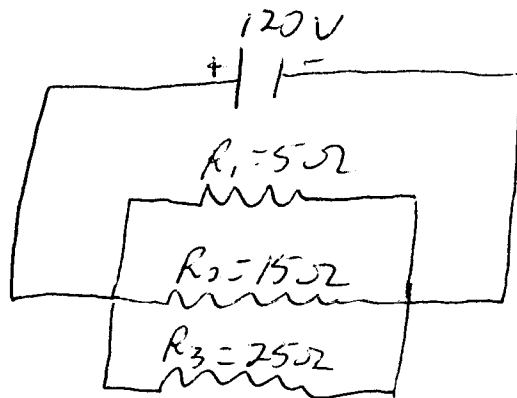


# Electric Current + Circuits Problems 45-52

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what is  $I_{total}$ ?

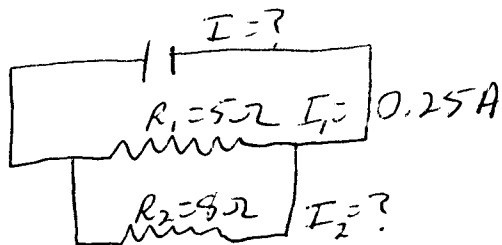
$$I_{total} = I_1 + I_2 + I_3 = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} =$$

$$\frac{120V}{5\Omega} + \frac{120V}{15\Omega} + \frac{120V}{25\Omega} = 24A + 8A + 4.8A =$$

$$I_{total} = 36.8A$$

$$P_{total} = IV = 36.8A \cdot 120V = 4416W$$

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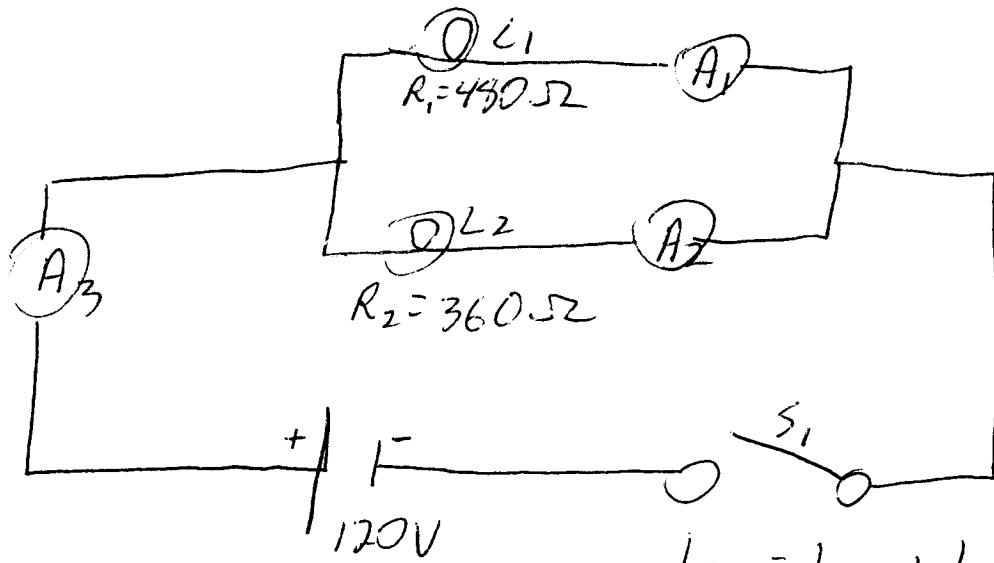


First, find voltage =  $IR = 0.25A \cdot 5\Omega = 1.25V$

$$I_2 = \frac{V}{R_2} = \frac{1.25V}{8\Omega} = 0.15625A$$

$$I_{total} = I_1 + I_2 = 0.25A + 0.15625A = 0.41A$$

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$$R_{eq} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$A_3 = I_{total} = \frac{V}{R_{eq}} = \frac{120V}{206\Omega}$$

$$A_3 = 0.58A$$

$$A_1 = I_1 = \frac{V}{R_1} = \frac{120V}{450\Omega} = 0.25A$$

$$A_2 = I_2 = \frac{V}{R_2} = \frac{120V}{360\Omega} = 0.33A$$

$$I_1 + I_2 = I_{total} = 0.25A + 0.33A = 0.58A$$

$A_3$  can also be found by totaling  $A_1$  and  $A_2$ .

$$\frac{1}{R_{eq}} = \frac{1}{450\Omega} + \frac{1}{360\Omega} =$$

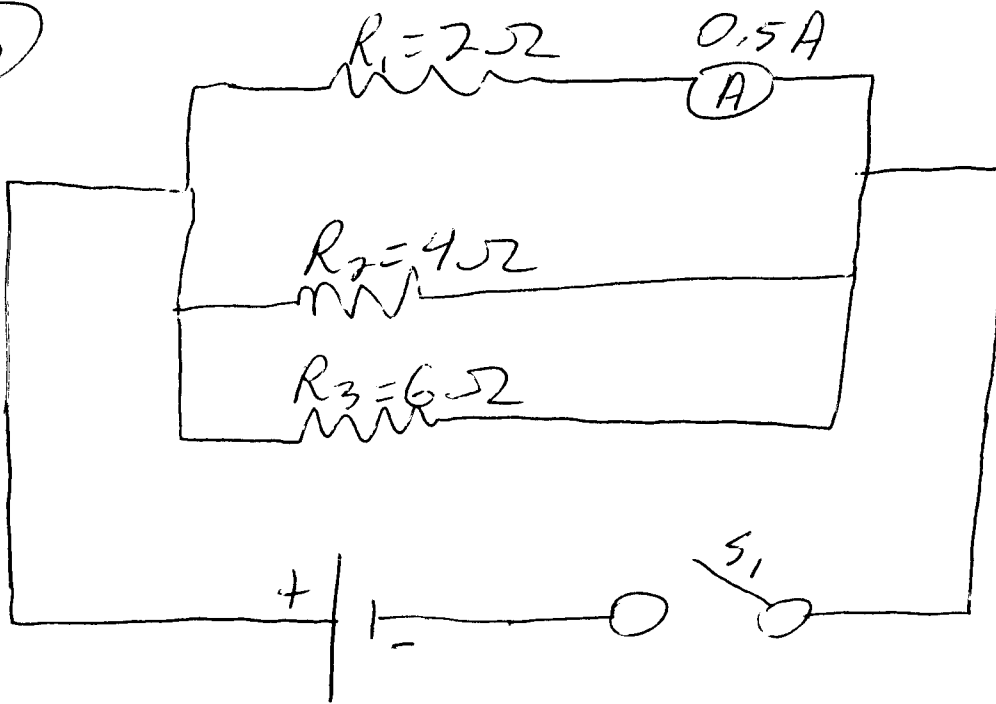
$$\frac{1}{R_{eq}} = \frac{3}{1440} + \frac{4}{1440} = \frac{7}{1440}$$

$$\frac{1}{R_{eq}} = \frac{7}{1440}$$

$$7R_{eq} = 1440$$

$$R_{eq} = 206\Omega$$

(48)



Use  $V = IR$  to find voltage.

$$V = 0.5A \cdot 2\Omega = 1V$$

$$I_2 = \frac{V}{R_2} = \frac{1V}{4\Omega} = 0.25A$$

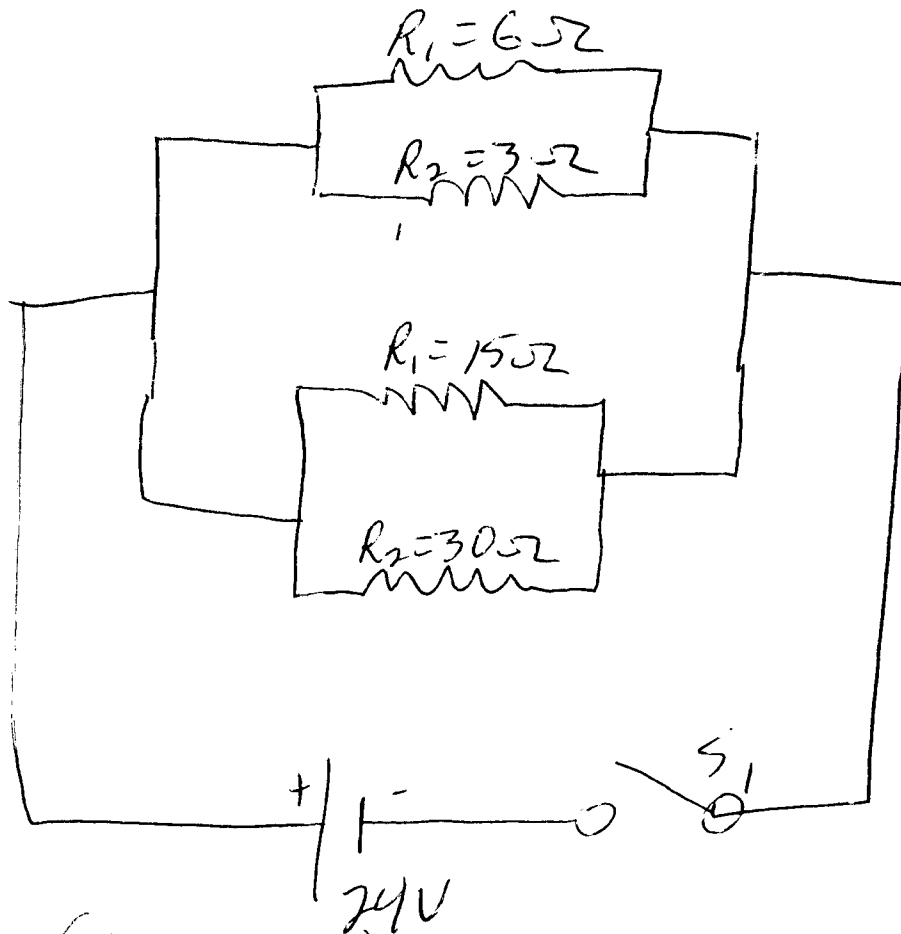
$$I_3 = \frac{V}{R_3} = \frac{1V}{6\Omega} = 0.17A$$

$$I_{total} = I_1 + I_2 + I_3 = 0.5A + 0.25A + 0.17A$$

$$I_{total} = 0.92A$$

(3)

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$$\frac{1}{R_{EQ1}} = \left( \frac{1}{6\Omega} + \frac{1}{3\Omega} \right) = \frac{1}{6} + \frac{2}{6} = \frac{3}{6} = \frac{1}{R_{EQ1}}$$

$$R_{EQ1} = 2\Omega$$

$$\frac{1}{R_{EQ2}} = \left( \frac{1}{15\Omega} + \frac{1}{30\Omega} \right) = \frac{2}{30} + \frac{1}{30} = \frac{3}{30} = \frac{1}{R_{EQ2}}$$

$$\frac{1}{R_{EQ2}} = \frac{3}{30} \quad \therefore 3R_{EQ2} = 30$$

$$R_{EQ2} = 10\Omega$$

~~Now, add  $R_{EQ1} + R_{EQ2} = 7\Omega + 10\Omega = 17\Omega$~~

~~$$I_{\text{battery}} = \frac{V}{R_{\text{total}}} = \frac{24V}{17\Omega} = 2A$$~~

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49) Continued

$$\frac{1}{R_{\text{total}}} = \frac{1}{R_{e21}} + \frac{1}{R_{e22}} = \frac{1}{20\Omega} + \frac{1}{10\Omega} = \frac{2}{10} + \frac{1}{10}$$

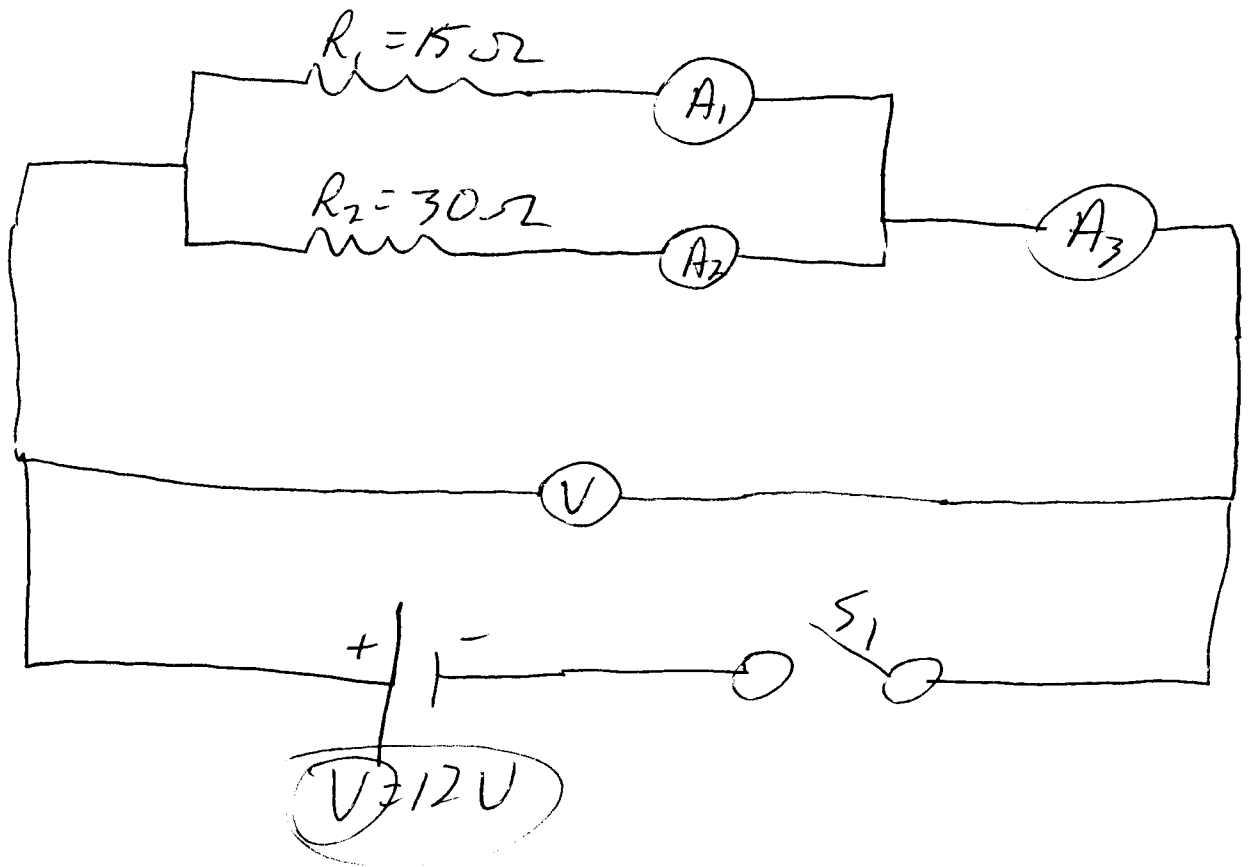
$$\frac{1}{R_{\text{total}}} = \frac{6}{10}$$

$$6R_{\text{total}} = 10$$

$$R_{\text{total}} = \frac{10}{6} = 1.7\Omega$$

$$I_{\text{battery}} = \frac{V}{R_{\text{total}}} = \frac{24V}{1.7\Omega} = \frac{24}{1.7} = 14A$$

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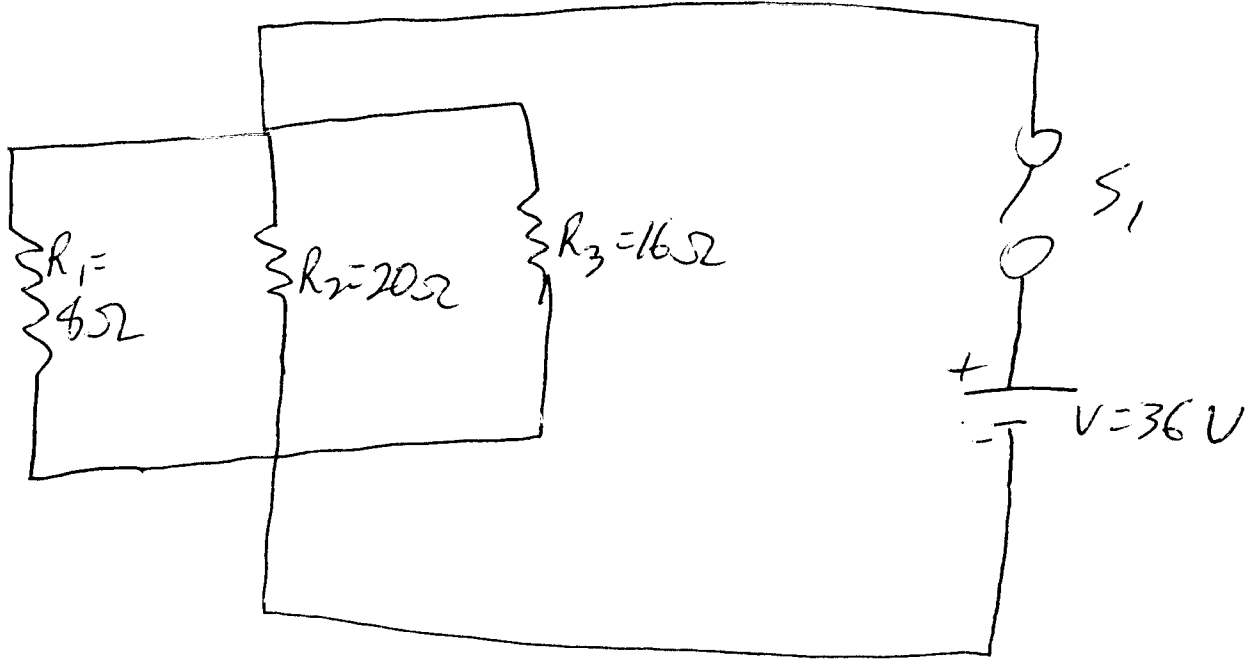
$$A_1 = I_1 = \frac{V}{R_1} = \frac{12V}{15\Omega} = 0.8A$$

$$A_2 = I_2 = \frac{V}{R_2} = \frac{12V}{30\Omega} = 0.4A$$

$$A_3 = I_{total} = 0.8A + 0.4A = 1.2A$$

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(51)



$$I_1 = \frac{V}{R_1} = \frac{36V}{45\Omega} = 4.5A$$

$$I_2 = \frac{V}{R_2} = \frac{36V}{20\Omega} = 1.8A$$

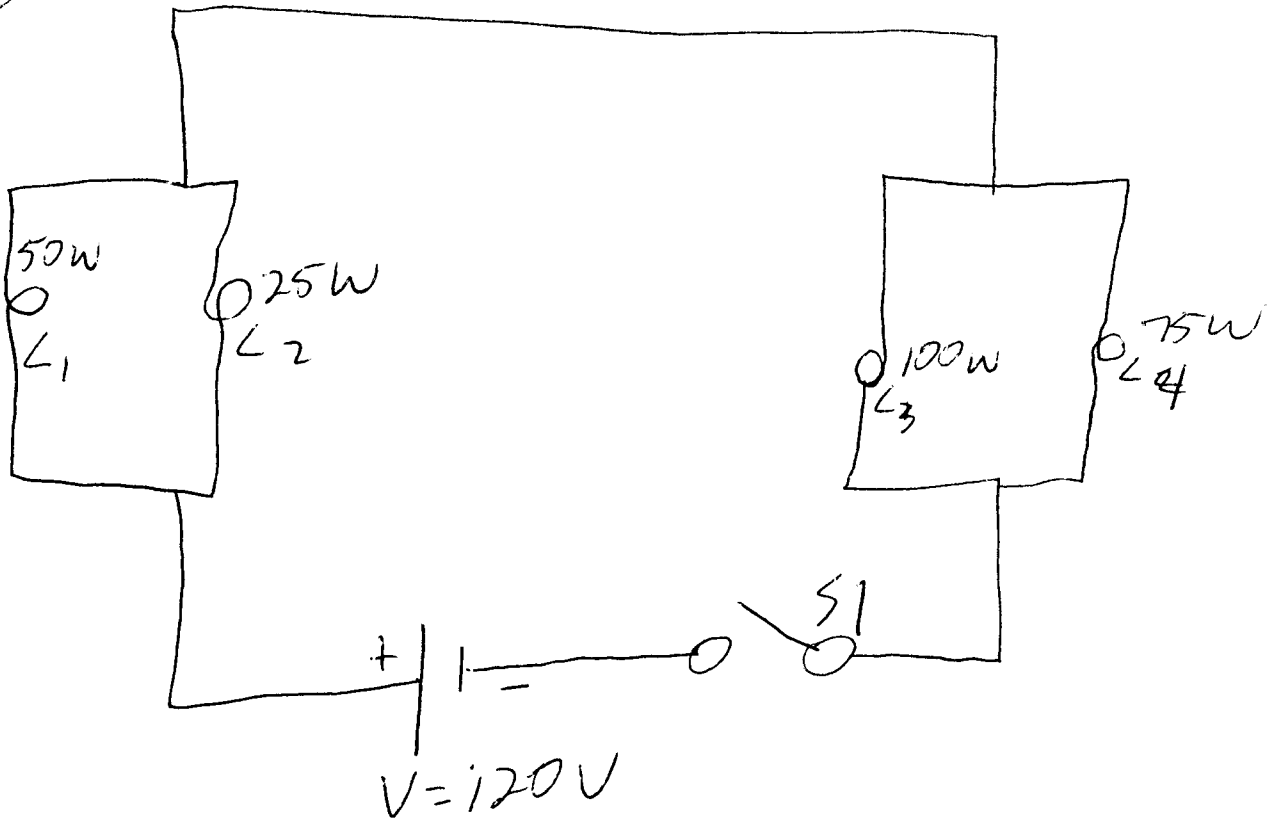
$$I_3 = \frac{V}{R_3} = \frac{36V}{16\Omega} = 2.25A$$

$$I_{total} = I_1 + I_2 + I_3 = 4.5A + 1.8A + 2.25A = 8.55A$$

$$R_{total} = \frac{V}{I_{total}} = \frac{36V}{8.55A} = 4.21\Omega$$

(7)

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Use  $P = IV$  to calculate  $I$  through each bulb.

$$I_1 = \frac{P_1}{V} = \frac{50\text{W}}{120\text{V}} = 0.42\text{A}$$

$$I_2 = \frac{P_2}{V} = \frac{25\text{W}}{120\text{V}} = 0.21\text{A}$$

$$I_3 = \frac{P_3}{V} = \frac{100\text{W}}{120\text{V}} = 0.83\text{A}$$

$$I_4 = \frac{P_4}{V} = \frac{75\text{W}}{120\text{V}} = 0.63\text{A}$$

$$I_{\text{total}} = \frac{0.42 + 0.21 + 0.83 + 0.63}{1} = 2.1\text{A}$$

$$R_{\text{total}} = \frac{V}{I_{\text{total}}} = \frac{120\text{V}}{2.1\text{A}} = 57.14\Omega$$

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