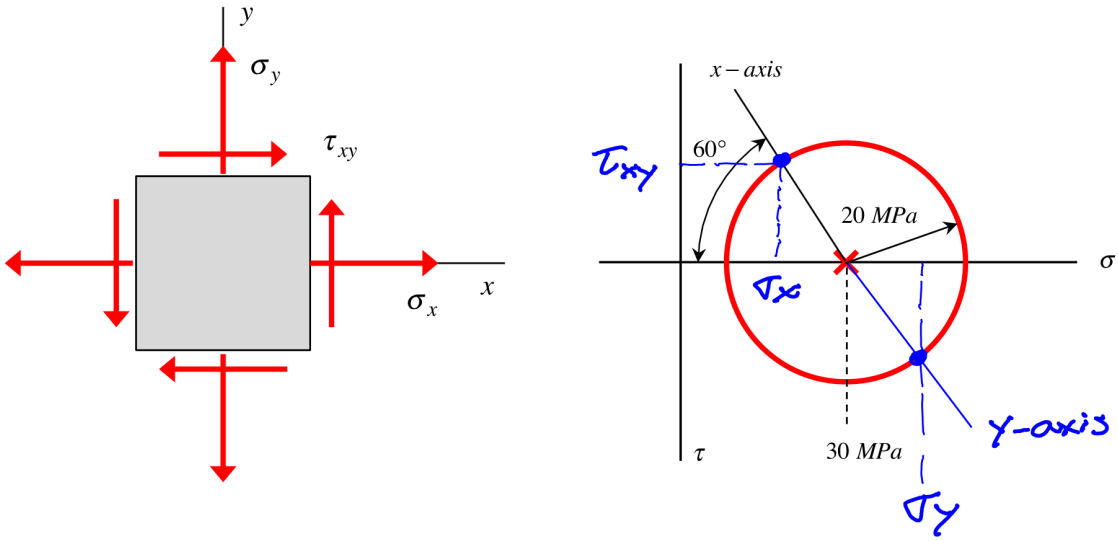
Example 13.8



The Mohr's circle for a stress state is presented above.

a) Show the location of the y-axis in the Mohr's circle above.

b) Determine the principal stresses and the absolute maximum shear stress for this state.

c) Determine the values for σ_x, σ_y and τ_{xy} of this stress state.

$\sigma_{ave} = 30\,MPa$

$R = 20\,MPa$

$\sigma_1 = \sigma_{ave} + R = 50\,MPa$

$\sigma_2 = \sigma_{ave} - R = 10\,MPa$

} σ_1 & σ_2 have same sign

$(\tau_{max})_{in\text{-}plane} = R = 20\,MPa$

$(\tau_{max})_{abs} = \frac{\sigma_1}{2} = 25\,MPa$

From figure:

$\sigma_x = \sigma_{ave} - R\cos 60^\circ = 30 - 20\cos 60^\circ = 20\,MPa$

$\sigma_y = \sigma_{ave} + R\cos 60^\circ = 30 + 20\cos 60^\circ = 40\,MPa$

$\tau_{xy} = -R\sin 60^\circ = -20\left(\frac{\sqrt{3}}{2}\right) = -10\sqrt{3}\,MPa$