ec_na_week1_b_a **SOLUTIONS**

1. **(a)** Find the equivalent resistance of the parallel combination of two 8 Ω resistors.

$$R_{eq}=\frac{R_1 R_2}{R_1+R_2}=\frac{8x8}{8+8}=\frac{64}{16}=4\Omega$$

Find the equivalent resistance of the resulting parallel combination.

$$R_{eq}=\frac{R_1 R_2}{R_1+R_2}=\frac{(16+8)'(4+8)}{(16+8)+(4+8)}=\frac{24'12}{24+12}=\frac{288}{36}=8\Omega$$

(b) If the potential difference between *a* and *b* is 16 V, the total current is

$$I=\frac{V}{R_{eq}}=\frac{16}{8}=2\text{A}$$

The current in each branch may be found using the current splitter theorem.

$$I_A=I\frac{R_2}{R_1+R_2}=2\frac{(4+8)}{(4+8)+(16+8)}=2\frac{12}{36}=\frac{2}{3}A$$

Therefore, the current series combination of a 16 Ω resistor and a 8 Ω resistor is 2/3 A.

$$I_2=I\frac{R_1}{R_1+R_2}=2'\frac{(16+8)}{(4+8)+(16+8)}=2'\frac{24}{36}=\frac{4}{3}A$$

or applying Kirchhoff's current law at node *a*

$$I_2=I-I_1=2-\frac{2}{3}=\frac{4}{3}A$$

Therefore the current through the series 8 Ω resistor is 4/3 A. Since the current is split equally by the parallel combination of two 8 Ω resistors, the current in each of the resistors is 2/3 A.