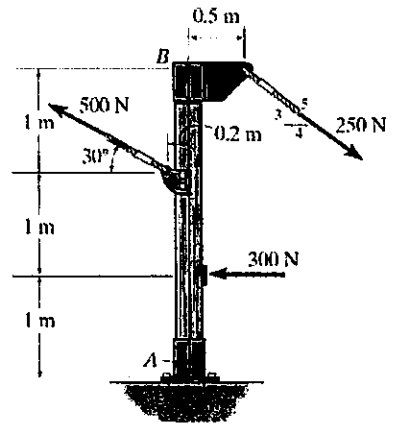
Problem 1 (20%)

Consider a force system acting on the post, as shown in this figure.

(a) Determine the magnitude of the resultant force. (10%)

(b) Specify the location of the resultant force which intersects the post *AB* measured from point *B*. (10%)

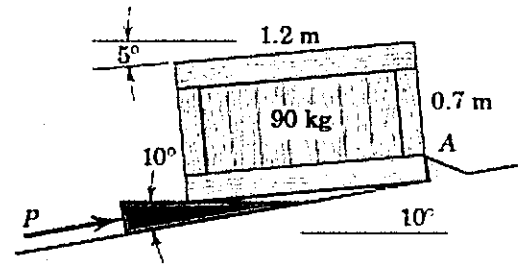


Problem 2 (25%)

Determine the force *P* required to force the 10° wedge under the 90-kg uniform crate, which rests against the small stop at *A*. The coefficient of friction for all surfaces is 0.40. (**Hint:**$\tan^{-1}(0.4) = 21.8°$)

(a) What is the angle of the reaction force provided by the wedge to the crate? The angle is indicated between the reaction force and the vertical line. (10%)

(b) Determine *P* of which the unit is N. (15%)

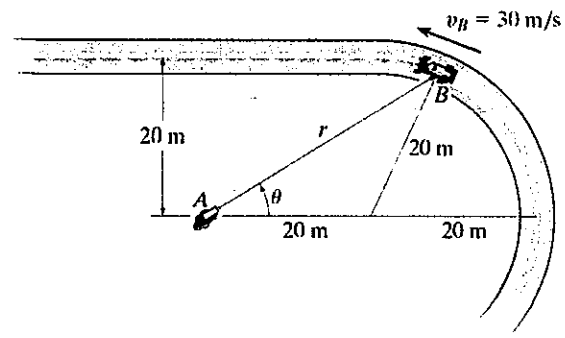


Problem 3 (25%)

A cameraman standing at *A* is following the movement of a race car, *B*, which is traveling around a curved track at a constant speed of 30 m/sec. When the man must turn to keep the camera directed on the car at the instant $\theta = 30^{\circ}$,

(a) Determine the angular velocity $\dot{\theta}$. (10%)

(b) Determine the radial and transverse components of the velocity of the race car. (15%)



Problem 4 (30%)

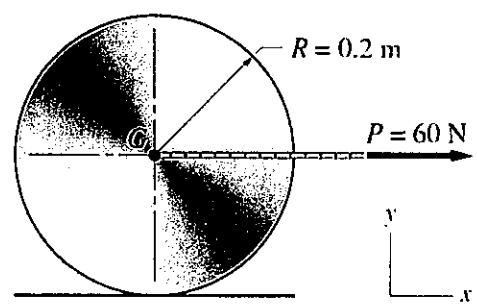
As shown in the figure, a 10-kg homogeneous disk of radius 0.2 m. The disk is at rest before the horizontal force $P = 60$ N is applied to its mass center *G*. The coefficients of static and kinetic friction for the surfaces in contact are 0.20 and 0.15, respectively. After the force is applied,

(a) Is the disk rolling or slopping? (5%)

(b) What is the friction force between the disk and contact surfaces? (5%)

(c) Determine the angular acceleration of the disk. (10%)

(d) Determine the acceleration of *G*. (10%)



$\mu_s = 0.20$
$\mu_k = 0.15$

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