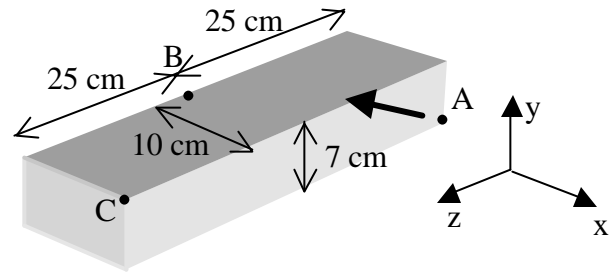


Name _____ Section _____

Include all your calculations on these pages. While there should be no ambiguities, just proceed as you see fit if you have any uncertainties. We are looking to see if you know how to do these kinds of problems.

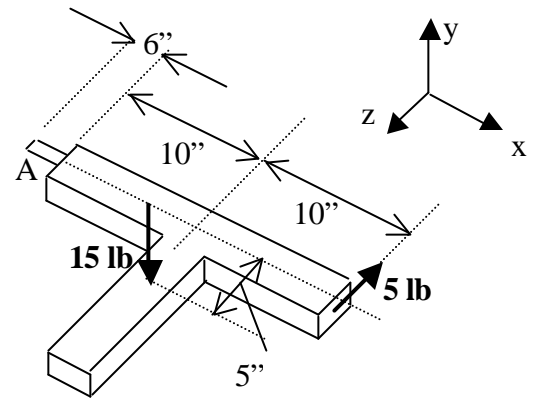
1. (30 points) The force has a magnitude of 200 N and acts from point A in the corner toward point B. (Point B is midway along its edge.)

- (i) Express this force in terms of x- y- and z-components.
- (ii) Determine the moment about the x- y- and z- axes through the point C. Do this by finding the moments due to each of the force components and summing them.



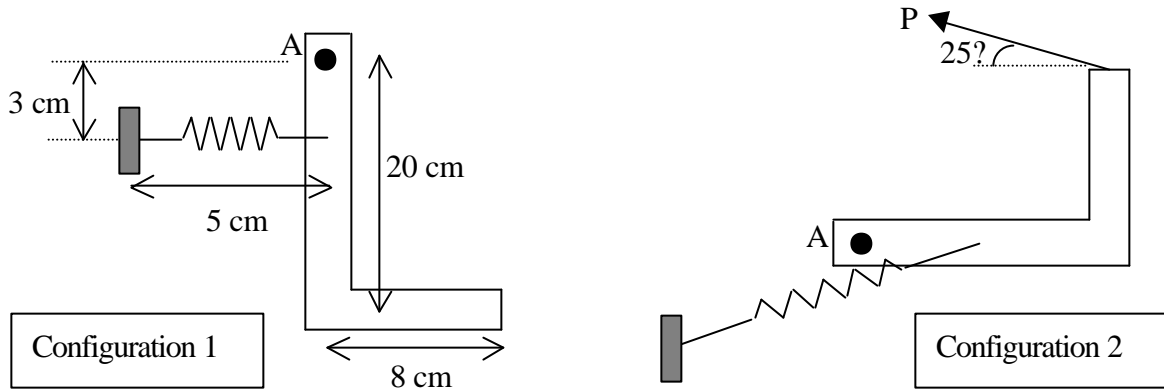
2. (20 points) The body shown is subjected to two forces and it is maintained in the position shown by a hand which firmly grips the handle at A. The 15 lb force accounts for the weight. The 5 lb force is applied in the middle of its face. The handle comes out from the middle of its face.

Determine what the hand is exerting on the handle. Using what you found, draw the handle with vectors in the appropriate directions and magnitudes.



3. (30 points) The spring is unstretched when the L-shaped arm is in configuration 1. The pin at A does not move, but permits pivoting of the arm. Gravity acts perpendicular to the plane of the paper (so it does not matter). A force P is applied to maintain the L-shaped arm in configuration 2. In configuration 2, the arm has pivoted by 90°. The end of the spring not attached to the arm remains at the same point. The spring is linear with spring constant 20 N/cm.

- (i) Determine the magnitude of the force P to maintain the arm in configuration 2.
- (ii) Determine what the arm exerts on the pin at A.



4. (20 points) A set of three sprockets is connected by a chain. The chain moves at a constant speed. Sprocket 1 is connected to a shaft which drives the sprocket by applying a 300 N-cm moment in the counter-clockwise direction to the sprocket. Sprocket 2 is connected to a shaft which applies a moment to the sprocket. Sprocket 3 rotates freely on an axis. (Sprocket 3 is an idler with no moment applied to it by the axis on which it rotates.)

Between sprockets 1 and 3, the chain has a tension of 75 N.

- (i) Determine the tensions in the chain between sprockets 1 and 2 and between 2 and 3.
- (ii) Determine the moment (magnitude and direction) applied by the shaft attached to sprocket 2 to that sprocket.

