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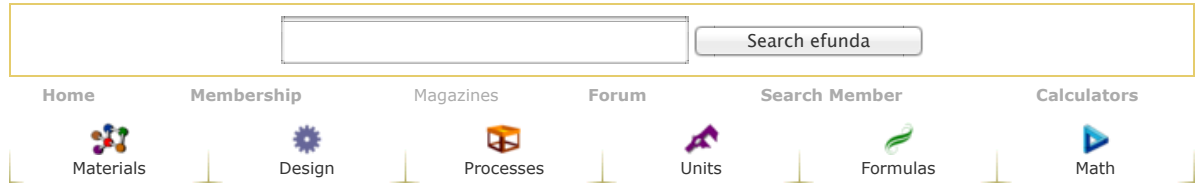
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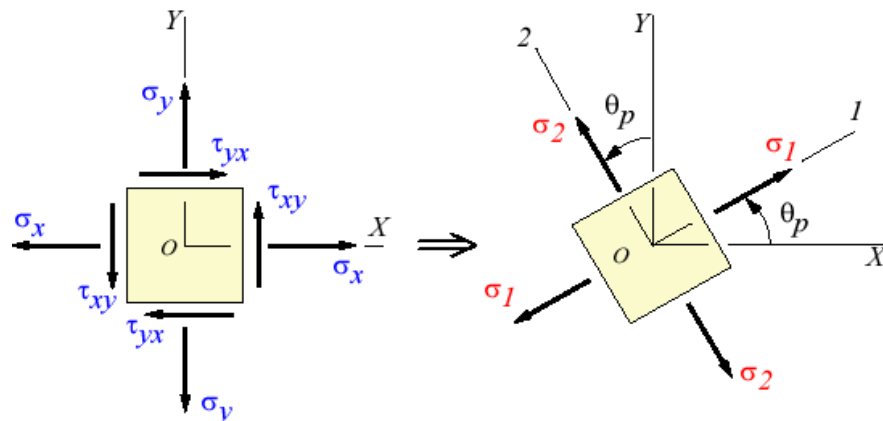
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Calculator Introduction

Given the stress components s_x , s_y , and t_{xy} , this calculator computes the principal stresses s_1 , s_2 , the principal angle q_p , the maximum shear stress t_{max} and its angle q_s . It also draws an approximate Mohr's circle for the given stress state.



Stresses in given
coordinate system

Principal stresses

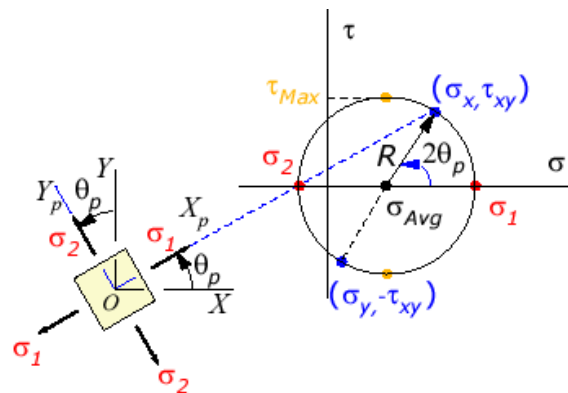
Inputs

Normal Stress s_x :	<input type="text" value="1"/>	<input type="button" value="MPa"/>
Normal Stress s_y :	<input type="text" value="0.1"/>	
Shear Stress t_{xy} :	<input type="text" value="1"/>	

Answers

Maximum Normal Stress s_1 :	1.65 MPa	<input type="button" value="MPa"/>
Minimum Normal Stress s_2 :	-0.547 MPa	
Principal Angle q_p :	32.9 deg	<input type="button" value="deg"/>
Maximum Shear Stress t_{max} :	1.10 MPa	
Maximum Shear Angle q_{s1} :	77.9 deg	
and q_{s2} :	-12.1 deg	

The Mohr's circle associated with the above stress state is similar to the following figure. However, the exact location of the center s_{Avg} , the radius of the Mohr's circle R , and the principal angle q_p may be different from what are shown in the figure.



Equations behind the Calculator

The formulas used in this calculator are,

$$\tan 2\theta_p = \frac{2\tau_{xy}}{\sigma_x - \sigma_y}$$

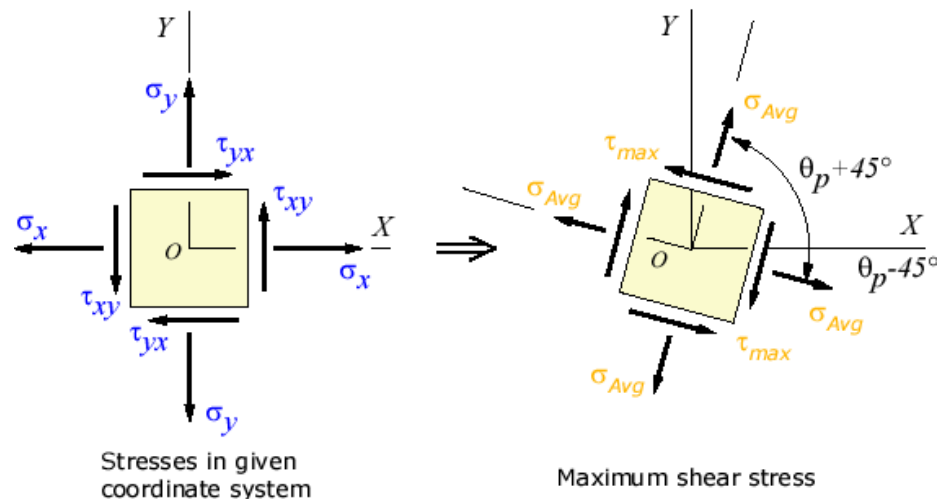
$$\sigma_x - \sigma_y$$

$$\sigma_{1,2} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\tau_{\max} = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} = \frac{\sigma_1 - \sigma_2}{2}$$

$$\tan 2\theta_s = -\frac{\sigma_x - \sigma_y}{2\tau_{xy}}$$

$$\Rightarrow \theta_s = \theta_p \pm 45^\circ$$



Further information can be found in the [plane stress](#), [Mohr's Circle](#), and the [Mohr's Circle usage](#) pages.

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