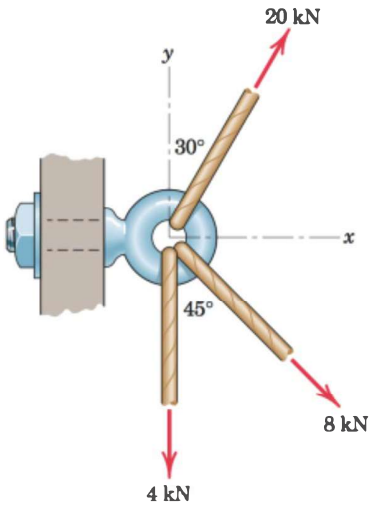
PROBLEMS

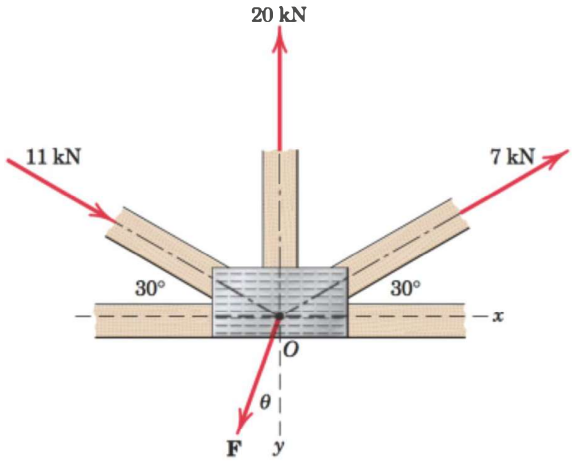
Introductory Problems

2/79 Determine the resultant **R** of the three tension forces acting on the eye bolt. Find the magnitude of **R** and the angle θ_x which **R** makes with the positive x-axis.



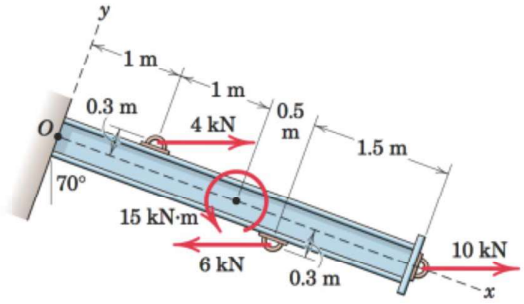
Problem 2/79

2/80 Determine the force magnitude F and direction θ (measured clockwise from the positive y-axis) that will cause the resultant **R** of the four applied forces to be directed to the right with a magnitude of 9 kN.



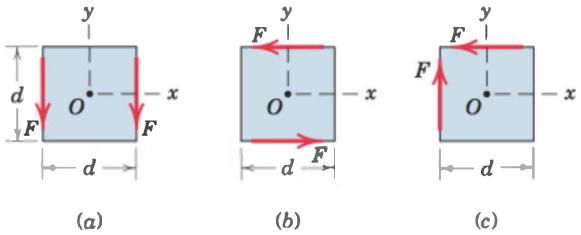
Problem 2/80

2/81 Replace the three horizontal forces and applied couple with an equivalent force–couple system at O by specifying the resultant **R** and couple M_O. Next, determine the equation for the line of action of the stand-alone resultant force **R**.



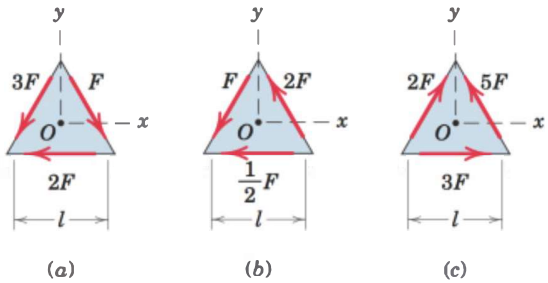
Problem 2/81

2/82 Determine the equivalent force–couple system at the center O for each of the three cases of forces being applied along the edges of a square plate of side d.



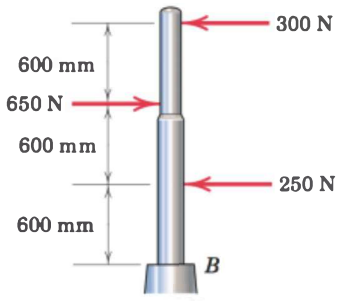
Problem 2/82

2/83 Determine the equivalent force–couple system at O for each of the three cases of forces applied along the edges of an equilateral triangle of side l. Where possible, replace this force–couple system with a single force and specify the location along the y-axis through which the single force acts. Note that the location of O in each case is at the centroid of the triangle. See Table D/3 in Appendix D for the centroid location of a triangle.



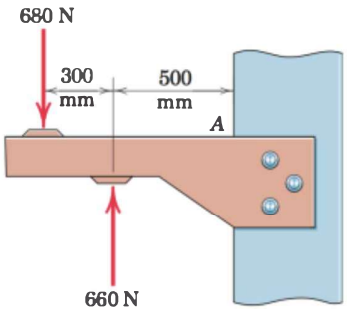
Problem 2/83

2/84 Determine the height h above the base B at which the resultant of the three forces acts.



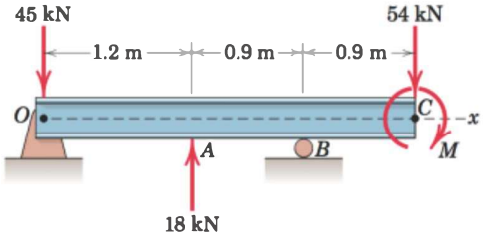
Problem 2/84

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



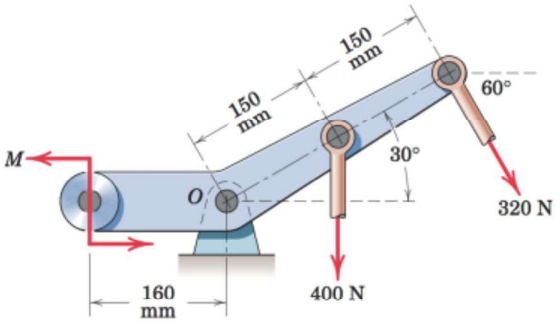
Problem 2/85

2/86 If the resultant of the loads shown passes through point B, determine the equivalent force–couple system at O.



Problem 2/86

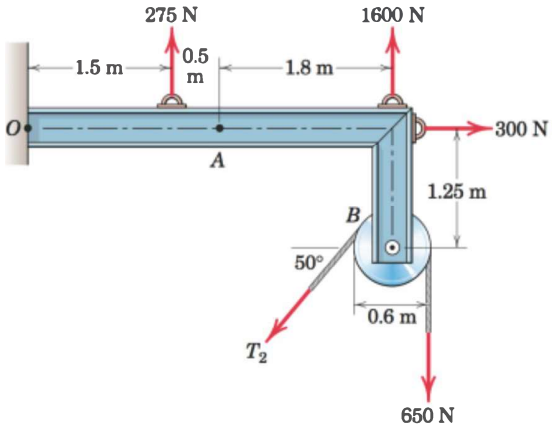
2/87 If the resultant of the two forces and couple M passes through point O, determine M.



Problem 2/87

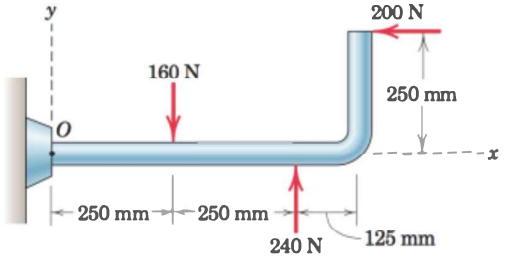
Representative Problems

2/88 If the resultant of the forces shown passes through point A, determine the magnitude of the unknown tension T_2 which acts on the braked pulley.



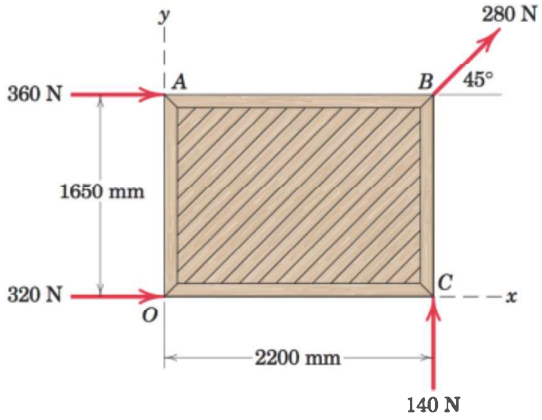
Problem 2/88

2/89 Replace the three forces acting on the bent pipe by a single equivalent force $\mathbf{R}$. Specify the distance x from point O to the point on the x-axis through which the line of action of $\mathbf{R}$ passes.



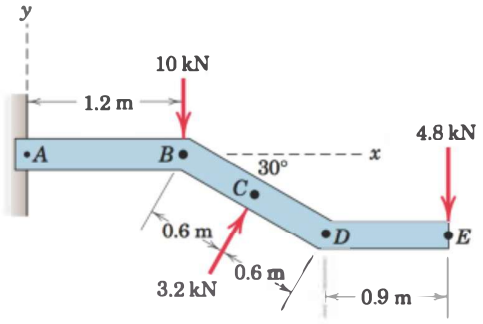
Problem 2/89

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.



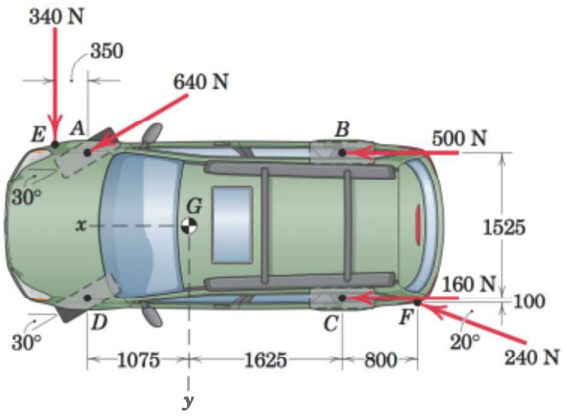
Problem 2/90

2/91 Replace the three forces which act on the bent bar by a force–couple system at the support point *A*. Then determine the *x*-intercept of the line of action of the stand-alone resultant force **R**.



Problem 2/91

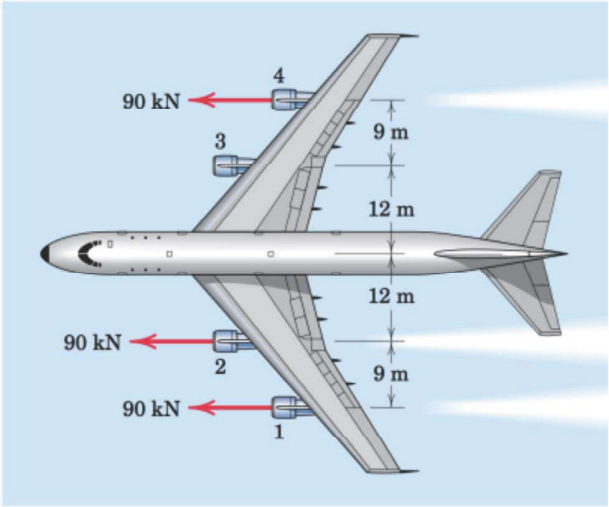
2/92 Uneven terrain conditions cause the left front wheel of the all-wheel-drive vehicle to lose traction with the ground. If the driver causes the traction forces shown to be generated by the other three wheels while his two friends exert the indicated forces on the vehicle periphery at points *E* and *F*, determine the resultant of this system and the *x*- and *y*-intercepts of its line of action. Note that the front and rear tracks of the vehicle are equivalent; that is, $\overline{AD} = \overline{BC}$. Treat this as a two-dimensional problem and realize that *G* lies on the car centerline.



Dimensions in millimeters

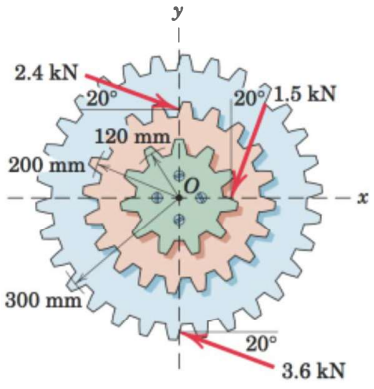
Problem 2/92

2/93 A commercial airliner with four jet engines, each producing 90 kN of forward thrust, is in a steady, level cruise when engine number 3 suddenly fails. Determine and locate the resultant of the three remaining engine thrust vectors. Treat this as a two-dimensional problem.



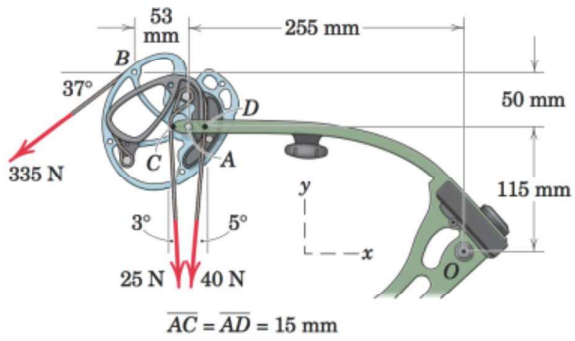
Problem 2/93

2/94 Determine the x- and y-axis intercepts of the line of action of the resultant of the three loads applied to the gearset.



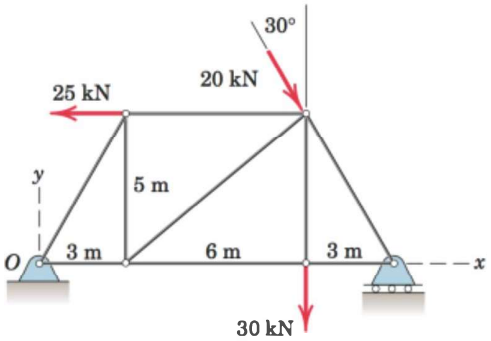
Problem 2/94

2/95 Replace the three cable tensions acting on the upper portion of the compound bow with an equivalent force–couple system at O.



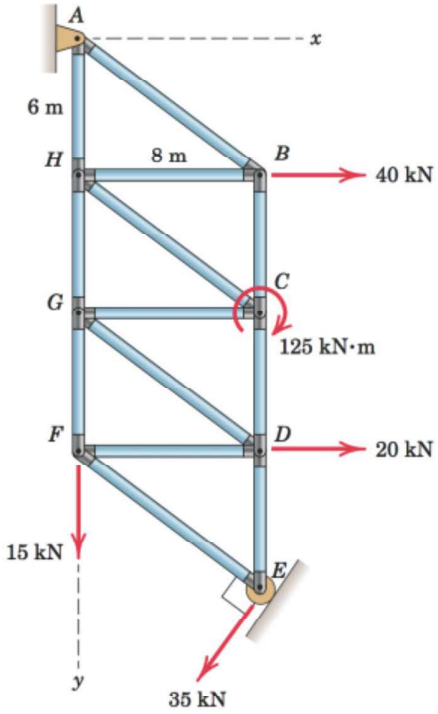
Problem 2/95

2/96 Determine the resultant **R** of the three forces acting on the simple truss. Specify the points on the x- and y-axes through which **R** must pass.



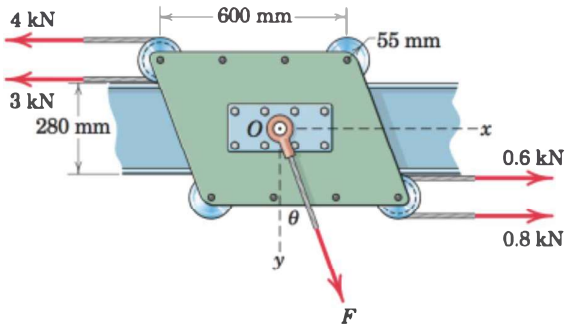
Problem 2/96

2/97 For the truss loaded as shown, determine the equation for the line of action of the stand-alone resultant **R** and state the coordinates of the points on the x- and y-axes through which the line of action passes. All triangles are 3-4-5.



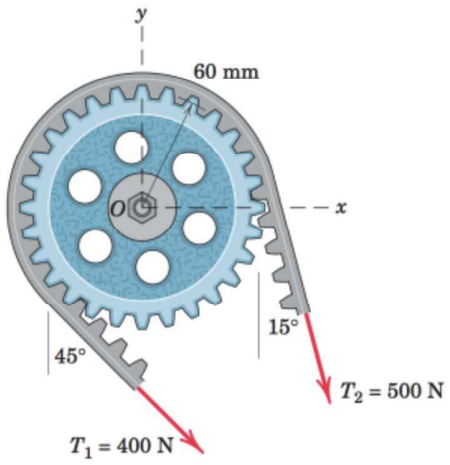
Problem 2/97

2/98 Five forces are applied to the beam trolley as shown. Determine the coordinates of the point on the y-axis through which the stand-alone resultant **R** must pass if $F = 5$ kN and $\theta = 30°$.



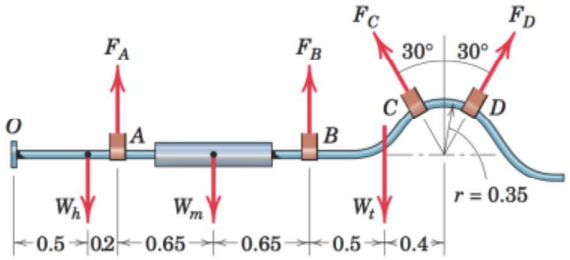
Problem 2/98

2/99 As part of a design test, the camshaft–drive sprocket is fixed, and then the two forces shown are applied to a length of belt wrapped around the sprocket. Find the resultant of this system of two forces and determine where its line of action intersects both the x- and y-axes.



Problem 2/99

2/100 An exhaust system for a pickup truck is shown in the figure. The weights W_h, W_m, and W_t of the headpipe, muffler, and tailpipe are 10, 100, and 50 N, respectively, and act at the indicated points. If the exhaust-pipe hanger at point A is adjusted so that its tension F_A is 50 N, determine the required forces in the hangers at points B, C, and D so that the force–couple system at point O is zero. Why is a zero force–couple system at O desirable?



Dimensions in meters

Problem 2/100