



Mechanics of Materials I:

Fundamentals of Stress & Strain and Axial Loading

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Module 37 Learning Outcome

- Calculate principal strains, maximum shear strain, and the orientation of principal planes based on strain gage rosette measurements

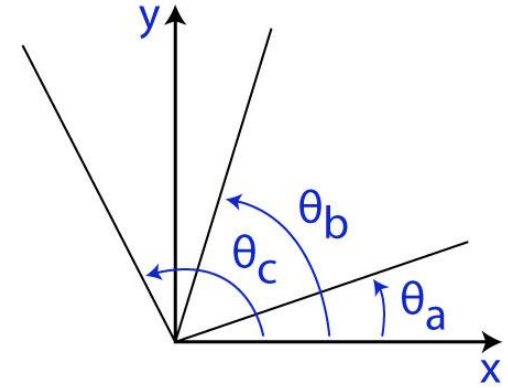
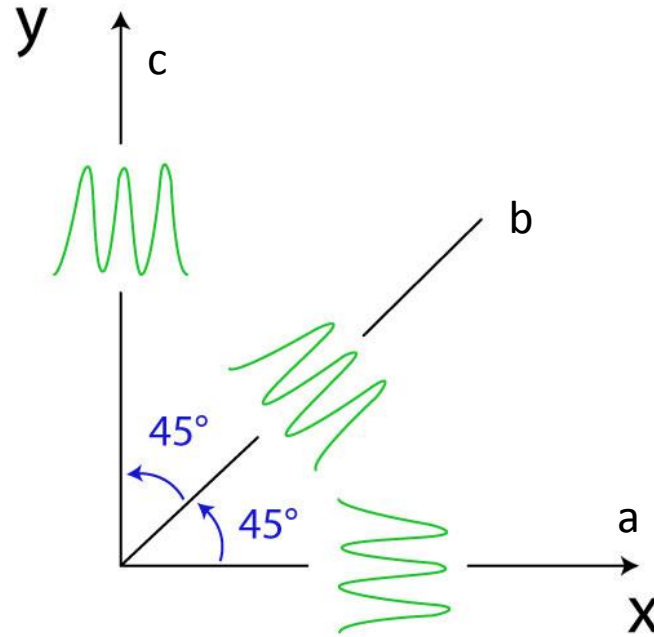
Example

A 45° strain rosette was placed on the surface of a critical point on an engineering part. The following were measured:

$$\varepsilon_a = 350 \mu \frac{\text{mm}}{\text{mm}}$$

$$\varepsilon_b = 400 \mu \frac{\text{mm}}{\text{mm}}$$

$$\varepsilon_c = 600 \mu \frac{\text{mm}}{\text{mm}}$$



Gage a was aligned with the x-axis.

a) Determine the in-place strains

$$\varepsilon_x, \varepsilon_y, \gamma_{xy}$$

b) Using Mohr's Circle, find the principal strains and the maximum – in-plane shear strain at that point, and find the orientation of the principal planes from the given x-y axes.

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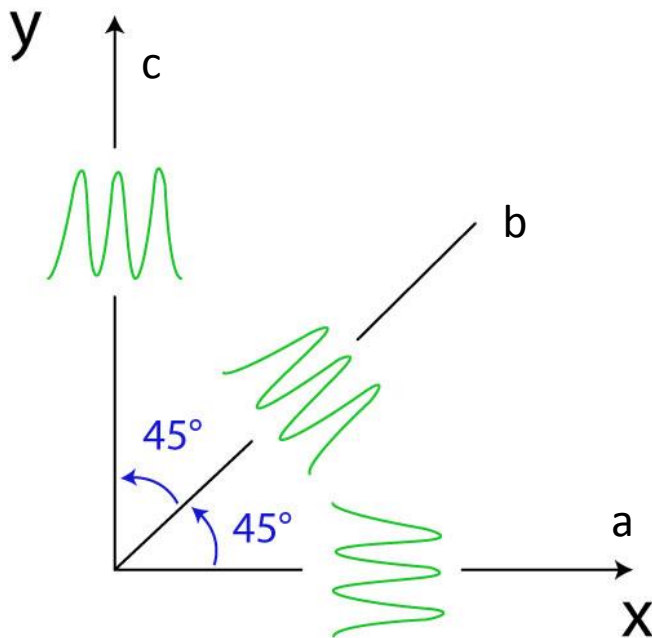
$$\varepsilon_c = 600 \mu \frac{\text{mm}}{\text{mm}}$$

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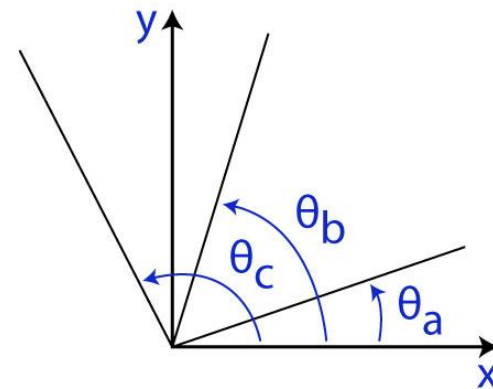
b) Using Mohr's Circle, find the principal strains and the maximum in-plane shear strain at that point, and find the orientation of the principal planes from the given x-y axes.



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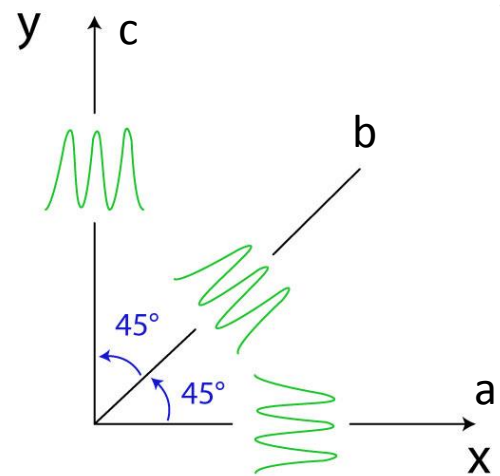
$$\gamma_{xy} = -150 \mu \text{ rad}$$



ANS

Example

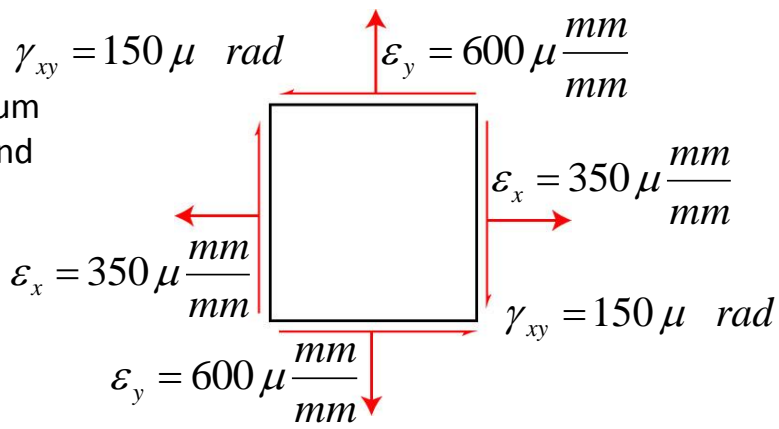
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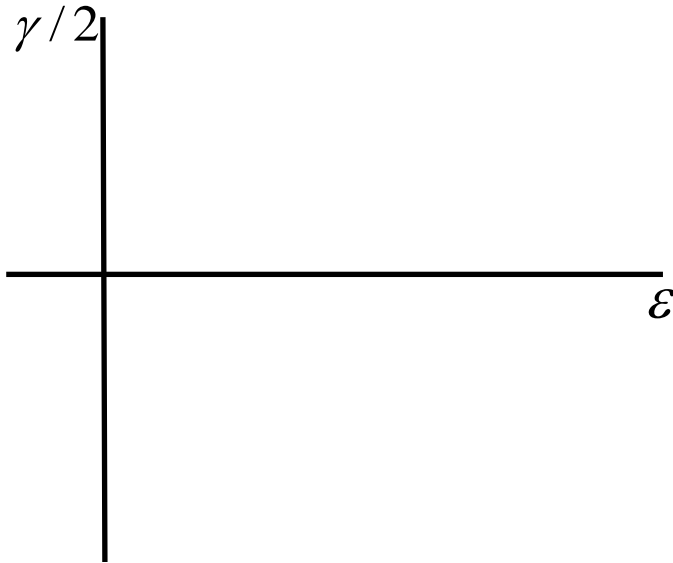
$$\epsilon_x = 350 \mu \frac{mm}{mm}$$

$$\epsilon_y = 600 \mu \frac{mm}{mm}$$

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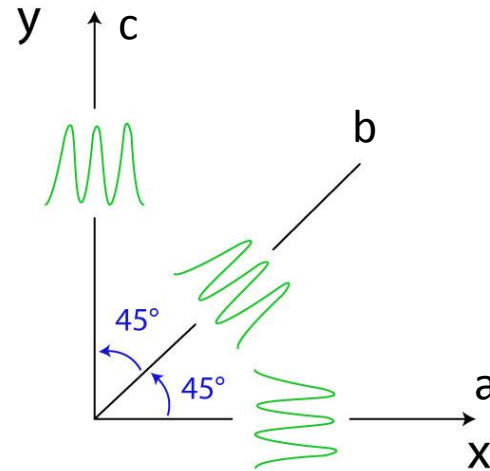


Mohr's Circle - Strain



Example

b) Using Mohr's Circle, find the principal strains and the maximum shear strain at that point, and find the orientation of the principal planes from the given x-y axes.



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$$\epsilon_y = 600 \mu \frac{mm}{mm}$$

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