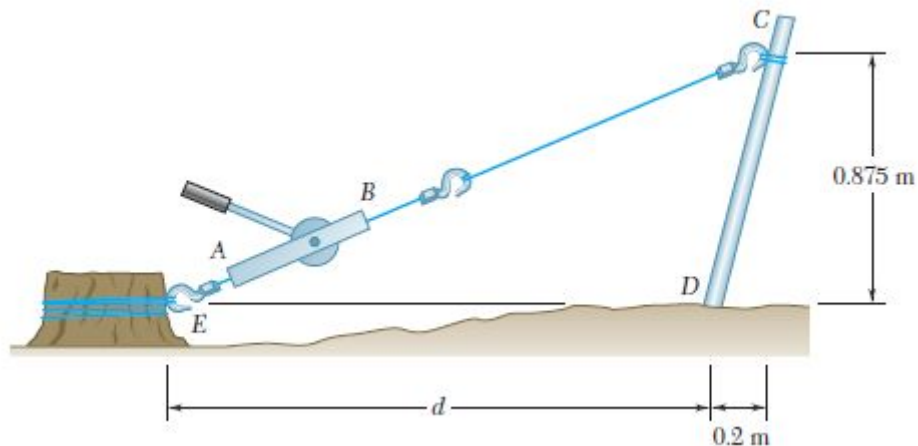


02- Rigid Bodies: Equivalent system of particles

Problem 1

Given that a force with a moment of 960 N.m about D is required to straighten the pole CD. Determine the tension that must be developed in the cable of AB to create the required moment about point D. ($d = 2.80$ m)



Problem 2

Tension in the cable BD is 980 N. Determine the moment about point O, perpendicular distance from point O to BD, moment about point C, perpendicular distance from C tot BD.

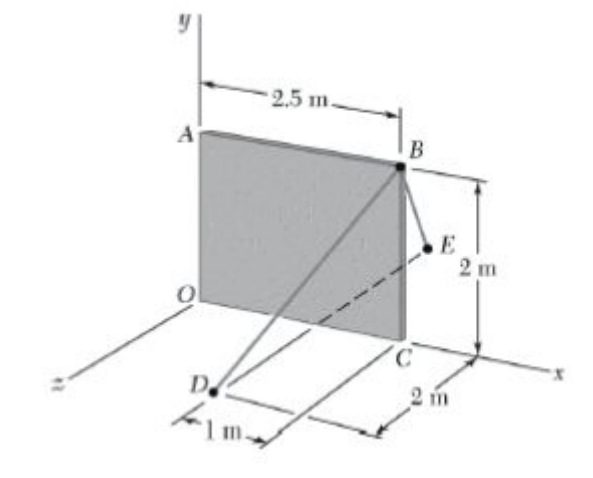
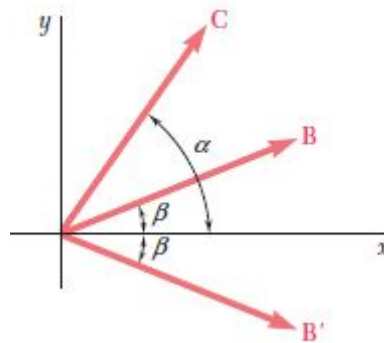


Fig: Problem 2

Problem 3

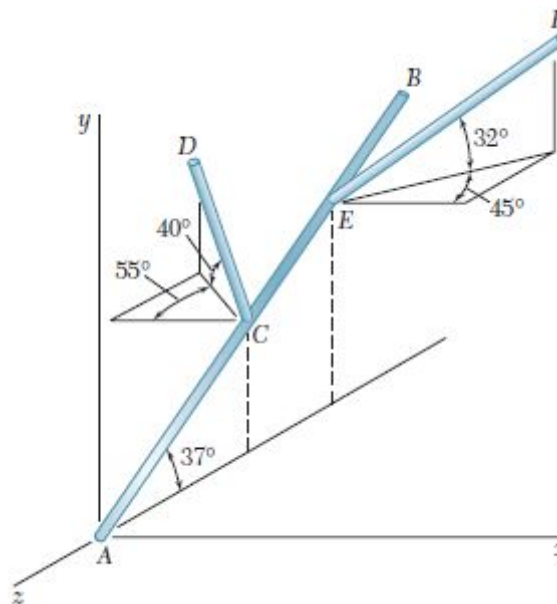
Form the scalar products $\mathbf{B} \cdot \mathbf{C}$ and $\mathbf{B}' \cdot \mathbf{C}$, where $B = B'$, and use the results obtained to prove the identity

$$\cos \alpha \cos \beta = \frac{1}{2} \cos (\alpha + \beta) + \frac{1}{2} \cos (\alpha - \beta)$$



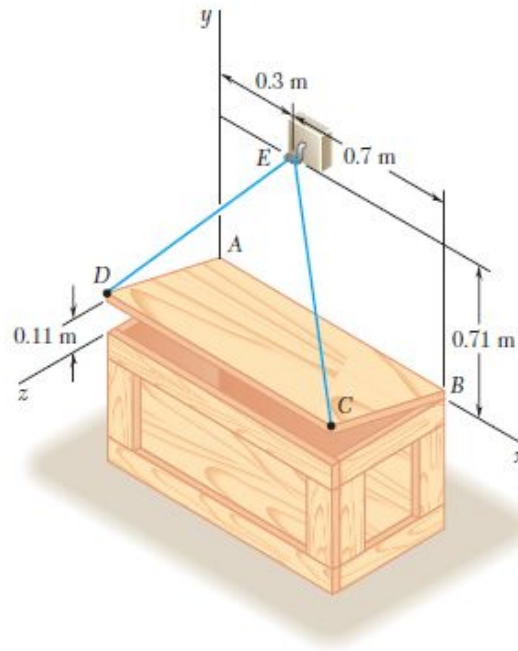
Problem 4

A pipeline AB makes an angle 37° with the z-axis as shown. Branch line CD and EF join AB with the angles as shown. Determine the angle between (a) AB and CD. (b) AB and EF



Problem 5

The 0.61×1.00 -m lid ABCD of a bin is hinged along side AB and is held up by cord DEC over a frictionless hook at E. If the tension in cord is 66 N. Determine the moment about each of the coordinate axes of the force exerted by the cord at D.



Problem 6

To lift a heavy crate, a man uses a block and tackle attached to the bottom of an I- beam at hook B.

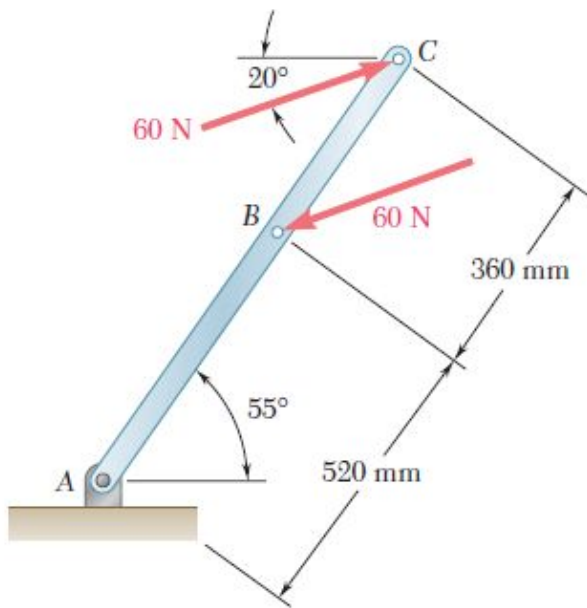
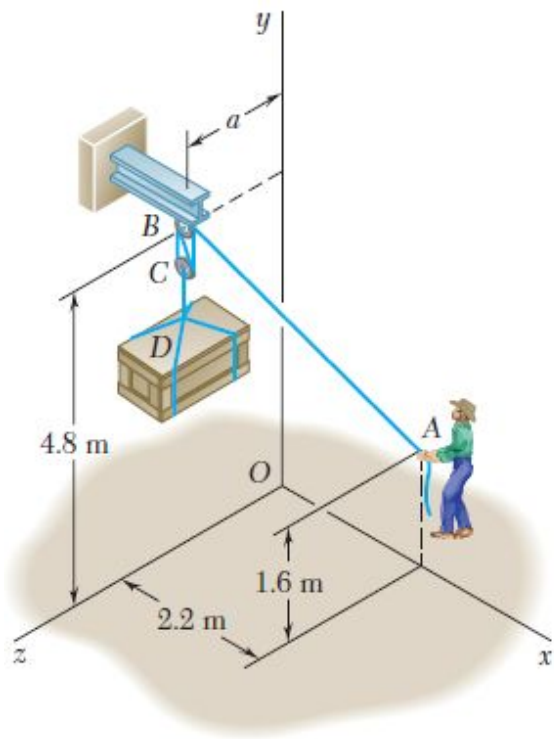
- Knowing that the moment about the y and the z axes of the force exerted at B by portion AB of the rope are, respectively, 120 N.m and - 460 N.m. Determine the distance a.
- Knowing that the man applies a 195 N force to end A of the rope and that the moment of that force about the y axis is 132 N.m. Determine the distance a.

Problem 7

Two parallel forces of 60 N each are applied to a lever as shown. Determine the moment of the couple formed by the two forces (a) by resolving each force into horizontal and vertical components and adding the moments of the two resulting couples, (b) by using the perpendicular distance between the two forces, (c) by summing the moments of the two forces about point A.

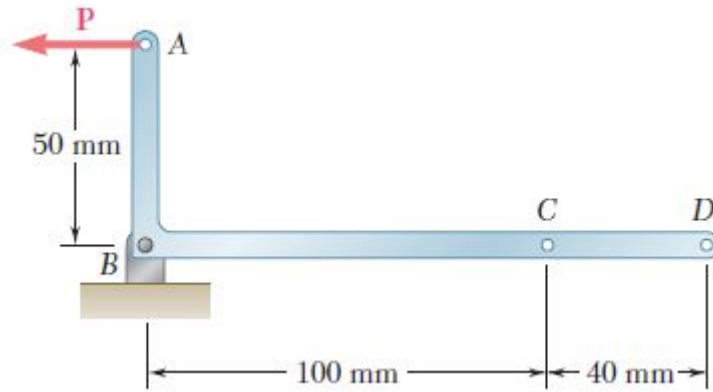
Problem 8

The 80-N horizontal force P acts on a bell crank as shown. (a) Replace **P** with equivalent force-couple system at B. (b) Find the two vertical forces at C and D that are equivalent to the couple found in part a.



Problem 6

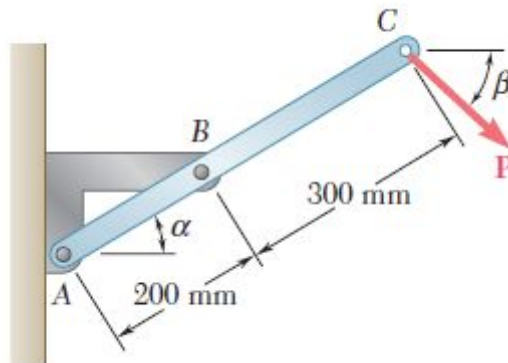
Problem 7



Problem 8

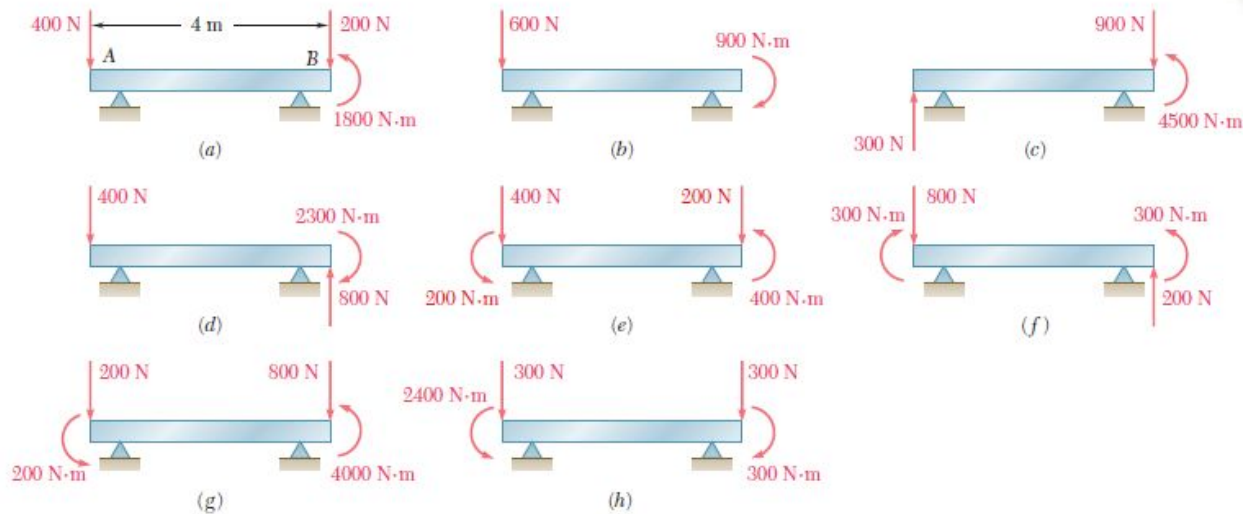
Problem 9

Force P has a magnitude of 250 N at the end C of a 500 mm rod AC as shown. Considering $\alpha = 30^\circ$, $\beta = 60^\circ$, replace P with (a) equivalent force-couple system at B , (b) an equivalent system formed by two parallel forces applied at A and B .



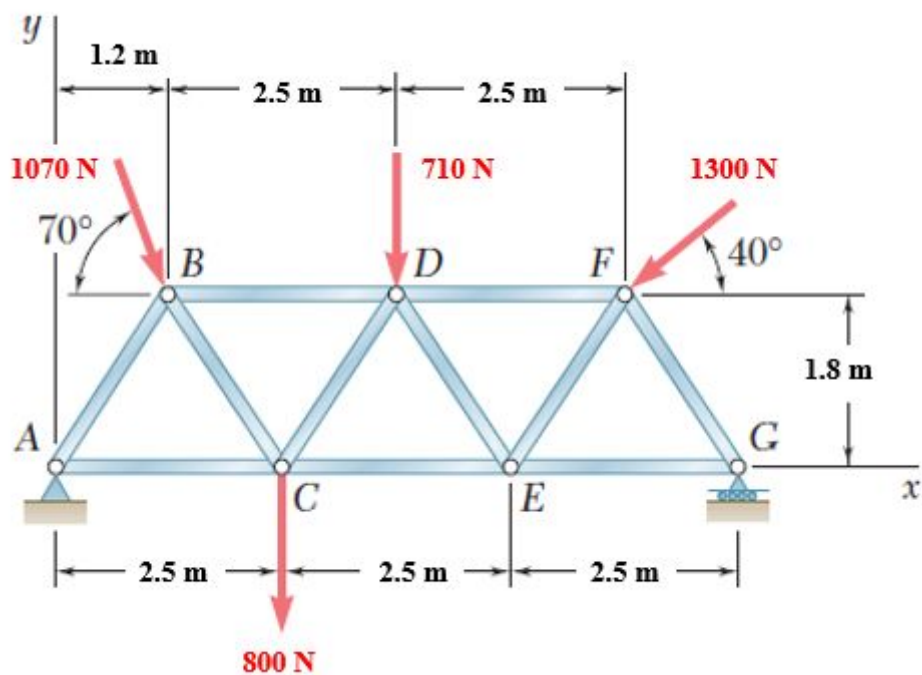
Problem 10

A 4m long beam is subjected to a variety of loadings. (a) Replace each loading with an equivalent force-couple system at end A of the beam (b) Which of the loadings are equivalent?



Problem 11

A truss supports the loading shown. Determine the equivalent force acting on the truss and the point of intersection of its line of action with a line drawn through points A and G.



Reference: Figures and questions are adapted from Vector mechanics for engineers. Statics and dynamics / Ferdinand Beer . . . [et al.]. — 9th ed.