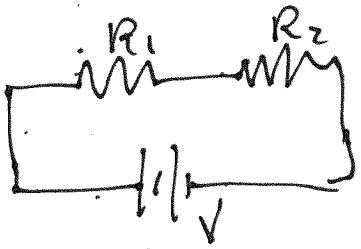
Ch10 Prob. 30

$V = 48.0\,V$

$R_1 = 24.0\,\Omega$

$R_2 = 96.0\,\Omega$

a) Find current and power when the resistors are in series.



$V - IR_1 - IR_2 = 0$

$V - I(R_1 + R_2) = 0$

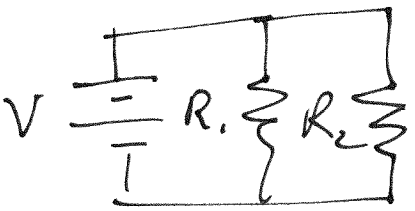
$V = I(R_1 + R_2)$

$I = \frac{V}{R_1 + R_2} = \frac{48.0\,V}{24\,\Omega + 96\,\Omega} = \boxed{0.40\,A}$

$P_1 = I_1^2 R_1 = (0.40\,A)^2(24.0\,\Omega) = \boxed{3.84\,W}$

$P_2 = I_2^2 R_2 = (0.40\,A)^2(96.0\,\Omega) = \boxed{15.36\,W}$

b) Find current and power when the resistors are in parallel



Not necessary for this problem

$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{24} + \frac{1}{96}$

~~$\frac{1}{R_p} = \frac{4}{96} + \frac{1}{96} = \frac{5}{96}$~~

~~$R_p = \frac{96}{5} = 19.2\,\Omega$~~

$\frac{1}{R_p} = \frac{4}{96} + \frac{1}{96} = \frac{5}{96} \quad R_p = \frac{96}{5} = 19.2\,\Omega$

$I_{total} = \frac{V}{R_p} = \frac{48\,V}{19.2\,\Omega} = \boxed{2.5\,A}$

Notice the individual currents add up to this total current.

Now, 48 V is across each resistor, so

$I_1 = \frac{V}{R_1} = \frac{48\,V}{24\,\Omega} = \boxed{2.0\,A} \qquad P_1 = I_1 \cdot V = (2.0\,A)(48\,V) = \boxed{96\,W}$

$I_2 = \frac{V}{R_2} = \frac{48\,V}{96\,\Omega} = \boxed{0.5\,A} \qquad P_2 = I_2 V = (0.5\,A)(48\,V) = \boxed{24\,W}$