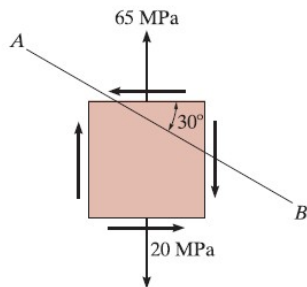


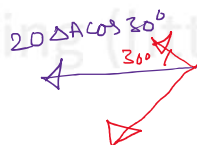
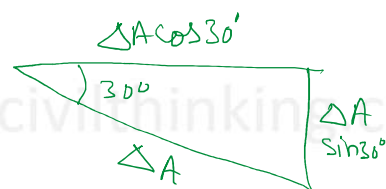
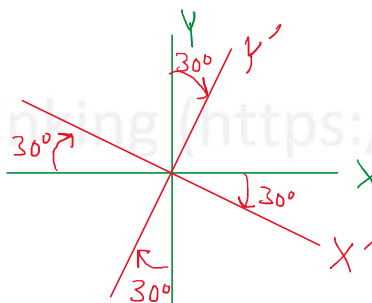
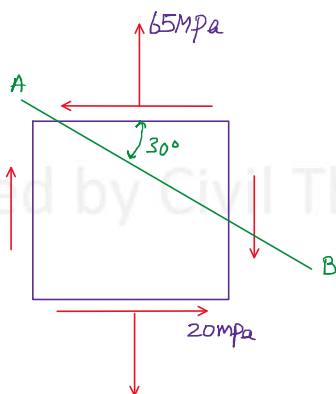
Plane stress transformation problems

9-2. Determine the stress components acting on the inclined plane AB . Solve the problem using the method of equilibrium described in Sec. 9.1.

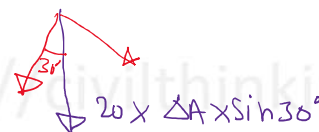
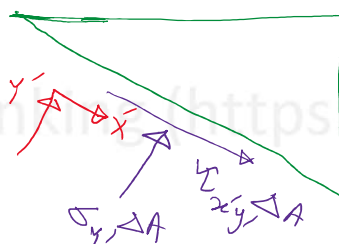
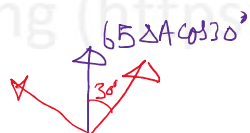


Prob. 9-2

Solution:



Force = Stress \times Area



$$+\nearrow \sum F_{y'} = 0 :$$

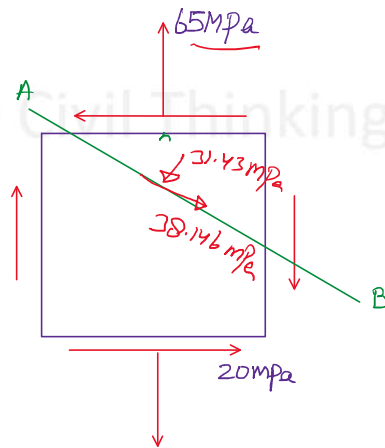
$$20 \Delta A \sin 30^\circ \cos 30^\circ + 65 \Delta A \cos 30^\circ \cos 30^\circ - 20 \Delta A \cos 30^\circ \sin 30^\circ = 0$$

$$+\nearrow \sum F_y = 0 : \quad \sigma_y \Delta A - 20 \Delta A \sin 30^\circ \cos 30^\circ + 65 \Delta A \cos 30^\circ \cos 30^\circ - 20 \Delta A \cos 30^\circ \sin 30^\circ = 0$$

$$\Rightarrow \sigma_y = -31.43 \text{ MPa}$$

$$+\rightarrow \sum F_x = 0 : \quad \tau_{x'y'} \Delta A + 20 \Delta A \sin 30^\circ \sin 30^\circ - 65 \Delta A \cos 30^\circ \sin 30^\circ - 20 \Delta A \cos 30^\circ \cos 30^\circ = 0$$

$$\Rightarrow \tau_{x'y'} = 38.146 \text{ MPa}$$



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