Given the single-phase circuit shown above. The voltage across Load 2 is 120 Vrms and has phase angle = 0°.

a. Compute the currents flowing into Load 2 and Load 1 (rms magnitudes and phase angles)
b. Compute the source current (rms magnitude and phase angle)
c. Compute the source voltage (rms magnitude and phase angle)
d. Compute the P and Q provided by the source

e. List the P absorbed and Q absorbed for each non-source component in the table provided, and confirm that P and Q are conserved (i.e., Total P and Q absorbed by the non-source components = P and Q provided by the source)

\[ S = \sqrt{I^2 \cdot V} \]
\[ I_2 = \left(\frac{S_2}{V}\right)^* = \left(\frac{357.1 \angle 45.59^\circ}{120}\right)^* = 2.98 \angle -45.59^\circ \text{ A}_{\text{rms}} \]

\[ V_1 = 120 + I_2 \times (0.5 + j0.1 \text{ A}) = 121.3 \angle -0.4^\circ \text{ V}_{\text{rms}} \]
\[ \theta_1 = \cos^{-1} 0.94 = 18.19^\circ \]
\[ S_1 = 400 \angle 18.19^\circ \text{ V A} \]
\[ I_1 = \left(\frac{S_1}{V_1}\right)^* = \left(\frac{400 \angle 18.19^\circ}{121.3 \angle -0.4^\circ}\right)^* = 3.30 \angle -18.59^\circ \text{ A}_{\text{rms}} \]

b. \[ I_s = I_1 + I_2 = 6.11 \angle -31.38^\circ \text{ A}_{\text{rms}} \]

c. \[ V_s = V_1 + I_s \times (0.5 + j0.1 \text{ A}) = 123.5 \angle -0.35^\circ \text{ V}_{\text{rms}} \]

d. \[ S_s = V_s \cdot I_s^* = 854.6 \angle 31.03^\circ = 646.6 + j389 \text{ P} \quad \text{Q} \]
\begin{center}
\begin{tabular}{|l|l|l|}
\hline
 & P & Q \\
\hline
R1 & 11.2 & 0 \\
X1 & 0 & j7.47 \\
R2 & 4.44 & 0 \\
X2 & 0 & j0.89 \\
Load 1 & 380 & j124.9 \\
Load 2 & 250 & j255 \\
Total & 645.6 & 388.3 \\
\hline
\end{tabular}
\end{center}

\begin{align*}
R1: & \quad S_{R1} = V I_s^* = 0.3 \Omega \times I_s \times I_s^* = 0.3 \times 6.11^* = 11.2 \text{ W} + 0 \\
X1: & \quad S_{X1} = j0.2 \times 6.11^* = j7.47 \text{ VAr} \\
R2: & \quad S_{R2} = 0.5 \times 2.98^* = 4.44 \text{ W} \\
X2: & \quad S_{X2} = j0.1 \times 2.98^* = j0.89 \text{ VAr} \\
\text{Load 1}: & \quad S_1 = 400 \angle 18.19^\circ = 380 + j124.9 \\
\text{Load 2}: & \quad S_2 = 357.1 \angle 45.57^\circ = 250 + j255 \\
\text{Total}: & \quad S_{Total} = 645.6 + j388.3 \\
\end{align*}
Given the single-phase circuit shown above. The voltage across Load 2 is 120Vrms and has phase angle = 0°.

a. Compute the currents flowing into Load 2 and Load 1 (rms magnitudes and phase angles)
b. Compute the source current (rms magnitude and phase angle)
c. Compute the source voltage (rms magnitude and phase angle)
d. Compute the P and Q provided by the source

Given the single-phase circuit shown above. The voltage across Load 2 is 120Vrms and has phase angle = 0°.

\[
\text{Load 2: } I_2 = \frac{P_{2}}{V_{2}} = \frac{150W}{0.8} = 187.5, \quad \Theta_2 = \cos^{-1}0.8 = 36.87° \quad \therefore S_2 = 187.5 \angle 36.87°
\]

\[
S = V I^* \quad \left( I_2 = \left( \frac{S_2}{V} \right)^* = 1.56 \angle -36.87° \text{ Arms} \right)
\]

\[
\text{Load 1: } V_1 = 120 + I_2 \times (0.5 + j0.1) = 120.72 \angle -0.16°
\]

\[
\Theta_1 = \cos^{-1}0.95 = 18.19° \quad \therefore \quad S_1 = 600 \angle 18.19°
\]

\[
J_1 = 4.97 \angle -18.35° \text{ Arms}
\]

b. \[ I_S = I_1 + I_2 = 6.47 \angle -22.14° \text{ Arms} \]

c. \[ V_S = V_1 + I_S \times (0.3 + j0.2) = 123 \angle 0.049° \text{ Vrms} \]

d. \[ S_S = V_S \times I_S^* = 795.89 \angle -22.79° \text{ VA} = \frac{733.74}{P} + j308.27 \]
<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>12.56</td>
<td>0</td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
<td>8.37</td>
</tr>
<tr>
<td>R2</td>
<td>1.22</td>
<td>0</td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
<td>0.24</td>
</tr>
<tr>
<td>Load 1</td>
<td>570.02</td>
<td>187.3</td>
</tr>
<tr>
<td>Load 2</td>
<td>150</td>
<td>112.5</td>
</tr>
<tr>
<td>Total</td>
<td>733.74</td>
<td>308.27</td>
</tr>
</tbody>
</table>

R1: $0.3 \times |J_{s}|^2 = 0.3 \times 6.41^2 = 12.56$

X1: $0.2 \times 6.41^2 = 8.37$

R2: $0.5 \times 1.56^2 = 1.22$

X2: $0.1 \times 1.56^2 = 0.24$
Given the single-phase circuit shown above. The voltage across Load 2 is 120Vrms and has phase angle = 0°.

a. Compute the currents flowing into Load 2 and Load 1 (rms magnitudes and phase angles)

b. Compute the source current (rms magnitude and phase angle)

c. Compute the source voltage (rms magnitude and phase angle)

d. Compute the P and Q provided by the source

e. List the P absorbed and Q absorbed for each non-source component in the table provided, and confirm that P and Q are conserved (i.e., Total P and Q absorbed by the non-source components = P and Q provided by the source)
<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>0.3</td>
<td>0</td>
</tr>
<tr>
<td>X1</td>
<td>0</td>
<td>0.12</td>
</tr>
<tr>
<td>R2</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>X2</td>
<td>0</td>
<td>0.12</td>
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<tr>
<td>Load 1</td>
<td>260</td>
<td>249.7</td>
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<tr>
<td>Load 2</td>
<td>290</td>
<td>187.5</td>
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<tr>
<td>Total</td>
<td>101</td>
<td>437.5</td>
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</table>