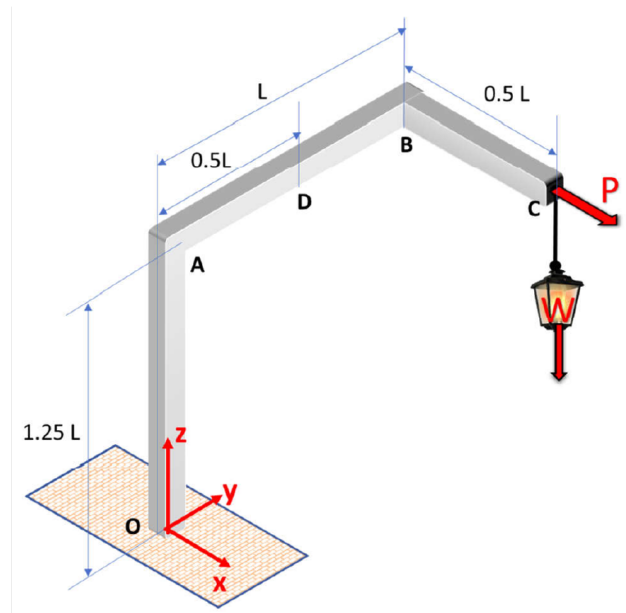


Homework 1 is due on Gradescope by 11:59 pm EDT on Friday, June 17. Your submitted homework must be your work and must not be copied from other sources.

1. **10 points.**

A street lamp with weight W is suspended from post $OABC$ as shown.

Load P is also applied at point C and acts in the x -direction.



Determine the following.

- The external reactions acting at O . Express your answer in vector form.
- The magnitudes of the internal resultants acting at D .

2. 10 points.

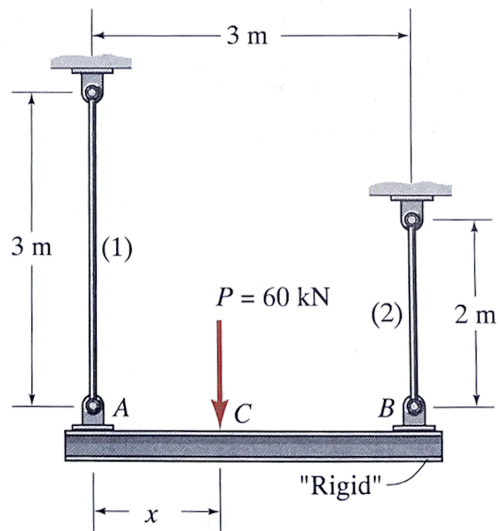
Rigid beam AB is supported by vertical rods at its ends.

Force P acts a distance x from A .

The diameter of rod (1) is $d_1 = 25$ mm. The diameter of rod (2) is $d_2 = 20$ mm.

Neglect the weight of the beam and the rods.

The beam remains horizontal and the rods remain vertical during loading.



Determine the following.

- For $x = 0.75$ m, determine the normal stresses in rod (1) and in rod (2). Express your answers in MPa.
- The distance x for the normal stresses in rods (1) and (2) to be equal.
- If the strain in rod (1) is ϵ_1 , what is the strain in rod (2)?

3. 10 points.

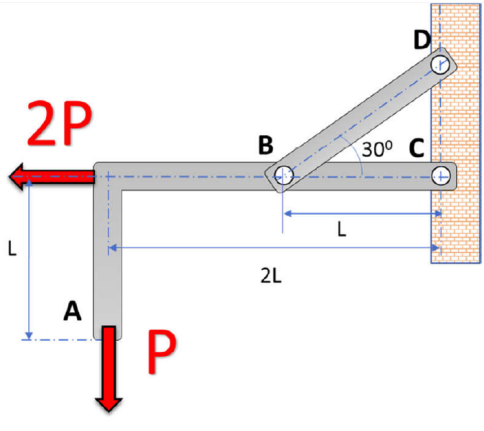
The structure $ABCD$ is loaded as shown with forces $2P$ and P .

Bars ABC and BD are rigid. The connections at B , C , and D are pin joints.

Each pin has diameter d . The shear strength of each pin is S_{sy} .

Pin C is loaded in single-shear. Pins B and D are loaded in double-shear.

Neglect the weights of the structure.



Determine the following.

- The average shear stress acting at each pin.
- The maximum value of P in terms of the variables given in the problem.