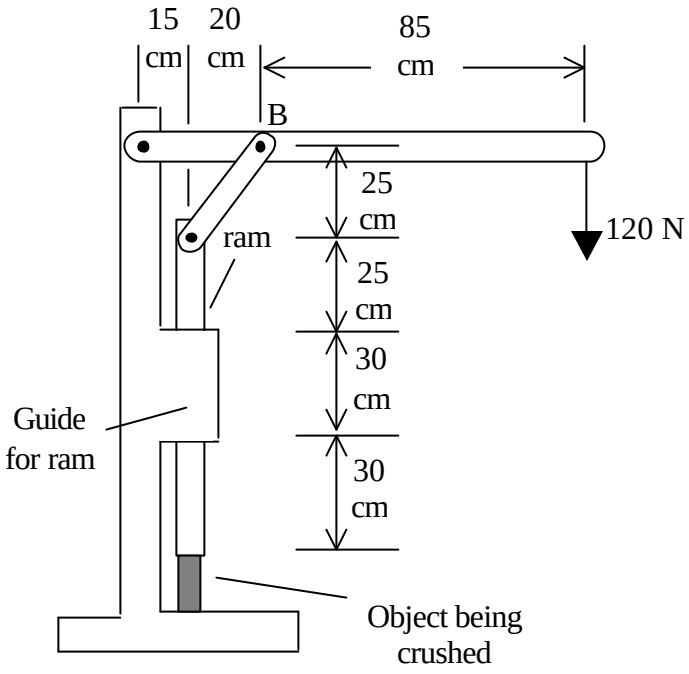
Quiz #2 A 24-261 Statics Nov. 8, 2001

Name_____

Complete free body diagrams and equations should be shown. Include all your calculations on these pages.

1. **(35 points)** In the hand press shown, a 120 N force is applied to the lever, which drives a ram by way of a link. The ram fits closely inside a guide which maintains the orientation of the ram and exerts negligible friction. The ram crushes an object, which exerts an upward force on the ram. Do not include the masses of the members.



(i) Determine the crushing force exerted by the ram.

(ii) Determine the forces and/or moments between the guide and the ram. (There is more than one way of representing the interactions between the guide and the ram; any statically correct way is acceptable.)

(iii) Determine the internal forces and moments at the cross-section 10 cm <u>to the left</u> of the pin at B.

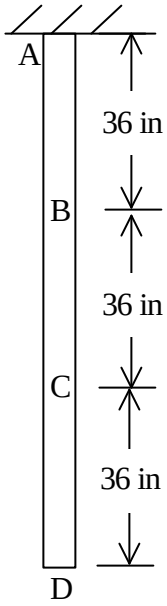
(iv) Assuming there are actually two identical links on either side of the lever, determine the average shear stress on the 6 mm diameter pin at B.

2. **(30 points)** There is a light, flexible cord, with cross-sectional area 0.5 in^2 and Young's modulus 200 psi, on which four points A, B, C and D are marked off. The initial positions of these points are shown in the left figure (**Initial**).

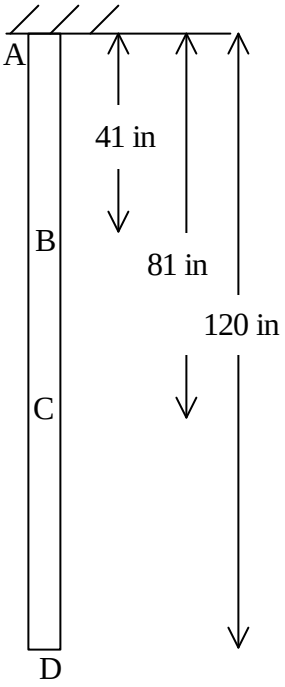
The cord is attached at point A to a fixed surface, and weights are hung from points B, C and D. The new positions of points B, C and D, 41 in, 81 in and 120 in below the fixed surface, are shown in the right figure (**With weights hung**).

(i) Determine the weights W_B, W_C, and W_D, which are hung at the points B, C and D.

(ii) Determine the stress at the point midway between B and C.

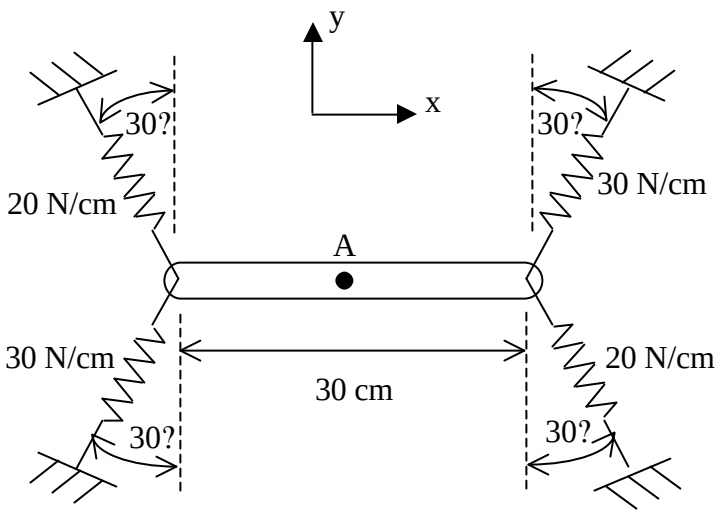


Initial



With weights hung

3. **(35 points)** A rigid bar which is pinned at A is attached to four springs as shown. Ignore gravity which acts perpendicularly to the plane of the figure. With the springs at their initial lengths with no force, the bar is in the position shown (parallel to the x-axis). The springs can take both tension and compression. The spring constant is shown next to each spring.



A moment of 1000 N-cm is applied to the bar at A about the positive z-axis. This moment causes the bar to rotate counter-clockwise about A by a small angle ? .

Determine the angle of rotation ? .