دانشکده مهندسی مکانیک

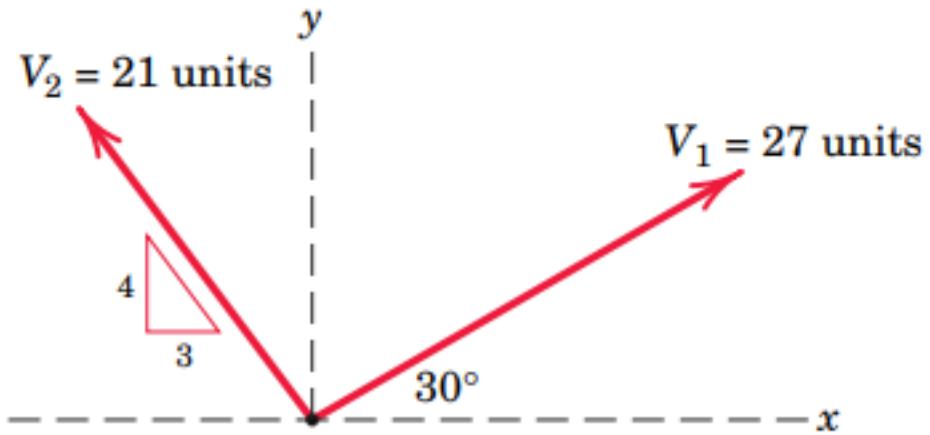
تمرین درس مکاترونیک

نام و شماره دانشجویی:

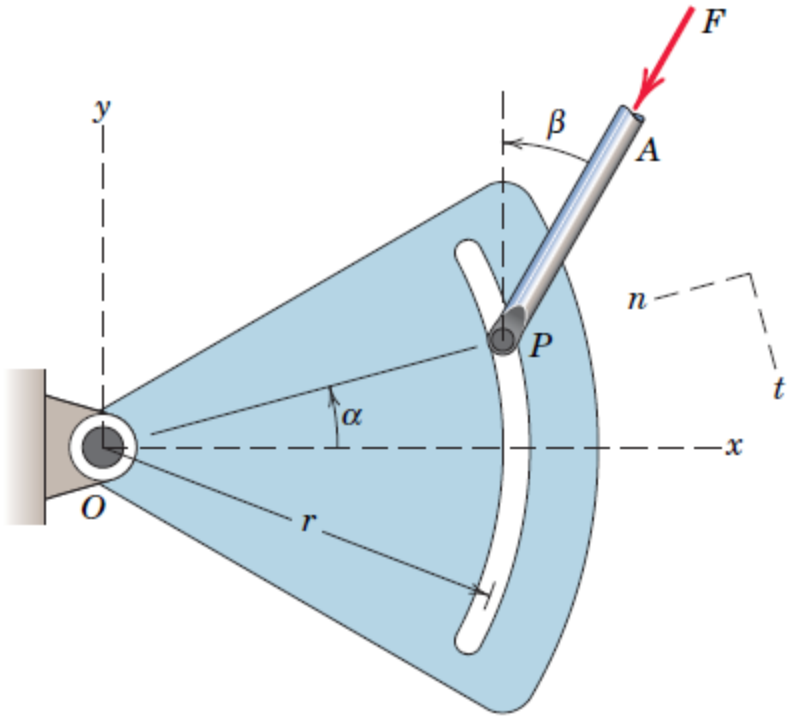
STATICS REVIEW EXERCISES

Chapter 1 – 3

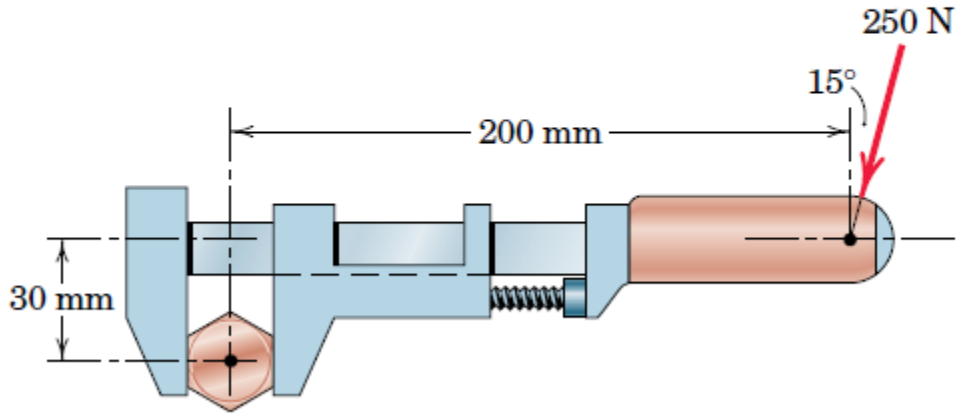
1/2 Determine the magnitude of the vector sum $\mathbf{V} = \mathbf{V}_1 + \mathbf{V}_2$ and the angle θ_x which $\mathbf{V}$ makes with the positive x-axis. Complete both graphical and algebraic solutions.



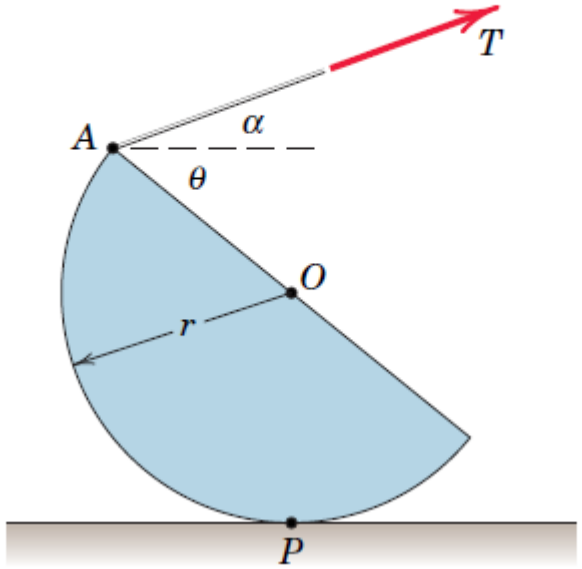
2/5 The control rod AP exerts a force $\mathbf{F}$ on the sector as shown. Determine both the x-y and the n-t components of the force.



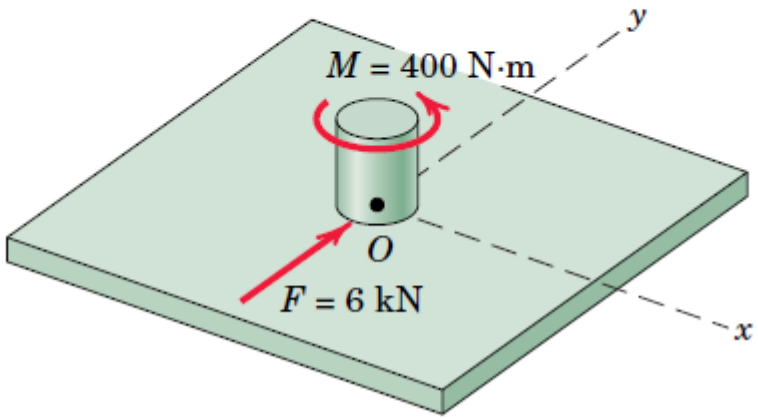
2/34 Calculate the moment of the 250-N force on the handle of the monkey wrench about the center of the bolt.



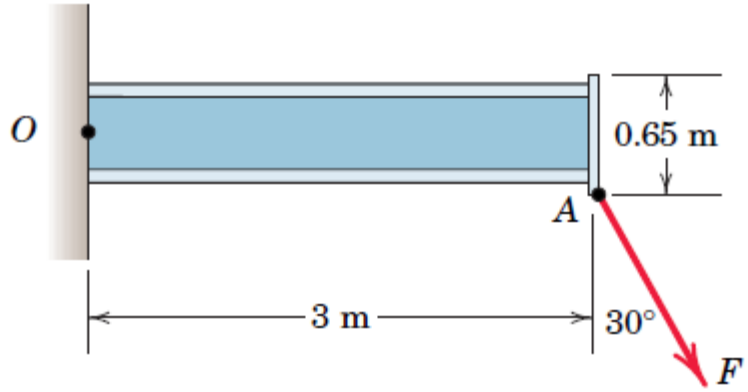
2/45 Determine the moments of the tension T about point P and about point O.



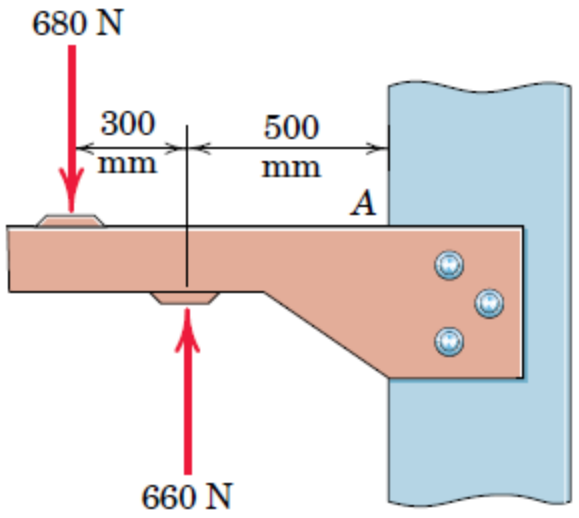
2/61 The indicated force–couple system is applied to a small shaft at the center of the plate. Replace this system by a single force and specify the coordinate of the point on the x-axis through which the line of action of this resultant force passes.



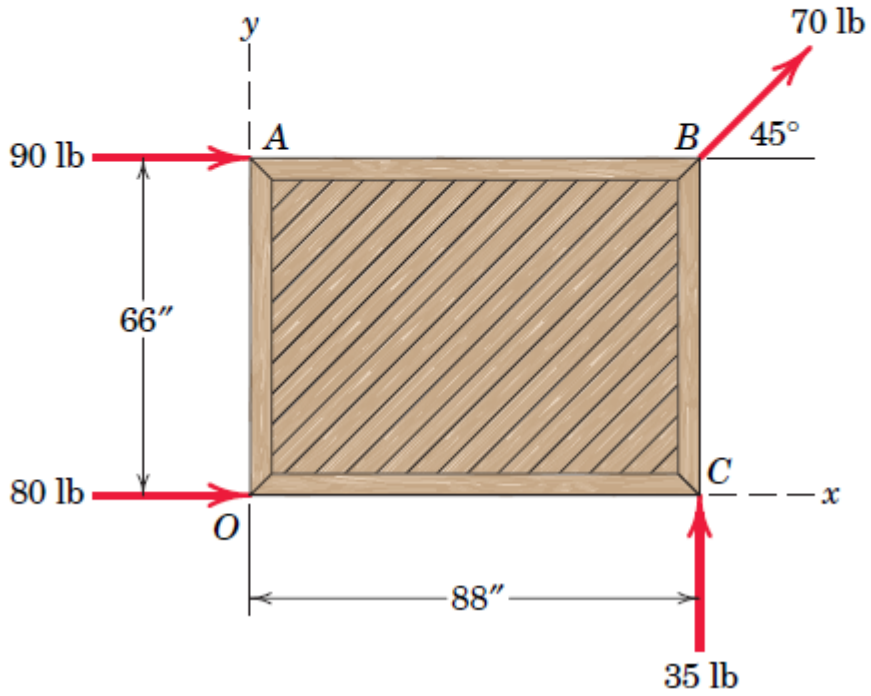
2/64 The cantilevered W530 × 150 beam shown is subjected to an 8-kN force F applied by means of a welded plate at A. Determine the equivalent force–couple system at the centroid of the beam cross section at the cantilever O.



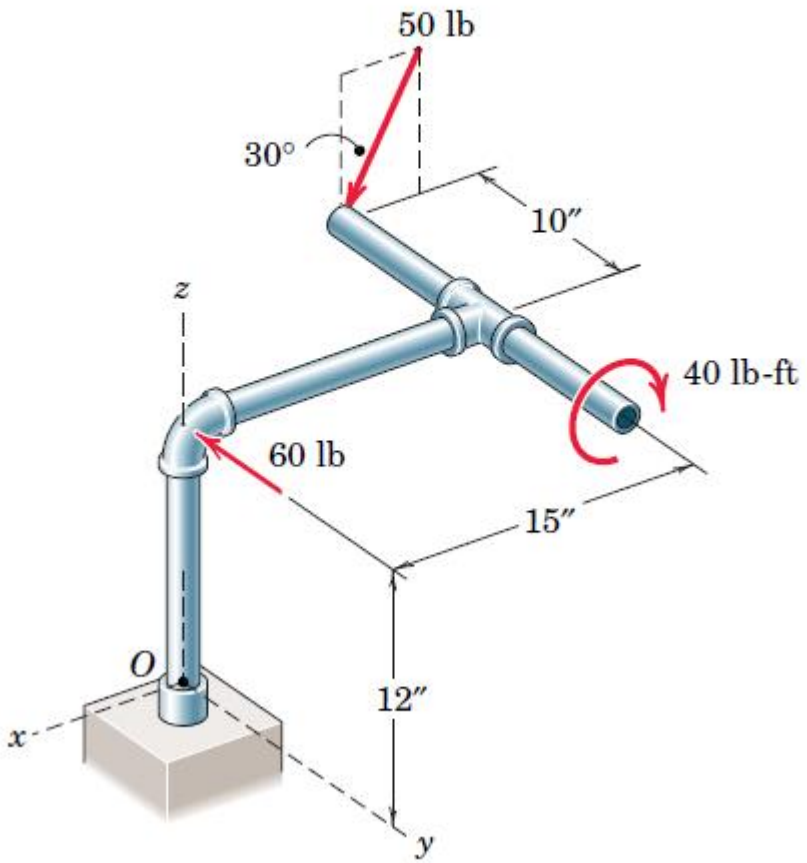
2/85 Where does the resultant of the two forces act?



2/90 Four people are attempting to move a stage platform across the floor. If they exert the horizontal forces shown, determine (*a*) the equivalent force–couple system at *O* and (*b*) the points on the *x*- and *y*-axes through which the line of action of the single resultant force **R** passes.

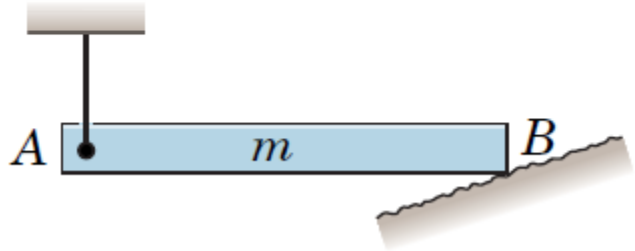


2/164 Replace the two forces and one couple acting on the rigid pipe frame by their equivalent resultant force $\mathbf{R}$ acting at point O and a couple $\mathbf{M}_O$.



3/C Draw a complete and correct free-body diagram of each of the bodies designated in the statements. The weights of the bodies are significant only if the mass is stated. All forces, known and unknown, should be labeled. (*Note:* The sense of some reaction components cannot always be determined without numerical calculation.)

1. Uniform horizontal bar of mass m suspended by vertical cable at A and supported by rough inclined surface at B.



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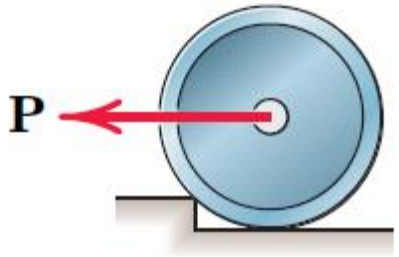
2. Wheel of mass m on verge of being rolled over curb by pull **P**.



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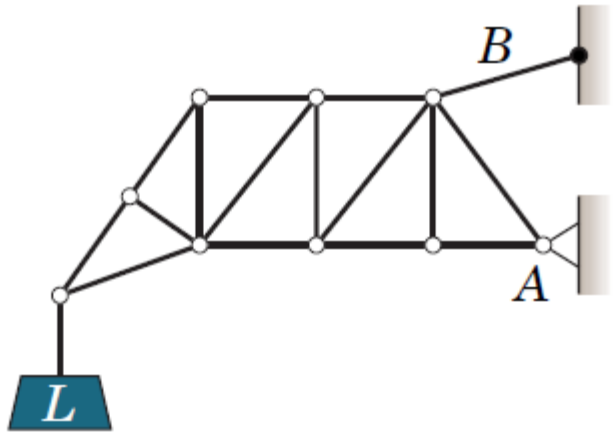
3. Loaded truss supported by pin joint at A and by cable at B.



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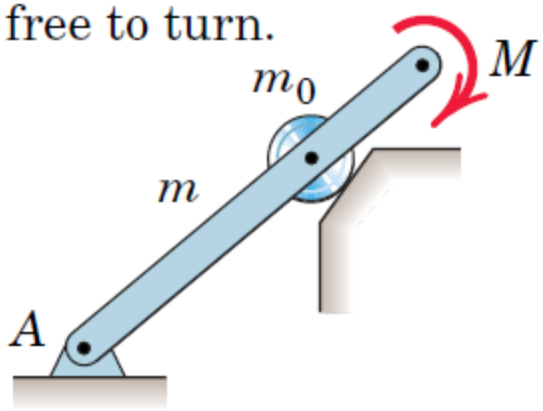
4. Uniform bar of mass m and roller of mass m_0 taken together. Subjected to couple M and supported as shown. Roller is free to turn.



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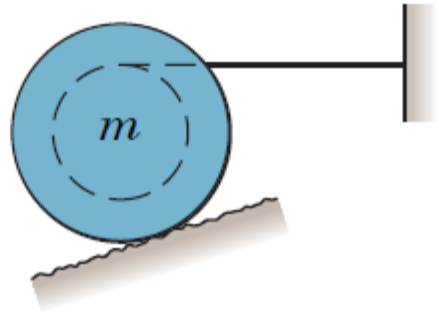
5. Uniform grooved wheel of mass m supported by a rough surface and by action of horizontal cable.



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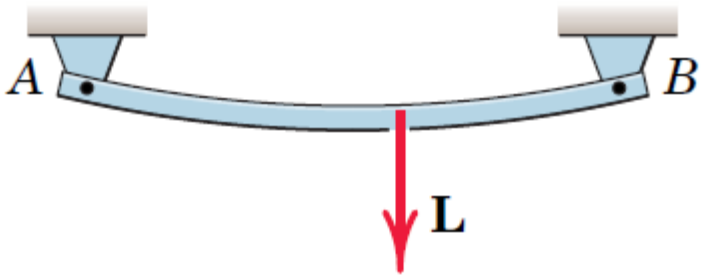
6. Bar, initially horizontal but deflected under load **L**. Pinned to rigid support at each end.



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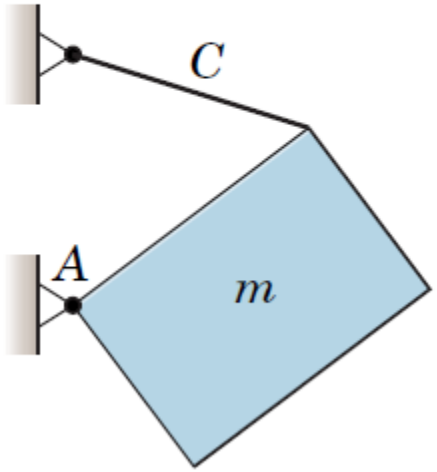
7. Uniform heavy plate of mass m supported in vertical plane by cable C and hinge A.



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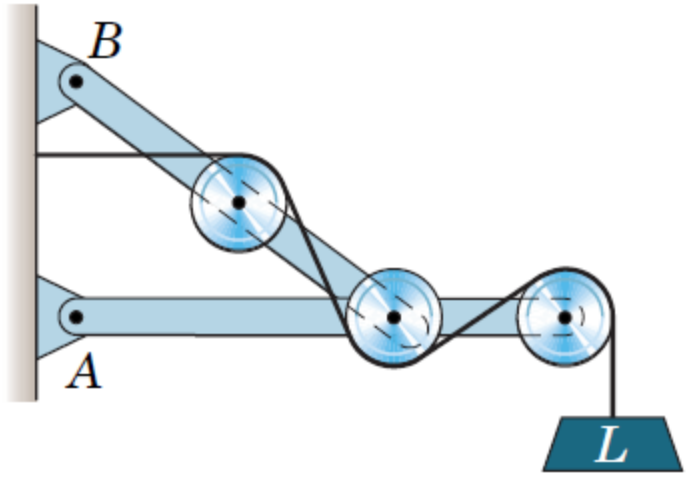
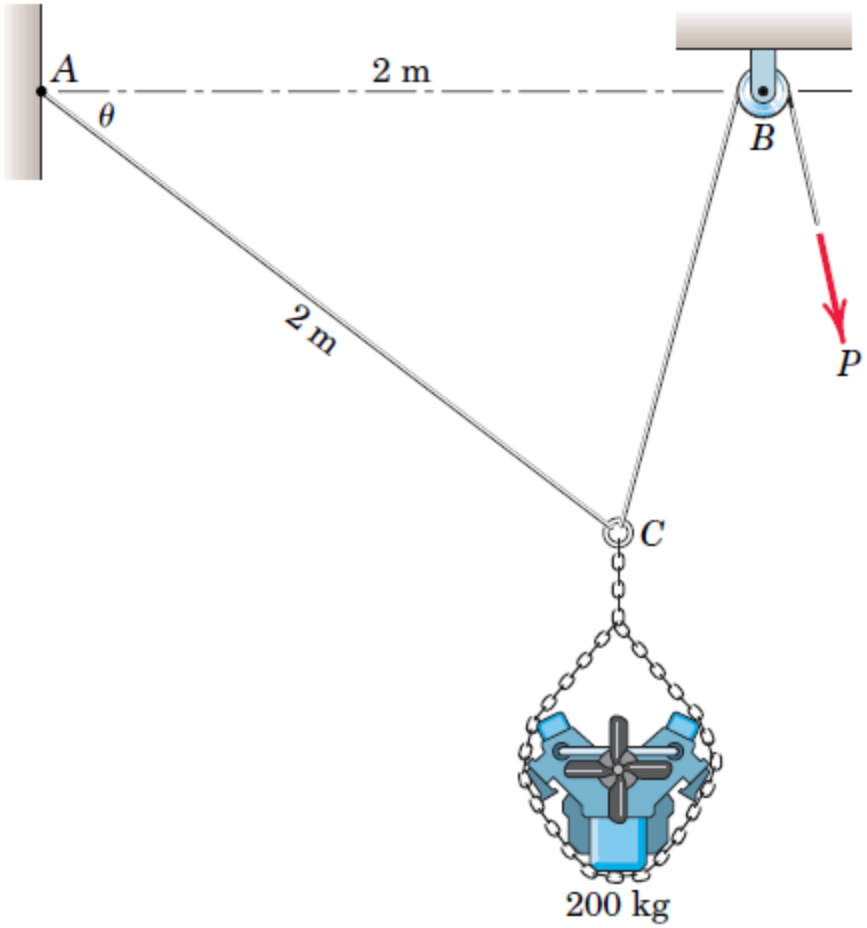
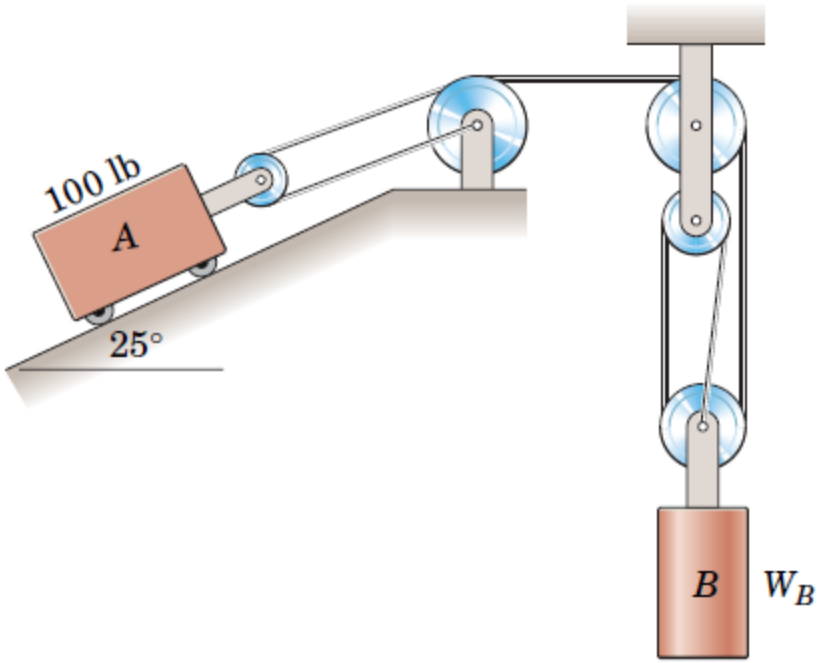
8. Entire frame, pulleys, and contacting cable to be isolated as a single unit.



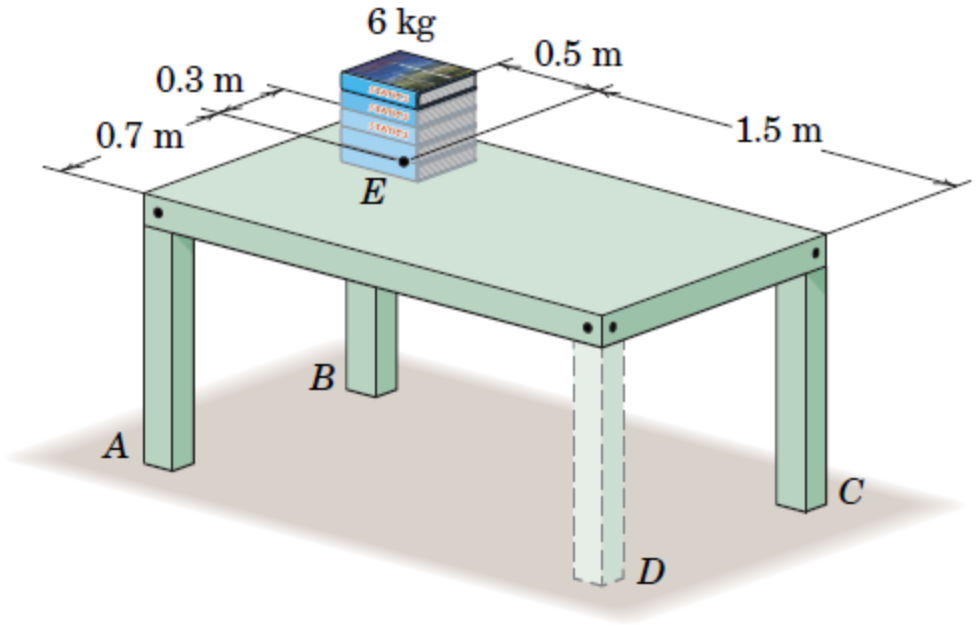
3/5 Determine the force P required to maintain the 200-kg engine in the position for which $\theta = 30°$. The diameter of the pulley at B is negligible.



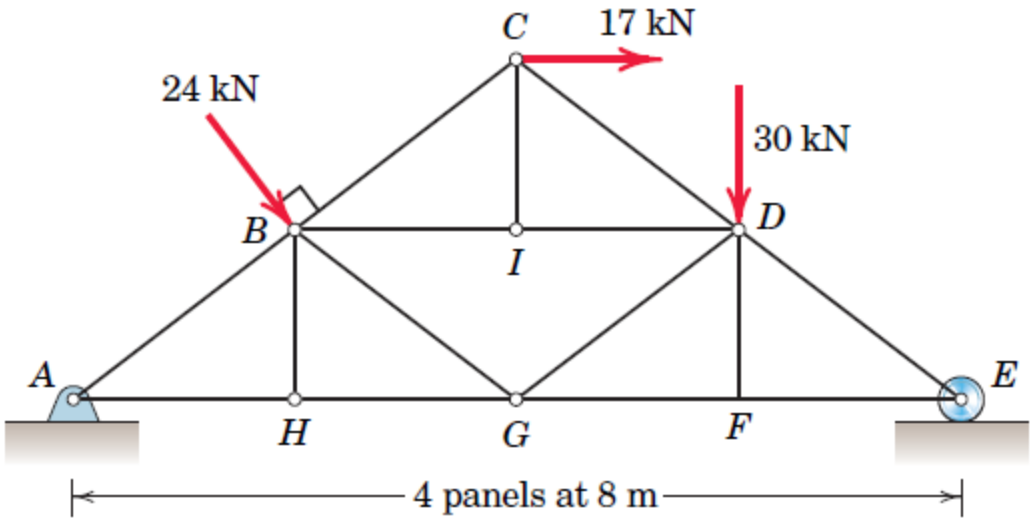
3/15 What weight W_B will cause the system to be in equilibrium? Neglect all friction, and state any other assumptions.



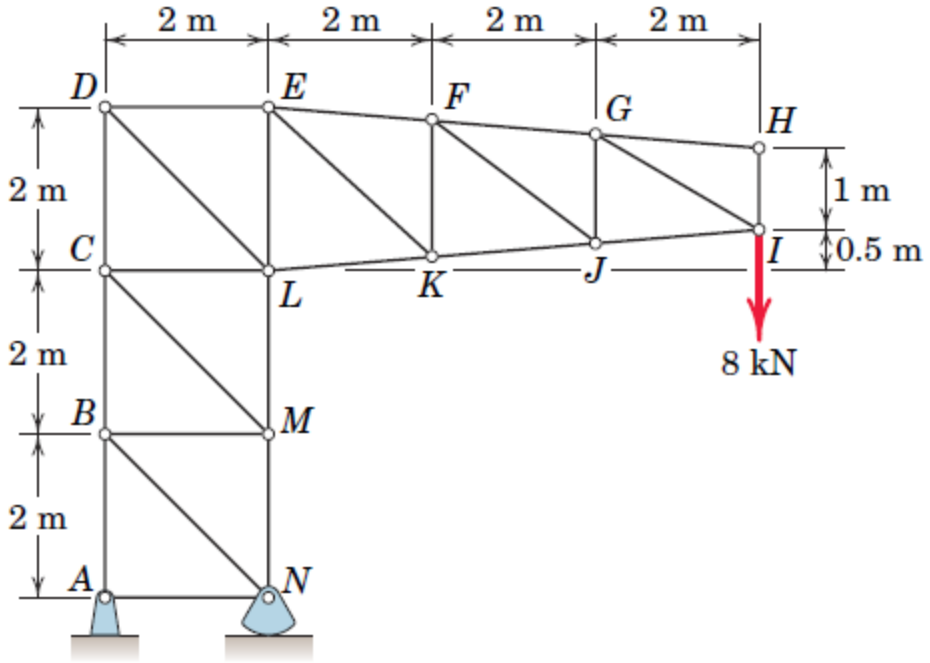
3/67 In order to make an adjustment, engineering students remove leg D from a laboratory worktable. To ensure that the table remains stable, they place a 6-kg stack of statics textbooks centered at point E of the tabletop as shown. Determine the normal reaction force at each leg A, B, and C. The uniform tabletop has a mass of 40 kg, and each leg has a mass of 5 kg.



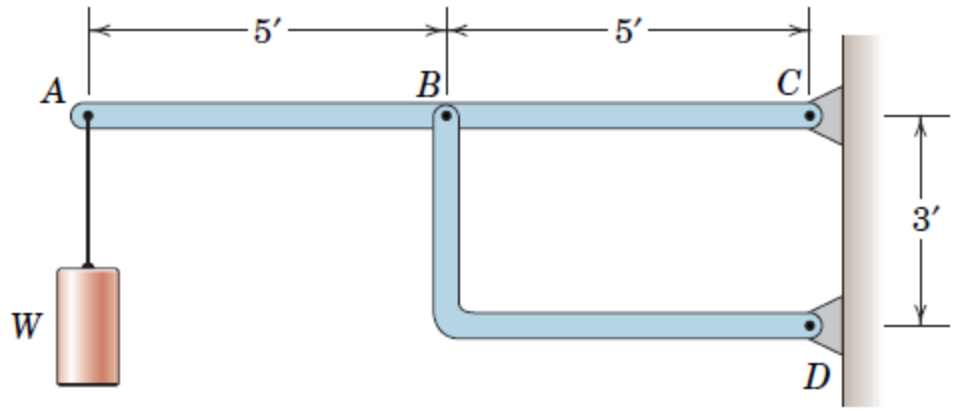
4/16 Determine the force in each member of the loaded truss. All triangles are 3-4-5.



4/37 Determine the forces in members *DE* and *DL*.



4/73 Determine the magnitude of the pin reactions at B and C if $W = 2400$ lb.



6/1 The force P is applied to the 90-kg crate, which is stationary before the force is applied. Determine the magnitude and direction of the friction force F exerted by the horizontal surface on the crate if (a) $P = 300$ N, (b) $P = 400$ N, and (c) $P = 500$ N.