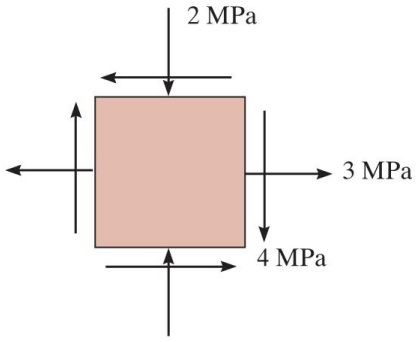
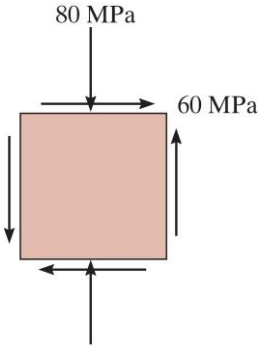
1. Determine the equivalent state of stress if an element is oriented 20^0 clockwise from the element shown. Show the result on the element. [15%] Ans:47.5, 202, -15.8 MPa



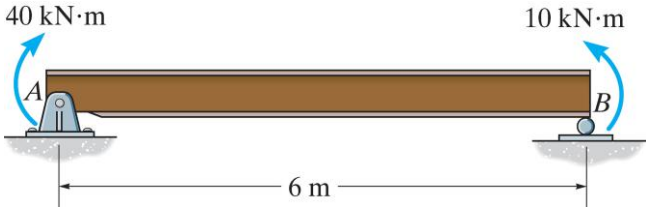
2. The state of stress at a point is shown on the element. (a) Determine the principal stresses and the corresponding orientation of the element. (b) Determine the maximum in-plane shear stress and average normal stress at the point, and specify the orientation of the element. You must use Mohr's circle to solve this problem. [20%] Ans: (a) 32.1, -112 MPa, 28.15^0 (b) 72.1, -40 MPa, -16.8^0



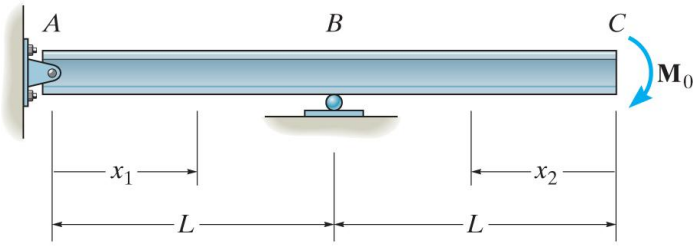
3. The state of plane strain at a point has components $\varepsilon_x = 250(10^{-6})$, $\varepsilon_y = 300(10^{-6})$, and $\gamma_{xy} = -180(10^{-6})$. (a) Determine the in-plane principal strains. (b) Determine the maximum in-plane shear strain and average normal strain. You must use Mohr's circle to solve this problem. [15%] Ans: (a)368, 182 (10^{-6}) (b) 187, 275 (10^{-6})

4. The state of plane strain at a point is represented on an element having components $\varepsilon_x = 200(10^{-6})$, $\varepsilon_y = 180(10^{-6})$, and $\gamma_{xy} = -300(10^{-6})$. Determine the state of strain on an element oriented 60^0 counterclockwise from the reported position. [15%] Ans: 55.1, 325, 133 (10^{-6})

5. Determine the maximum deflection of the simply supported beam. The Young's modulus E=200 GPa and I=39.9(10^{-6}) m^4. [15%] Ans:-14.2 mm



6. Determine the equation of the elastic curve for the beam using the coordinates x_1 and x_2, and specify the deflection and slope at C. EI is constant. [20%]



$\theta_C = \left.\frac{dv_2}{dx_2}\right|_{x_2=0} = -\frac{4M_0L}{3EI}$) Ans.

The elastic Curve:

$v_1 = \frac{M_0}{6EIL}[-x_1^3 + L^2x_1]$ Ans.

$v_2 = \frac{M_0}{6EIL}[-3Lx_2^2 + 8L^2x_2 - 5L^3]$ Ans.

$v_C = v_2|_{x_2=0} = -\frac{5M_0L^2}{6EI}$ Ans.

The negative sign indicates downward deflection.