An element in plane stress is subjected to the stresses shown. Determine the stresses acting on an element oriented 60° clockwise from the element position shown. Show these stresses on a sketch of a properly oriented element.

\[
\begin{align*}
\tau_x &= 6.5 \\
\tau_y &= 1.7 \\
\tau_{xy} &= 3
\end{align*}
\]
Make a sketch of the rotated element.

Face 1

\[ \theta_1 = 30^\circ \]

Analyse Face 1

**The angle \( \theta \) for face 1 is \( \theta_1 = 30^\circ \)**

1. \[ \sigma \theta = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cos 2\theta + \tau_{xy} \sin 2\theta \]

2. \[ \sigma_{30^\circ} = \frac{6.5 + 1.7}{2} + \frac{6.5 - 1.7}{2} \cos 60^\circ + 3 \sin 60^\circ \]

3. \[ \sigma_{30^\circ} = 4.100 + 1.200 + 2.598 \]

4. \[ \sigma_{30^\circ} = 7.898 \]

5. \[ \tau_\theta = -\left( \frac{\tau_{x-y}}{2} \right) \sin 2\theta + \tau_{xy} \cos 2\theta \]

6. \[ \tau_{30^\circ} = -\left( \frac{6.5 - 1.7}{2} \right) \sin 60^\circ + 3 \cos 60^\circ \]
<table>
<thead>
<tr>
<th>(7)</th>
<th>$T_{30^\circ} = -2.078 + 1.5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8)</td>
<td>$T_{30^\circ} = -2.578$</td>
</tr>
<tr>
<td>(9)</td>
<td>Analyze Face 2</td>
</tr>
<tr>
<td></td>
<td>The angle $\theta$ for face 2 is $\theta_2 = 120^\circ$</td>
</tr>
<tr>
<td>(9)</td>
<td>$T_{120^\circ} = \left(\frac{6.5 - 1.7}{2}\right) + \left(\frac{6.5 - 1.7}{2}\right) \cos 240^\circ + 3 \sin 240^\circ$</td>
</tr>
<tr>
<td>(10)</td>
<td>$T_{120^\circ} = 4.100 - 1.20 - 2.598$</td>
</tr>
<tr>
<td>(11)</td>
<td>$T_{120^\circ} = -1.302$</td>
</tr>
<tr>
<td>(12)</td>
<td>$T_{120^\circ} = -\left(\frac{6.5 - 1.7}{2}\right) \sin 240^\circ + 3 \cos 240^\circ$</td>
</tr>
<tr>
<td>(13)</td>
<td>$T_{120^\circ} = +2.078 - 1.5$</td>
</tr>
<tr>
<td>(14)</td>
<td>$T_{120^\circ} = +0.578$</td>
</tr>
</tbody>
</table>

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Show results on a properly oriented sketch.

Face 1: 5.78

Face 2: 7.898

Face 3: 1.519

Face 4: 1.302

7.898