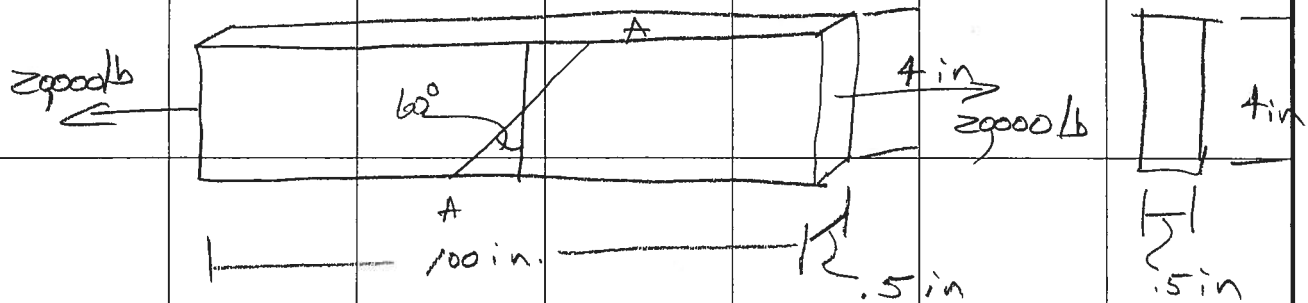
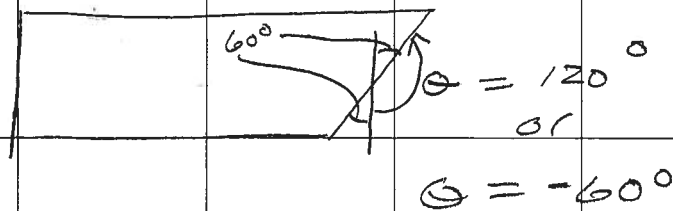


A rectangular bar is loaded as shown. Calculate the normal and shearing stress acting on plane A-A that is oriented as shown. Show the stresses on a sketch.



θ must be measured CCW from a vertical plane because of assumptions made during the derivation of the formulae that are to be used.



The cross-sectional area of the bar is given as follows

$$A = (.5 \text{ in})(4 \text{ in}) = 2 \text{ in}^2 \quad (1)$$

First calculate the normal stress
using the following formula

$$\sigma_{\theta} = \frac{P}{A} \cos^2 \theta \quad (2)$$

$$\sigma_{120} = \frac{20000 \text{ lb}}{2 \text{ in}^2} \cos^2 120^\circ \quad (3)$$

$$\sigma_{120} = +2500 \text{ psi} \quad (4)$$

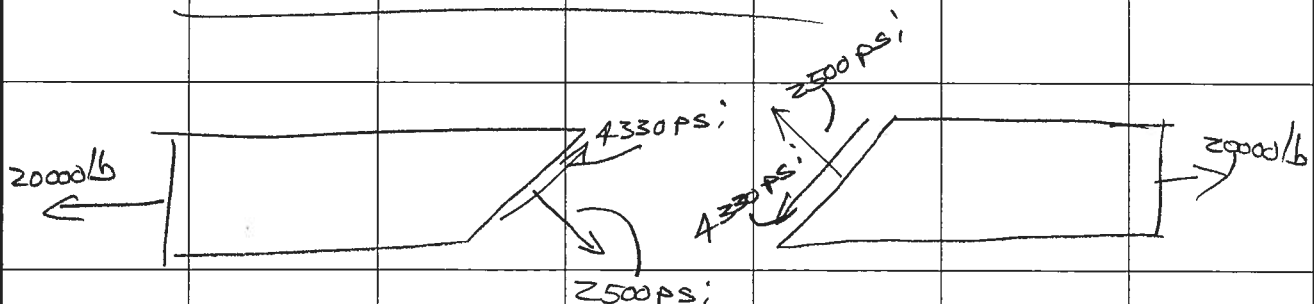
Next calculate the shearing stress
using the following formula

$$\tau_{\theta} = -\frac{P}{A} \sin \theta \cos \theta \quad (5)$$

$$\tau_{\theta} = -\frac{20000 \text{ lb}}{2 \text{ in}^2} \sin 120^\circ \cos 120^\circ \quad (6)$$

$$\tau_{\theta} = +4330 \text{ psi} \quad (7)$$

Sketch of Results



Left Side

Right Side