A "Black Box" with an available terminal pair delivers 640 V to a 160 Ω resistor and 480 V to a 40 Ω resistor. What load resistor would draw maximum power and how much power would that be?

Based on these two circuits,

\[ V_{th} = R_{th} \cdot 4 \cdot A + 640 \cdot V \]
\[ V_{th} = R_{th} \cdot 12 \cdot A + 480 \cdot V \]

\[ R_{th} \cdot 4 \cdot A + 640 \cdot V = R_{th} \cdot 12 \cdot A + 480 \cdot V \]
The Maximum Power Transfer Theorem holds that the load resistor will draw maximum power when it equals the Thevenin resistance. Then the voltage across this load resistor will be half the Thevenin voltage or $360\,\text{V}$.

\[
R_{th} := \frac{640\,\text{V} - 480\,\text{V}}{12\,\text{A} - 4\,\text{A}}
\]

\[
R_{th} = 20\,\Omega
\]

\[
V_{th} := R_{th} \cdot 4\,\text{A} + 640\,\text{V}
\]

\[
V_{th} = 720\,\text{V}
\]

The diagram shows a circuit with a 20 Ω load resistor and a voltage source of 720 V. The voltage across the load resistor is calculated to be 360 V.

\[
R_L := 20\,\Omega
\]

\[
P_{\text{max}} := \frac{(360\,\text{V})^2}{20\,\Omega}
\]

\[
P_{\text{max}} = 6.48 \times 10^3 \,\text{W}
\]