Series Circuit Analysis
Lesson Notes

Learning Outcomes
- How are the variety of circuit parameters mathematically related for series circuits?
- How do you analyze a series circuit?

Mathematical Equations

Equivalent Resistance: the collection of resistors act together to create an overall total resistance …
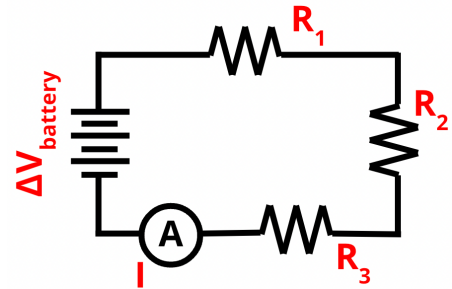
$$R_{eq} = R_1 + R_2 + R_3 + …$$

Current: the current in a series circuit is everywhere the same - in every wire, resistor, and battery …

$$I_{battery} = I_1 = I_2 = I_3 = …$$

Voltage Drops: The voltage drop (ΔV) across any resistor can be calculated using:

$$\Delta V_1 = I \cdot R_1 \qquad \Delta V_2 = I \cdot R_2 \qquad \Delta V_3 = I \cdot R_3$$

As a check, use $\Delta V_{battery} = \Delta V_1 + \Delta V_2 + \Delta V_3$

Watch the video and record answers and solutions/notes for the following three Example Problems.

Example Problem 1
Two resistors - 4.0 Ω and 6.0 Ω - are connected to a 24-volt power supply. Determine the equivalent resistance, the current in each resistor and battery, and the voltage drops across each resistor.

$R_1 = 4.0 \ \Omega \qquad R_2 = 6.0 \ \Omega$

$R_{eq} =$ _____

$I_1 =$ _____

$I_2 =$ _____

$I_{battery} =$ _____

$\Delta V_1 =$ _____

$\Delta V_2 =$ _____
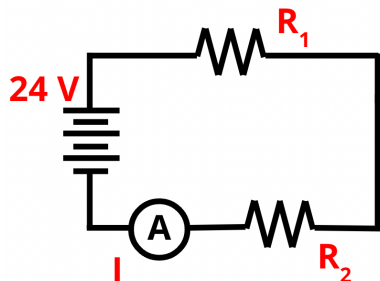
Example Problem 2
  Consider the 3-resistor circuit below. Determine all the blanks.

$R_1 = 17\Omega$ $R_2 = 12\Omega$ $R_3 = 11\Omega$

R_{eq} = _____

I_1 = _____

I_2 = _____

I_3 = _____
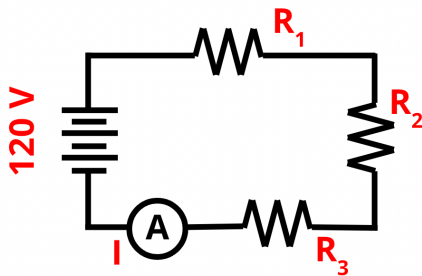
$I_{battery}$ = _____

ΔV_1 = _____

ΔV_2 = _____

ΔV_3 = _____
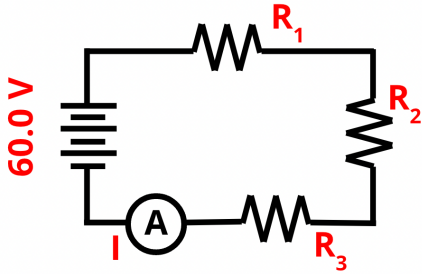
Work Shown Here:

Example Problem 3
  Consider the 3-resistor circuit below. Determine all the blanks.

$R_1 = 11\Omega$ $R_2 = 7\Omega$ $R_3 = 20\Omega$

R_{eq} = _____

I_1 = _____

I_2 = _____

I_3 = _____

$I_{battery}$ = _____

ΔV_1 = _____

ΔV_2 = _____

ΔV_3 = _____

Work Shown Here: