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Print by: SALEH HUSSAIN
ENGR 213-001 Sp17 / HW CH 12

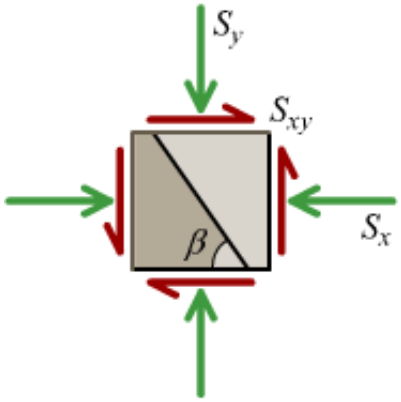
*P12.081 GO Multipart

*Part 1

☑ Correct

Consider a point in a structural member that is subjected to plane stress. Normal and shear stress magnitudes acting on horizontal and vertical planes at the point are S_x = 190 MPa, S_y = 110 MPa, and S_{xy} = 85 MPa.

Assume $\beta = 55^\circ$.



Construct Mohr's circle for this state of stress on paper and use the results to answer the questions in the subsequent parts of this GO exercise.

For this Mohr's circle, point *x*, which represents the state of stress on the *x* face of the stress element, should appear:

- (●) Below and to the left of the circle center.
- ( ) Above and to the left of the circle center.
- ( ) Below and to the right of the circle center.
- ( ) Above and to the right of the circle center.

Attempts: Unlimited

*Part 2

Correct

For the given state of stress at a point in a structural member, determine the center *C* and the radius *R* of Mohr's circle.

Answers: *C* = -150 MPa, *R* = 93.94 MPa.

Answer *1: *the tolerance is +/-2%*
Answer *2: *the tolerance is +/-2%*

Attempts: Unlimited

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*Part 3

Correct

Determine the principal stresses ($\sigma_{p1} > \sigma_{p2}$) for this state of stress.

Answers: $\sigma_{p1} =$ -56.058 MPa, $\sigma_{p2} =$ -243.941 MPa.

Answer *1: *the tolerance is +/-2%*
Answer *2: *the tolerance is +/-2%*

Attempts: Unlimited

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*Part 4

Incorrect

Use the coordinates of point *x* and the center *C* of the circle to determine the acute central angle. The other central angle is 180° minus the acute angle.

For this Mohr's circle, determine the magnitude of the central angle between:

(a) point *x* and the point representing the principal stress σ_{p1} .

(b) point *x* and the point representing the principal stress σ_{p2} .

Answers:

(a) Angle = -65 *1 °,

(b) Angle = -115 *2 °.

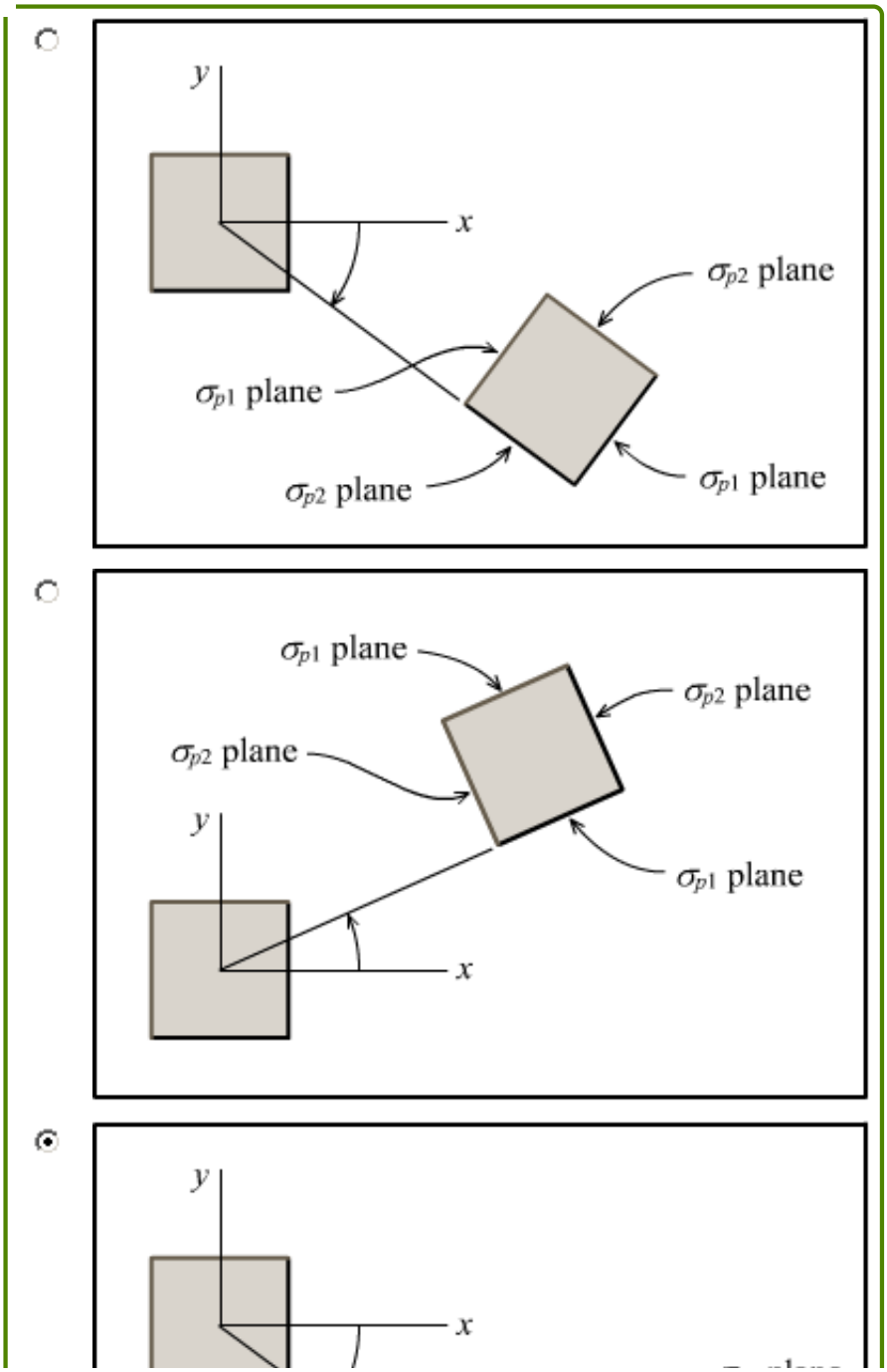
Answer *1: *the tolerance is +/-2%*
Answer *2: *the tolerance is +/-2%*

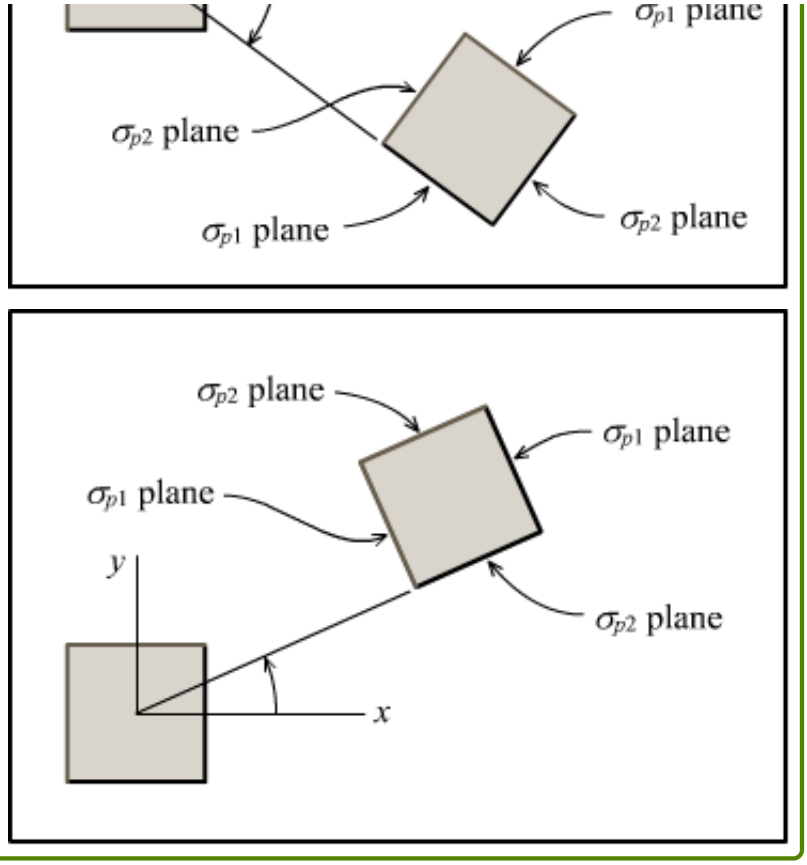
Attempts: Unlimited

Part 5

Correct

Angles measured in Mohr's circle are double angles 2θ. The orientation of the principal planes in the *x*–*y* coordinate system is defined by an angle θ. If the acute angle determined in Part 4 is used for θ, which sketch correctly defines the orientation of the principal planes?





C

Attempts: Unlimited

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*Part 6

☑ Correct

(a) Determine the magnitude of the maximum in-plane shear stress.
(b) Determine the normal stress that acts on planes of maximum in-plane shear stress. Give the stress value including sign if any.

Answers:

(a) τ_{max} = 93.941 MPa.

(b) σ_{ave} = -150 MPa.

Answer *1: *the tolerance is +/-2%*
Answer *2: *the tolerance is +/-2%*

Attempts: Unlimited

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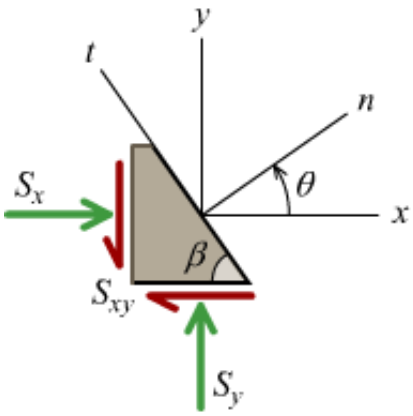
*Part 7

Correct

To determine the normal and shear stresses on the indicated plane, we must first determine the orientation of the inclined plane relative to the *x* face of the stress element. Determine the magnitude of the counterclockwise angle θ between the *x* face and the inclined plane. Assume S_x = 190 MPa, S_y = 110 MPa, S_{xy} = 85 MPa, and $\theta = 55^\circ$.



Answer: $\theta =$ 35 °.

the tolerance is +/-2%

Attempts: Unlimited

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*Part 8

Correct

For Mohr's circle, all angular measures are doubled; therefore, point *n* (which represents the state of stress on the *n* plane) on Mohr's circle is rotated 2θ counterclockwise from point *x*. From the Mohr's circle that you constructed on a piece of paper, determine the central angle β between point *n* and the principal stress σ_{p1}.

Answer: $\beta =$ 45 °.

the tolerance is +/-2%

Attempts: Unlimited

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*Part 9

Incorrect

Use the center of the circle *C*, the circle radius *R*, and the angle β determined in Part 8 to compute:

(a) the normal stress σ_n . Give the stress value including sign if any.

(b) the shear stress $\tau_{nt} =$. Give the stress value including sign if any.

Answers:

(a) $\sigma_n =$ -13.241 *1 MPa,

(b) $\tau_{nt} =$ 75 *2 MPa.

Answer *1: *the tolerance is +/-2%*
Answer *2: *the tolerance is +/-2%*

Attempts: Unlimited

*Part 10

Incorrect

Calculate the absolute maximum shear stress magnitude.

Answer: $\tau_{abs\ max} =$ 80 *1 MPa.

the tolerance is +/-2%

Attempts: Unlimited

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