

31.14. Model: Assume ideal connecting wires and an ideal battery.

Visualize: Please refer to Figure Ex31.14.

Solve: The power dissipated by each resistor can be calculated from Equation 31.18, $P_R = I^2 R$, provided we can find the current through the resistors. Let us choose a clockwise direction for the current and solve for the value of I by using Kirchhoff's loop law. Going clockwise from the negative terminal of the battery,

$$\sum_i (\Delta V)_i = \Delta V_{\text{bat}} + \Delta V_{R_1} + \Delta V_{R_2} = 0 \Rightarrow +9 \text{ V} - IR_1 - IR_2 = 0$$

$$\Rightarrow I = \frac{9 \text{ V}}{R_1 + R_2} = \frac{9 \text{ V}}{12 \Omega + 15 \Omega} = \frac{1}{3} \text{ A}$$

The power dissipated by resistors R_1 and R_2 is:

$$P_{R_1} = I^2 R_1 = \left(\frac{1}{3} \text{ A}\right)^2 (12 \Omega) = 1.33 \text{ W} \quad P_{R_2} = I^2 R_2 = \left(\frac{1}{3} \text{ A}\right)^2 (15 \Omega) = 1.67 \text{ W}$$