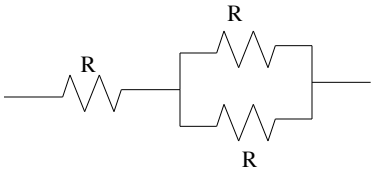
Problem 18.12

The maximum power to the circuit is 24 W.

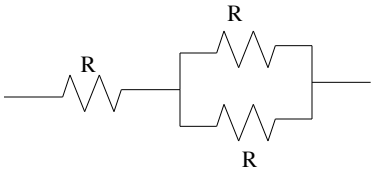
a.) What's the equivalent resistance?



b.) Maximum voltage? We need to determine the current first. Using Ohm's Law:

The maximum power to the circuit is 24 W.

a.) What's the equivalent resistance?



$$R_{equ} = R + \left(\frac{1}{R} + \frac{1}{R}\right)^{-1}$$

$$= \frac{3}{2}R$$

b.) Maximum voltage? We need to determine the current first. Using Ohm's Law:

$$V_o = iR_{eq} \quad \text{and} \quad P = i^2R_{eq} = iV_o = 24$$

$$\Rightarrow \quad V_o = i(1.5R) \text{ and } 24 = iV_o$$

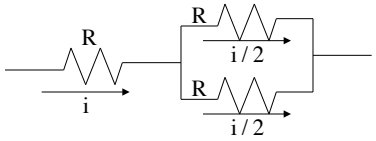
$$\Rightarrow \quad i = \frac{24}{V_o}$$

$$\Rightarrow \quad V = \left(\frac{24}{V}\right)(1.5R)$$

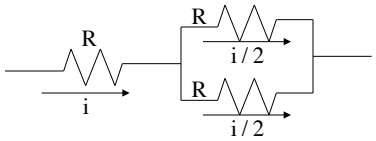
$$\Rightarrow \quad V^2 = 36R$$

$$\Rightarrow \quad V = 6R^{1/2}$$

c.) The power values for each resistor:



c.) The currents are identified in the sketch. The power value for the first resistor is, therefore:



$$P_{R1} = i^2R$$

For each of the two resistors in parallel, the power value is:

$$P_{parallel} = \left(\frac{i}{2}\right)^2 R$$

$$= \left(\frac{1}{4}\right) i^2R$$

So if i^2R goes to the first resistor and a quarter of that amount goes to each of the parallel resistors, the first resistor evidently dissipated 16 watts and each of the other two dissipated 4 watts. (I.e., the power is cut into 6 parts with 4 parts going to the first resistor and 1 part going to each of the parallel resistors.)

8.