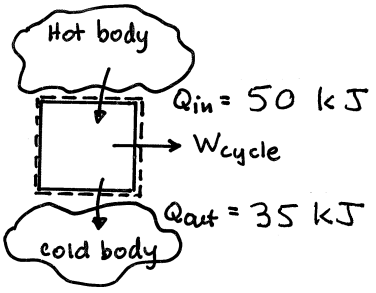
PROBLEM 2.76*

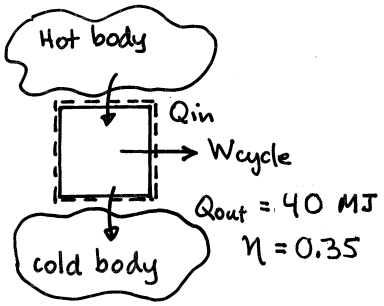


$W_{cycle} = Q_{in} - Q_{out}$

$= 50 - 35 = 15$ kJ ← W_{cycle}

$\eta = \frac{W_{cycle}}{Q_{in}} = \frac{15}{50} = 0.3\ (30\%)$ ← η

PROBLEM 2.77*



$\eta = \frac{W_{cycle}}{Q_{in}} = \frac{Q_{in} - Q_{out}}{Q_{in}} = 1 - \frac{Q_{out}}{Q_{in}}$

Solving for Q_{in}

$Q_{in} = \frac{Q_{out}}{1-\eta} = \frac{40}{(1-.35)}$

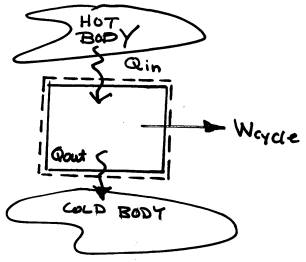
$= 61.54$ MJ ← Q_{in}

Thus

$W_{cycle} = \eta Q_{in} = (.35)(61.54)$

$= 21.54$ MJ ← W_{cycle}

PROBLEM 2.78*



W_{cycle} = 4000 Btu

Q_{out} = 8000 Btu

Energy Balance: $W_{cycle} = Q_{cycle}$

$= Q_{in} - Q_{out}$

$\Rightarrow Q_{in} = W_{cycle} + Q_{out}$

$= 4000 + 8000$

$= 12{,}000$ Btu

$\eta = \frac{W_{cycle}}{Q_{in}} = \frac{4000\ \text{Btu}}{12{,}000\ \text{Btu}} = 0.33\ (33\%)$ ← η