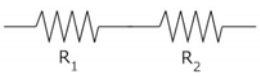
Resistors in Series and in Parallel

Series



- Voltage drop is different across each resistor
- The total voltage drop across the circuit is equal to the sum of the voltage drops across the individual resistors
- Current is the same through each resistor

Series (math)

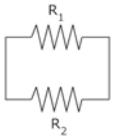
$$V_{eq} = V_1 + V_2$$

$$I_{eq}R_{eq} = I_1R_1 + I_2R_2$$

But… $I_{eq} = I_1 = I_2$

Therefore… $\boxed{R_{eq} = R_1 + R_2}$

Parallel



- Voltage drop across each resistor is the same
- Current through each resistor is different
- Total current through the circuit is the sum of the currents through each individual resistor

Parallel (math)

$$I_{eq} = I_1 + I_2$$

$$\frac{V_{eq}}{R_{eq}} = \frac{V_1}{R_1} + \frac{V_2}{R_2}$$

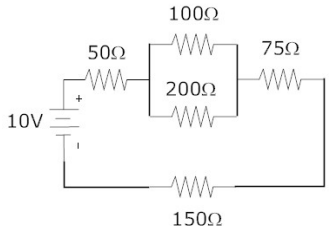
But… $V_{eq} = V_1 = V_2$

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

Other Information

- A circuit with resistors in series is known as a **voltage divider**.
  - The voltage is divided among the resistors.
- A circuit with resistors in parallel is known as a **current divider**.
  - The current is divided among the resistors.

Solving Circuits



Calculate the equivalent resistance of the circuit, the voltage drop across each resistor, and the current through each resistor.