Quiz #1 A   24-261 Statics   October 4, 2001

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.

1. (30 points) The force has a magnitude of
100 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.
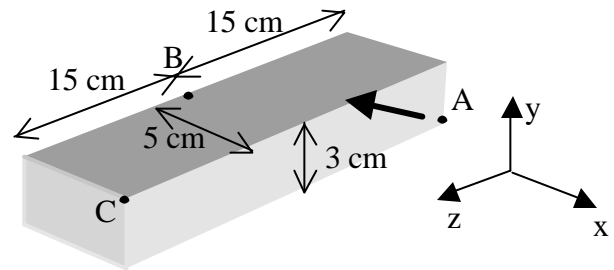
2. (20 points) The body shown is subjected to two forces and it is maintained in the position shown by a hand which firmly grips the handle at A. The 25 lb force accounts for the weight. The 10 lb force is applied in the middle of its face. The handle comes out from the middle of its face.

Determine what the hand is exerting on the handle. Using what you found, draw the handle with vectors in the appropriate directions and magnitudes.
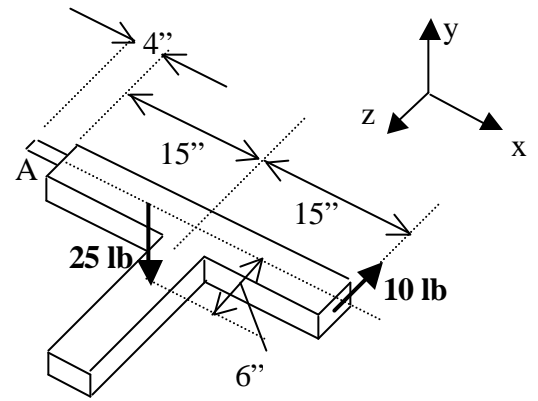
3. (30 points) The spring is unstretched when the L-shaped arm is in configuration 1. The pin at A does not move, but permits pivoting of the arm. Gravity acts perpendicular to the plane of the paper (so it does not matter). A force P is applied to maintain the L-shaped arm in configuration 2. In configuration 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.

Configuration 1

6 cm

A

40 cm

10 cm

15 cm

P

20?

A

Configuration 2
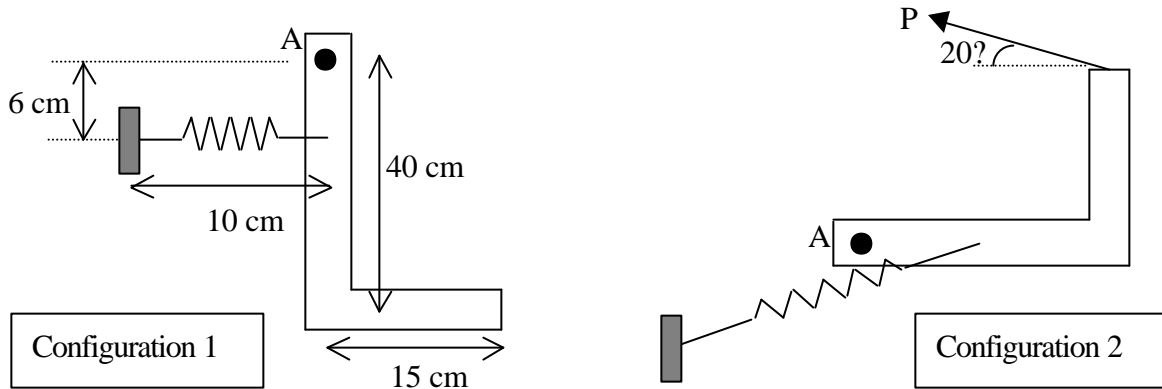
4. (20 points) A set of three sprockets is connected by a chain. The chain moves at a constant speed. Sprocket 1 is connected to a shaft which drives the sprocket by applying a 200 N-cm moment in the counter-clockwise direction to the sprocket. Sprocket 2 is connected to a shaft which applies a moment 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.

Sprocket 2
(Radius 10 cm)

Sprocket 3
(Radius 6 cm)

Sprocket 1
(Radius 4 cm)