Determine the normal and shear stresses acting on plane A-A of the point shown.

Use the Mohr’s Circle approach.

Determine the proper signs of $\tau_x$, $\tau_y$, and $\tau_{xy}$

$\tau_x = 2$
$\tau_y = -5$
$\tau_{xy} = -6$

Determine the center of the circle

\[ \tau_{center} = \frac{\tau_x + \tau_y}{2} \]

\[ \tau_{center} = \frac{2 + (-5)}{2} = -1.5 \]
Determine the radius of the circle

(3) \[ R = \sqrt{\left(\frac{1}{2}\right)^2 + \frac{1}{2}^2} \]

(4) \[ R = \sqrt{\left(\frac{2-1}{2}\right)^2 + \left(-\frac{1}{2}\right)^2} \]

(5) Construct Circle

\( R = 6.146 \)

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To locate plane A-A on the block you can rotate 36.87° CCW from the vertical plane or 53.13° CW from the horizontal plane. So on the circle you rotate 2 x 36.87° CCW from plane 1 (vertical plane) or you rotate 2 x 53.13° CW from plane 2 (horizontal plane). The location of plane A-A is shown on the circle.

Then the magnitudes TA-A and TA-A are determined using simple geometry.
<table>
<thead>
<tr>
<th>No.</th>
<th>Equation/Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>$T_{AA} = \sin 46.51^\circ \cdot R$</td>
</tr>
<tr>
<td>7</td>
<td>$T_{AA} = 5.1039$</td>
</tr>
<tr>
<td>8</td>
<td>and $T_{AA} = \sqrt{C_{xx} - \cos 46.51^\circ} \cdot R$</td>
</tr>
<tr>
<td>9</td>
<td>$\sqrt{T_{AA} = -1.5 - \cos 46.51^\circ \cdot 6.946}$</td>
</tr>
<tr>
<td>10</td>
<td>$\sqrt{T_{AA} = -6.28}$</td>
</tr>
</tbody>
</table>

Then using conceptual geometry:

Study the complete Mohr's circle to calculate $\theta_{AA}$

$\theta_{AA} = 180^\circ - 73.79^\circ - 57.75^\circ$

$\theta_{AA} = 46.51^\circ$ Center

(-1.5, 0)
Finally, we show the results on a properly oriented sketch

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