

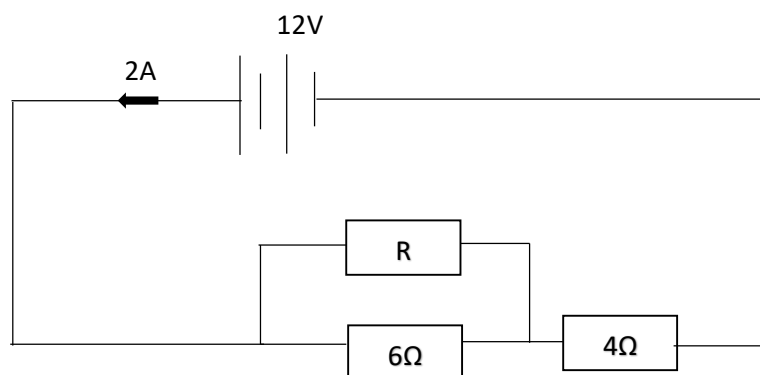
## OHM'S LAW AND RESISTANCE

### ACTIVITY OF INTEGRATION

Senior four

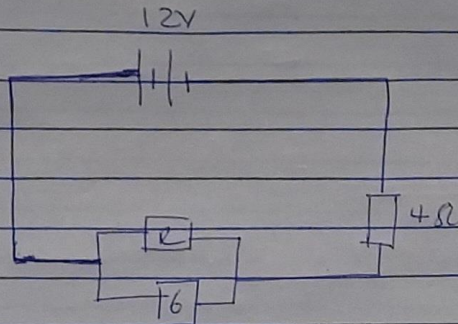
Time: 1 hour

Scenario: A village chairperson had a radio. On one day he found out that the radio couldn't be turned on so he took it to the mechanic for repair. After proper inspection, the mechanic realized that one of the resistors malfunctioned and needed to be replaced. Unfortunately he didn't know the specifications of the resistors to be used as a replacement. So the chairman asked him to make a sketch of the circuit indicating the arrangement of the resistors at the faulty corner in the radio and he brought it to you to help use your acquired knowledge in physics to identify the resistor needed for replacement.



**TASK:** Assuming your father is the chairman and he came home with this sketch wanting you to help them identify the resistor suitable for replacement. Use your acquired knowledge in physics to determine the value of the missing resistor in the radio and recommend it to the mechanic for replacement.

## Solution



$$\text{Let } V_{4\Omega} = I R_4$$

$$V_{4\Omega} = 2 \times 4$$

$$= 8 \text{ V (P.d across } 4\Omega \text{ resistor)}$$

$$V_p = 12 - 8 = 4 \text{ V (P.d across parallel combination)}$$

$$\text{But } I_6 = \frac{V_p}{R_6} = \frac{4}{6} = \frac{2}{3} \text{ A (current across } 6\Omega \text{ resistor)}$$

$$I_R = 2 - \frac{2}{3} = \frac{6-2}{3} = \frac{4}{3} \text{ A (current across resistor } R)$$

$$\Rightarrow V_p = I_R R$$

$$R = \frac{V_p}{I_R}$$

$$= \frac{4}{\frac{4}{3}}$$

$$= 4 \cdot \frac{3}{4}$$

$$= \frac{4}{1} \cdot \frac{3}{4}$$

$$= 4 \times \frac{3}{4}$$

$$= 3\Omega$$

$$\Rightarrow R = \underline{\underline{3\Omega}}$$

Mechanic should use a suitable resistor of  $\underline{\underline{3\Omega}}$  as  $R$ .