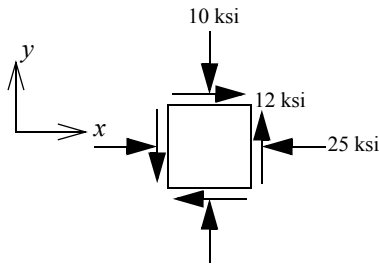1. At a point in a structural member subjected to plane stress, the stresses on the horizontal and vertical planes through the point are shown in the figure. Determine the principal stresses and and the maximum shearing stress at this point..


2. At a point in a structural member subjected to plane stress, the stresses are $\sigma_x = 80$ MPa (C), $\sigma_y = 50$ MPa (T) and $\tau_{xy} = -40$ MPa. If $E = 210$ GPa and $\nu = 0.25$, what are the strains that would be read by the two gages shown.
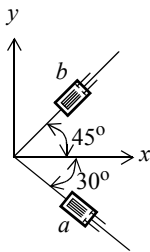

3. A solid steel shaft with a modulus of elasticity of 30,000 ksi and shear modulus of 12,000 ksi is securely connected to a hollow steel shaft as shown. Point D is on the inside surface of the shaft. Determine the torsional shear stress at point D and the rotation of the section at B.
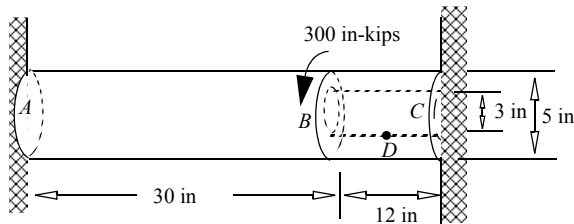

4. Calculate the maximum shearing stress acting at point B of the structure shown. (Note: Member DE is a 2-force member.)
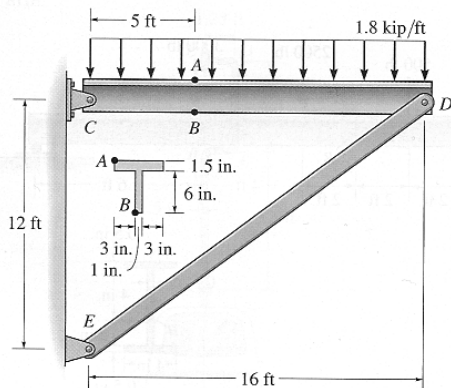
5. Two pieces of 2 in. x 4 in. lumber are pin connected to form a simple structure shown. Wood has a modulus of elasticity $E = 1800$ ksi. Member AC is 36 inch long and BC is 48 inch long. Determine the maximum force F that can be applied without causing buckling in the structure.
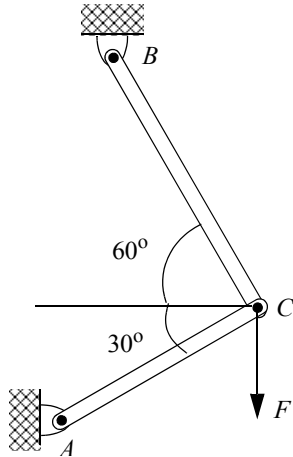
6. Bending rigidity EI for the cantilever beam shown is 3×10^6 N-m^2. Determine the deflection of the beam at $x = 2.4$ m. (Note: The support reactions at the wall are given.)
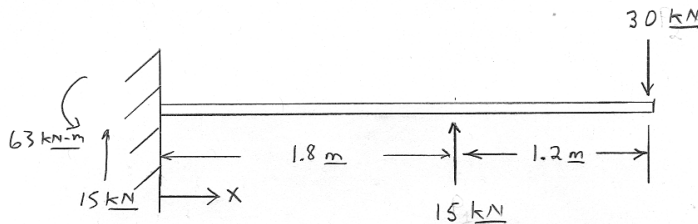
ANSWERS

1. $\sigma_{p1} = 3.35 ksi(C))$ $\sigma_{p2} = 31.65 ksi(C))$ $\tau_{max} = 15.82 ksi$

2. $\varepsilon_a = -40.02 \mu$ $\varepsilon_b = -291.15 \mu$

3. $|\tau_D| = 5.77$ ksi; $\phi_B = 3.85(10^{-3})$ rads CCW

4. $(\tau_{max})_B = 22.29 ksi$

5. $F_{max} = 73.1$ kips

6. Deflection $= 48.78$ mm