Combination Circuits

Series and Parallel (not or)

Electricity

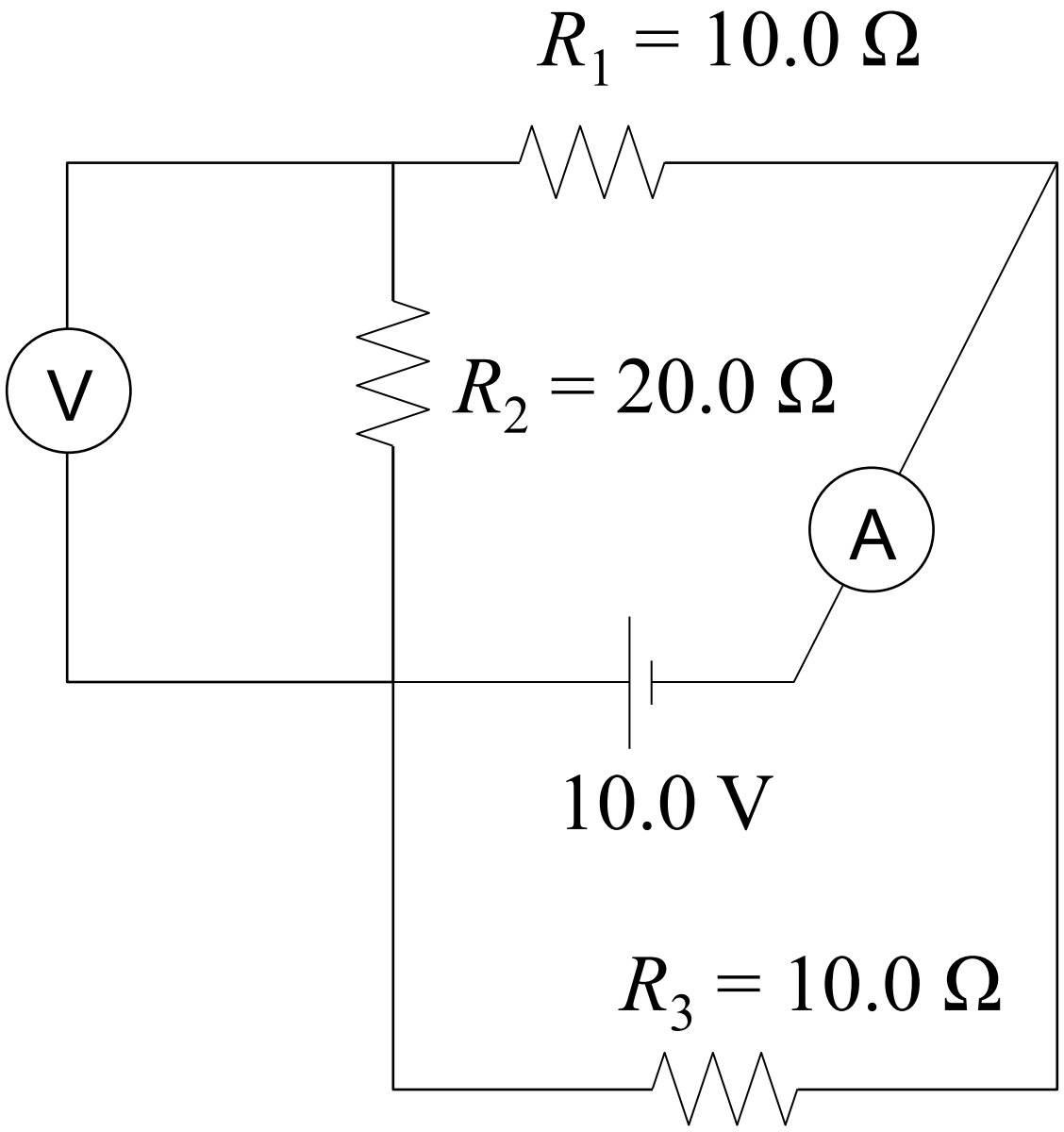
I. Charge and Force
   - concepts and definition
   - Coulomb's Law

II. Current and Potential
   - electric energy and power

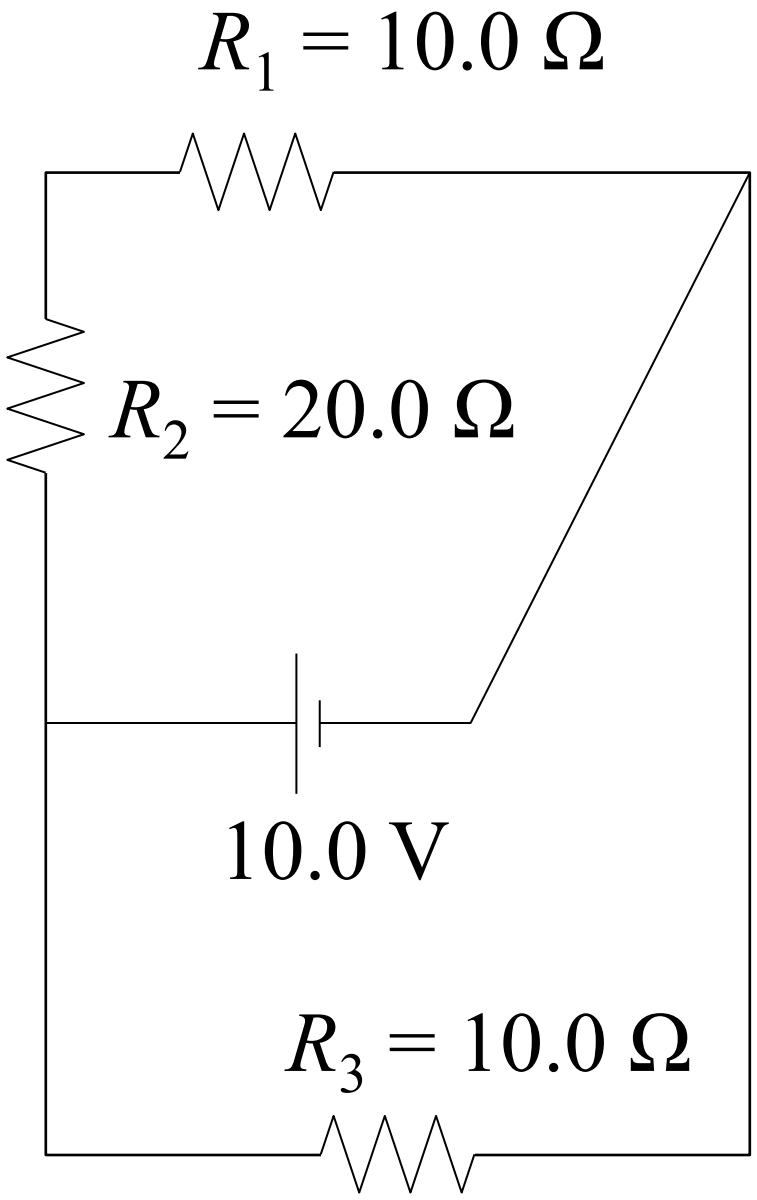
III. Resistance and Ohm's Law

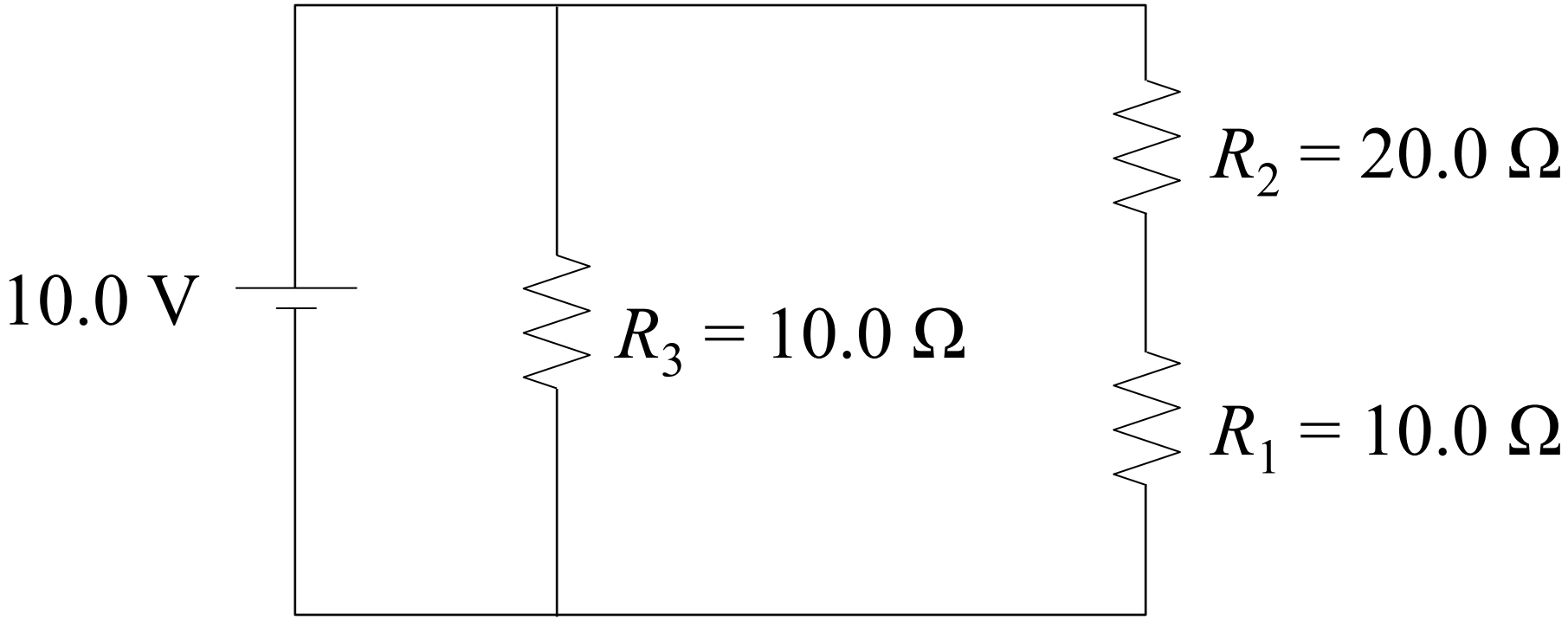
IV. DC Circuits
   - series vs. parallel
   - **Kirchoff's Laws**

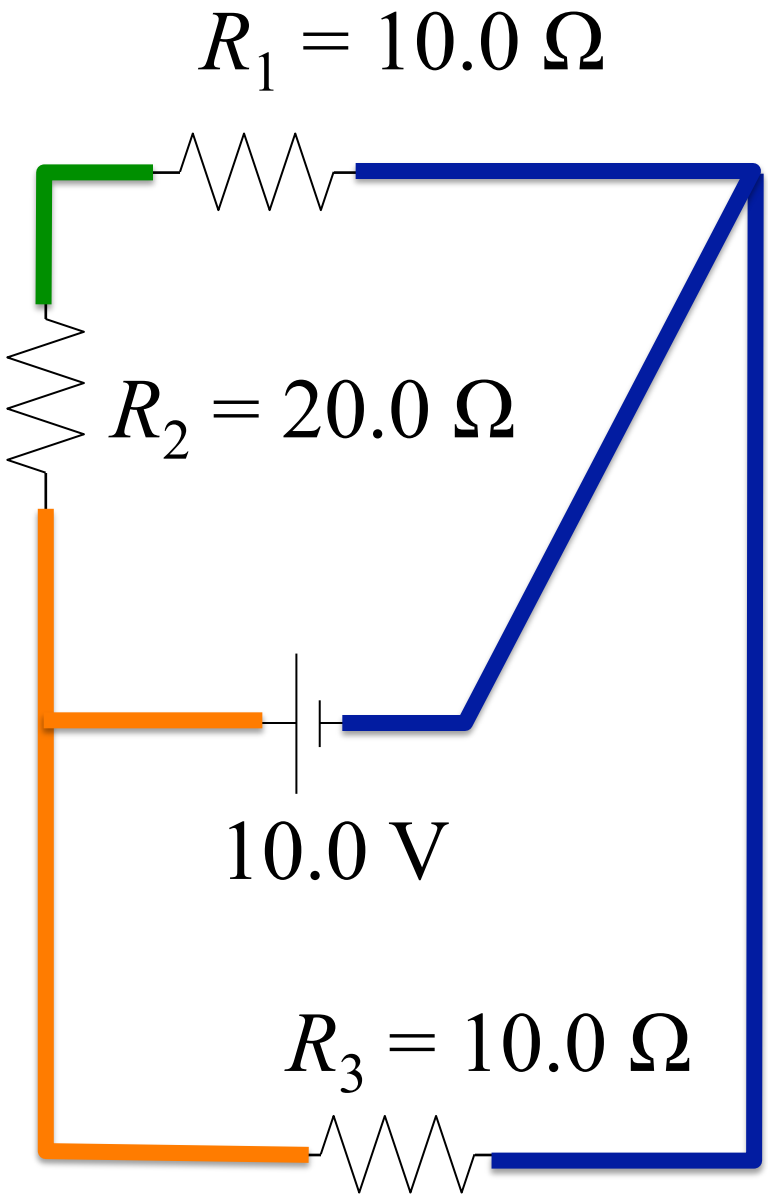
	The student will be able to:	HW:
1	Relate electrical phenomena to the motion and position of the fundamental charge found on electrons and protons and recognize the coulomb as the SI unit of charge and *e* as the elementary quantum of charge. ✓	1 – 6
2	State and apply Coulomb's Law to solve problems relating force, charge, and distance. ✓	7 – 11
3	Define electric current and the ampere and solve problems relating current to charge and time. ✓	12 – 14
4	Solve problems involving electric power. ✓	15 – 22
5	Define resistance the Ohm and solve problems using Ohm's Law to relate voltage, current, and resistance. ✓	23 – 32
6	Determine resistance for series or parallel combinations of resistors or as a function of resistivity, length, and cross-sectional area for a single resistor.	33 – 37
7	State and apply Kirchoff's node and loop rules and solve related problems, including analysis of battery resistor circuits with series and/or parallel connections.	38 – 48

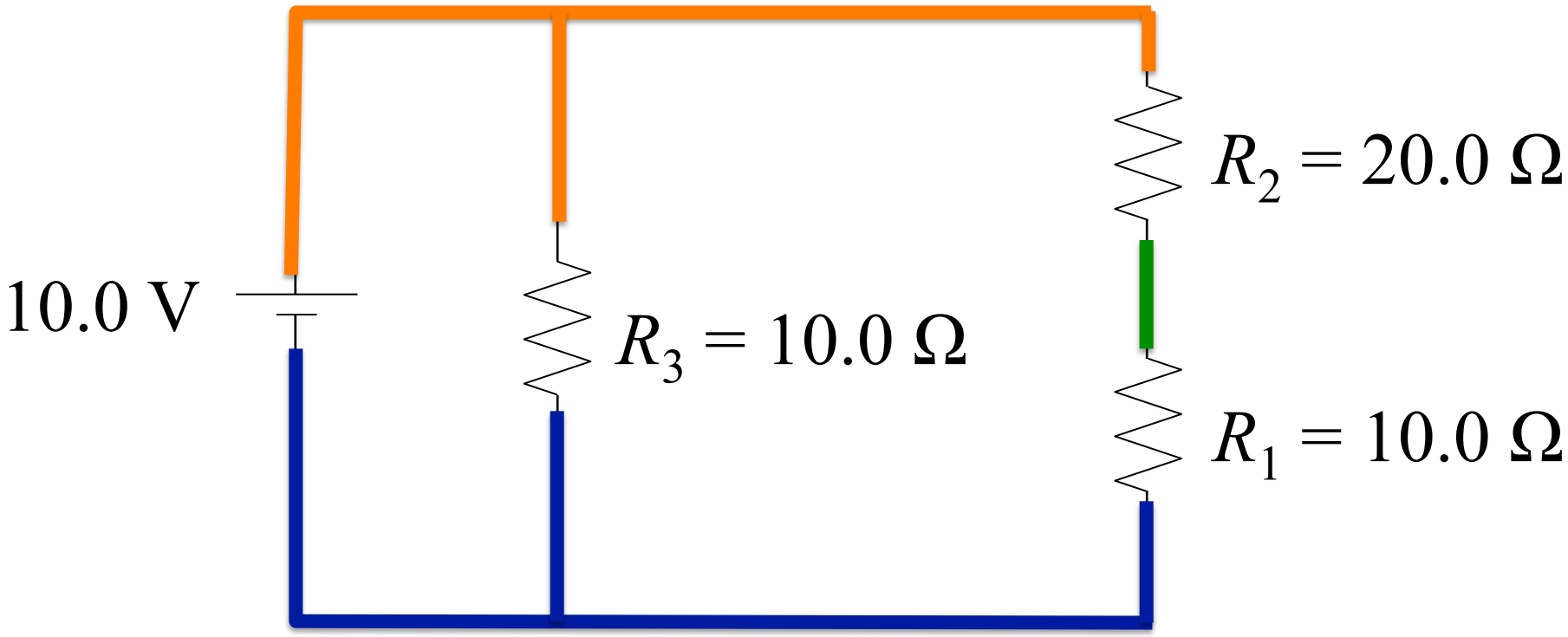


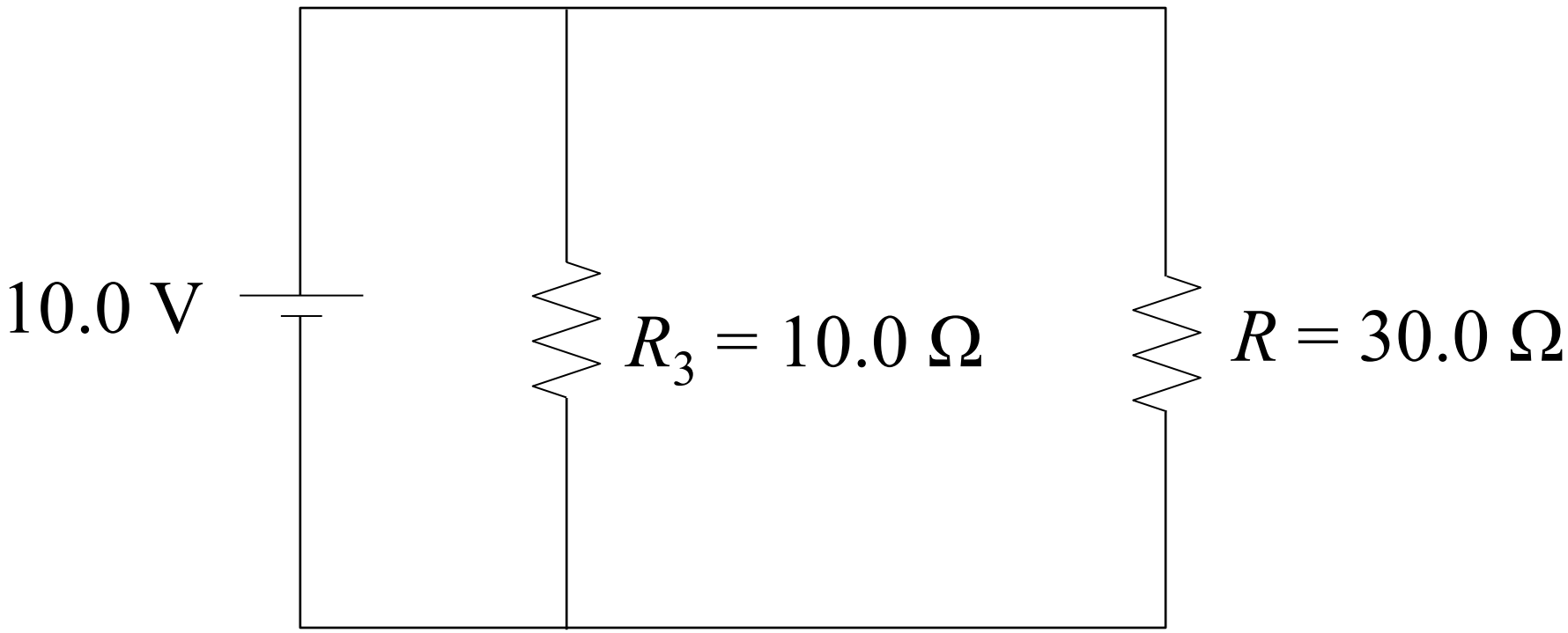
Determine the readings of each meter.

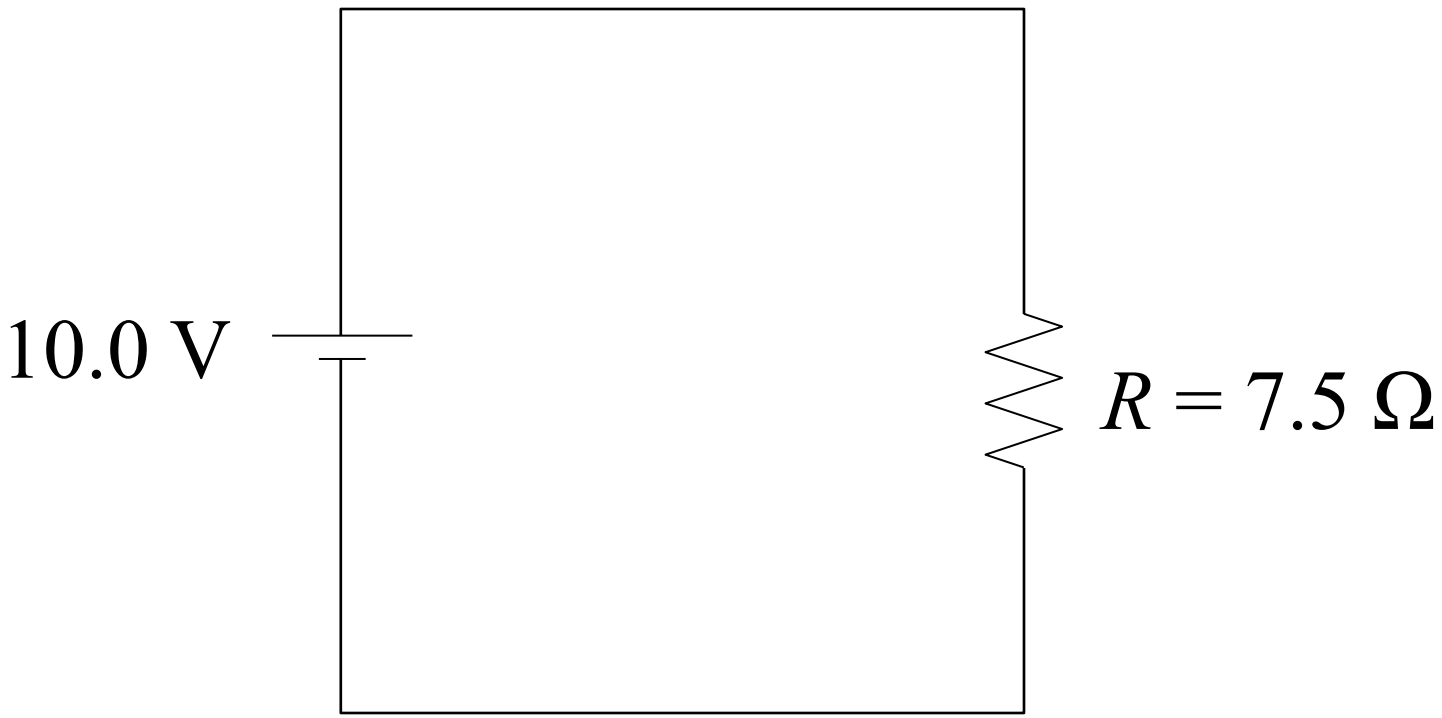






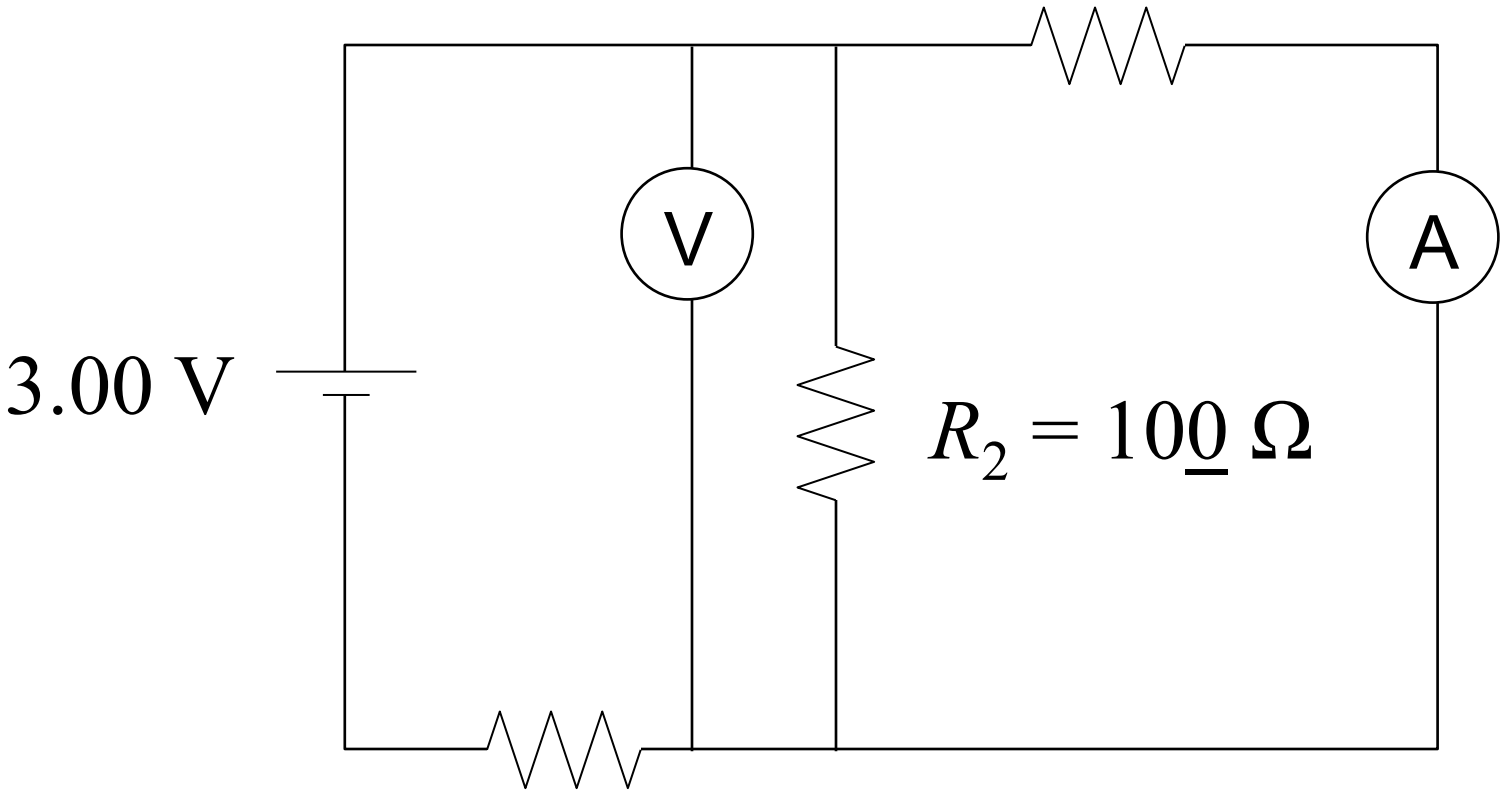




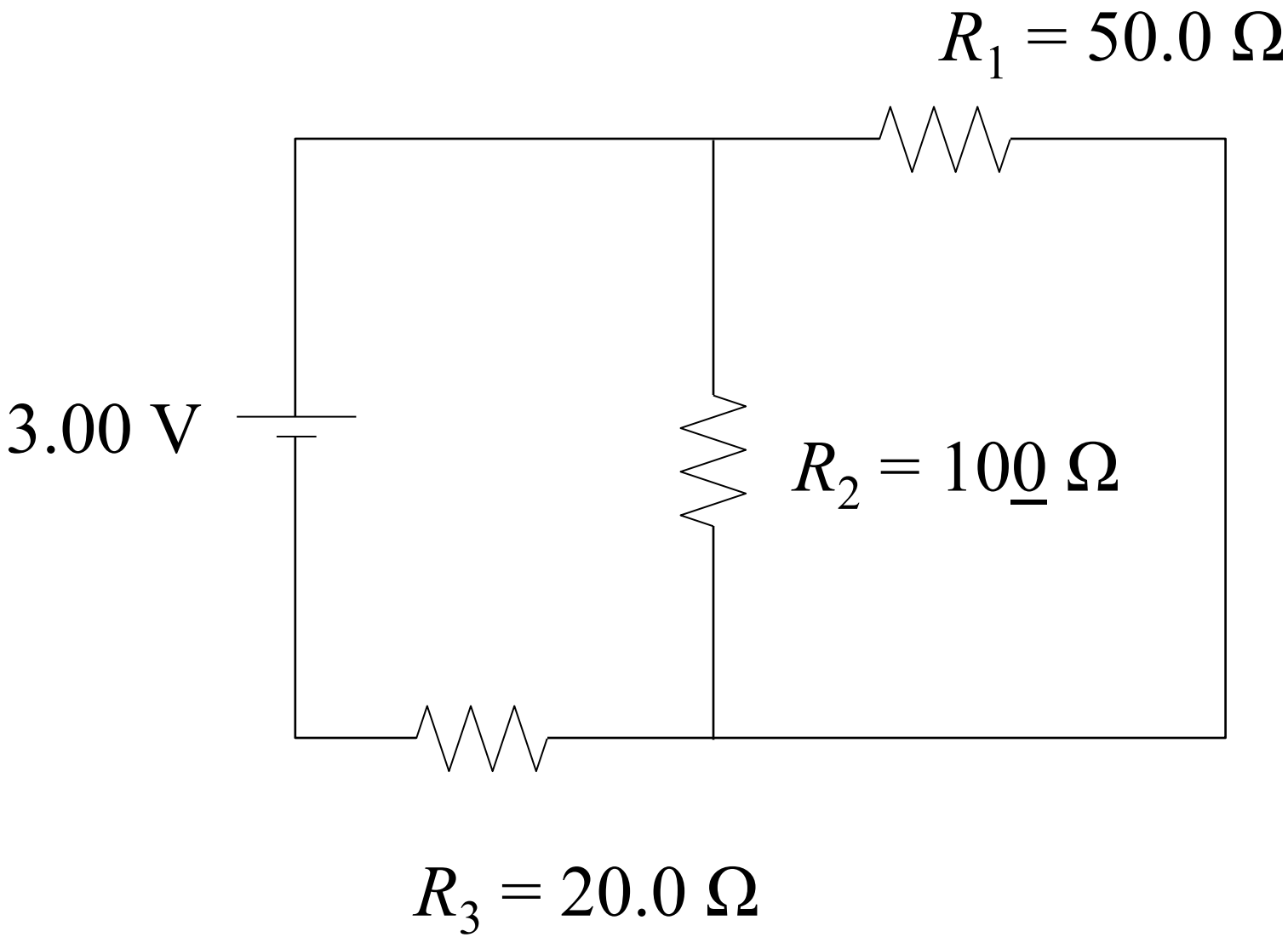


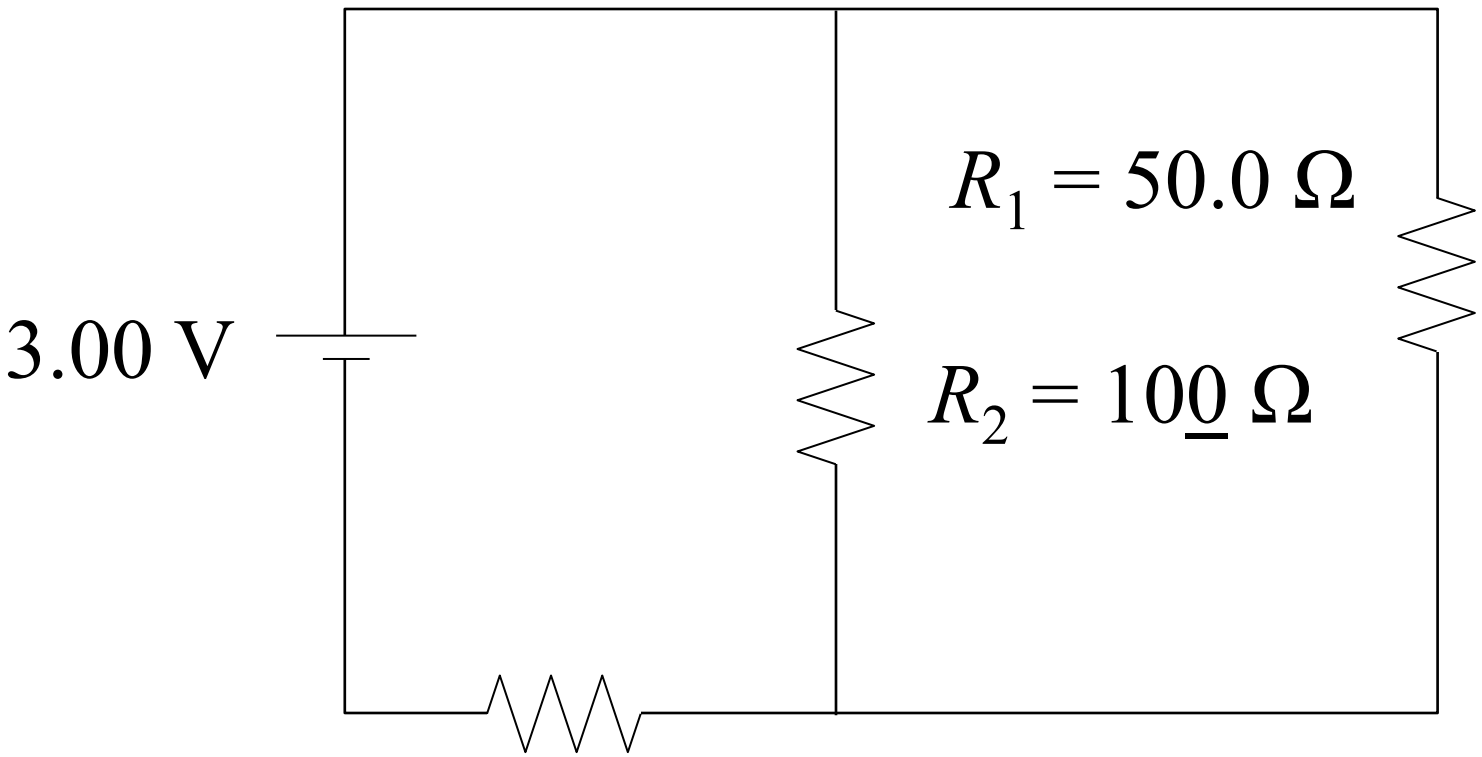
Determine the readings of each meter.

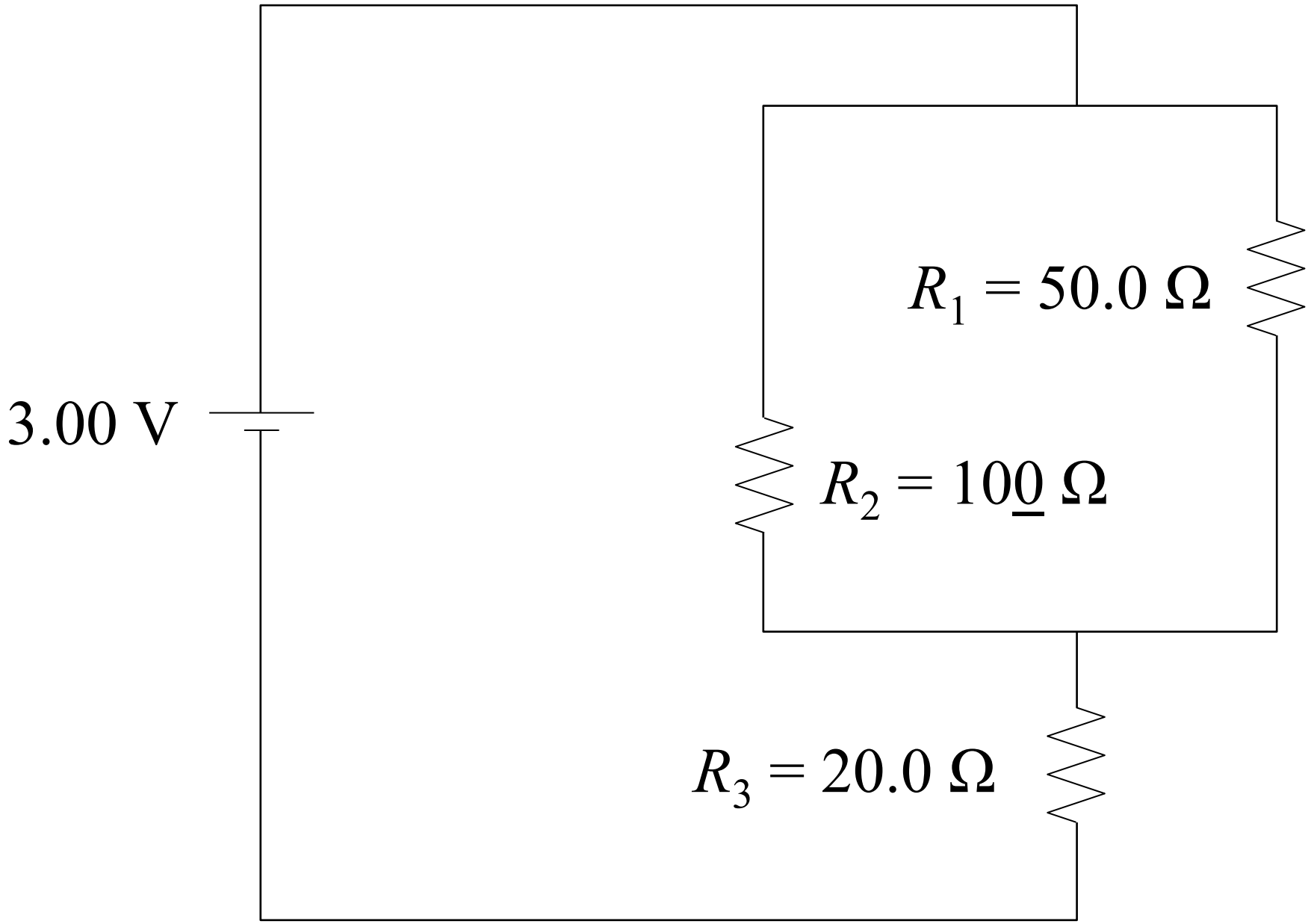
$R_1 = 50.0\ \Omega$

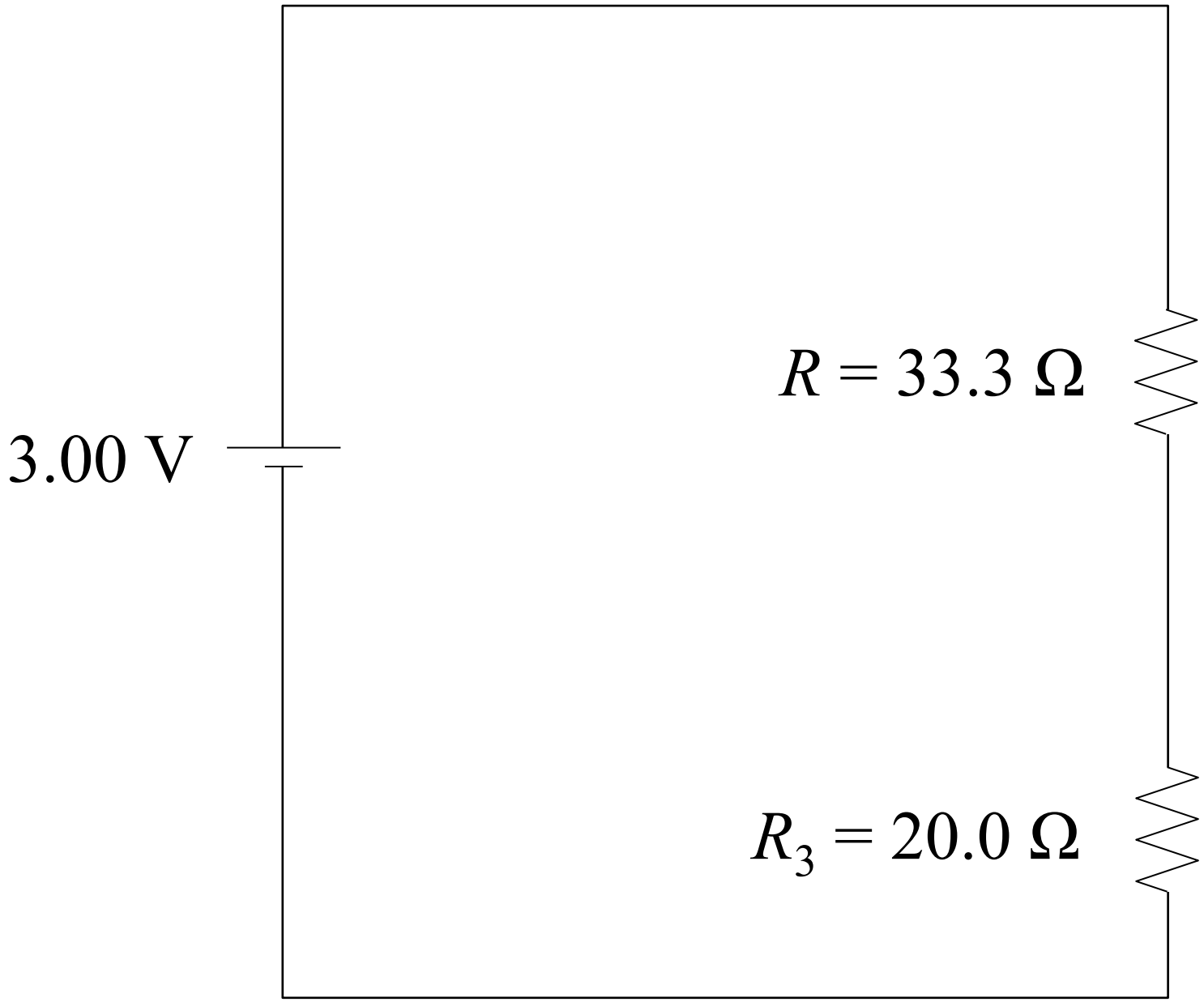


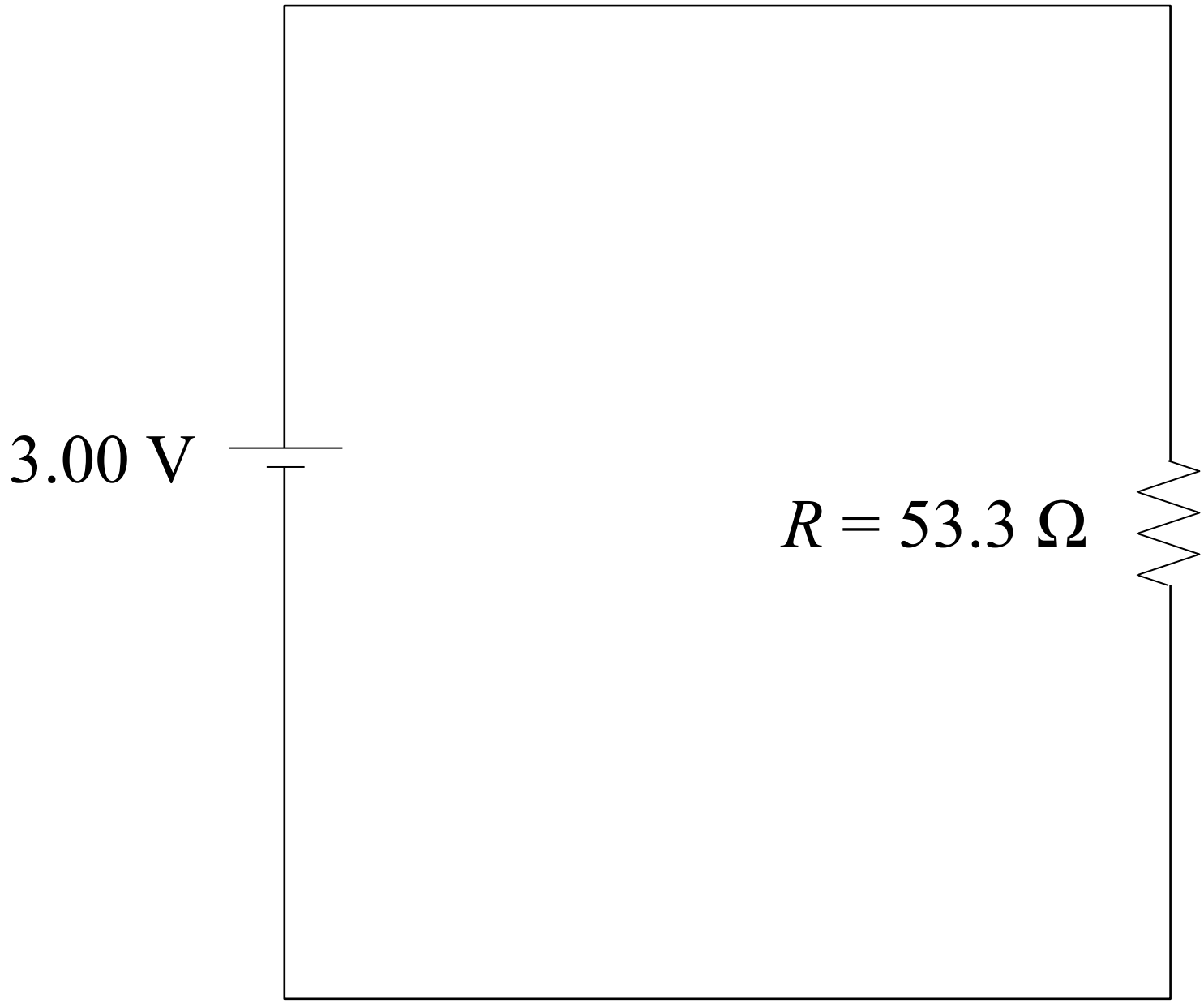
$R_3 = 20.0\ \Omega$











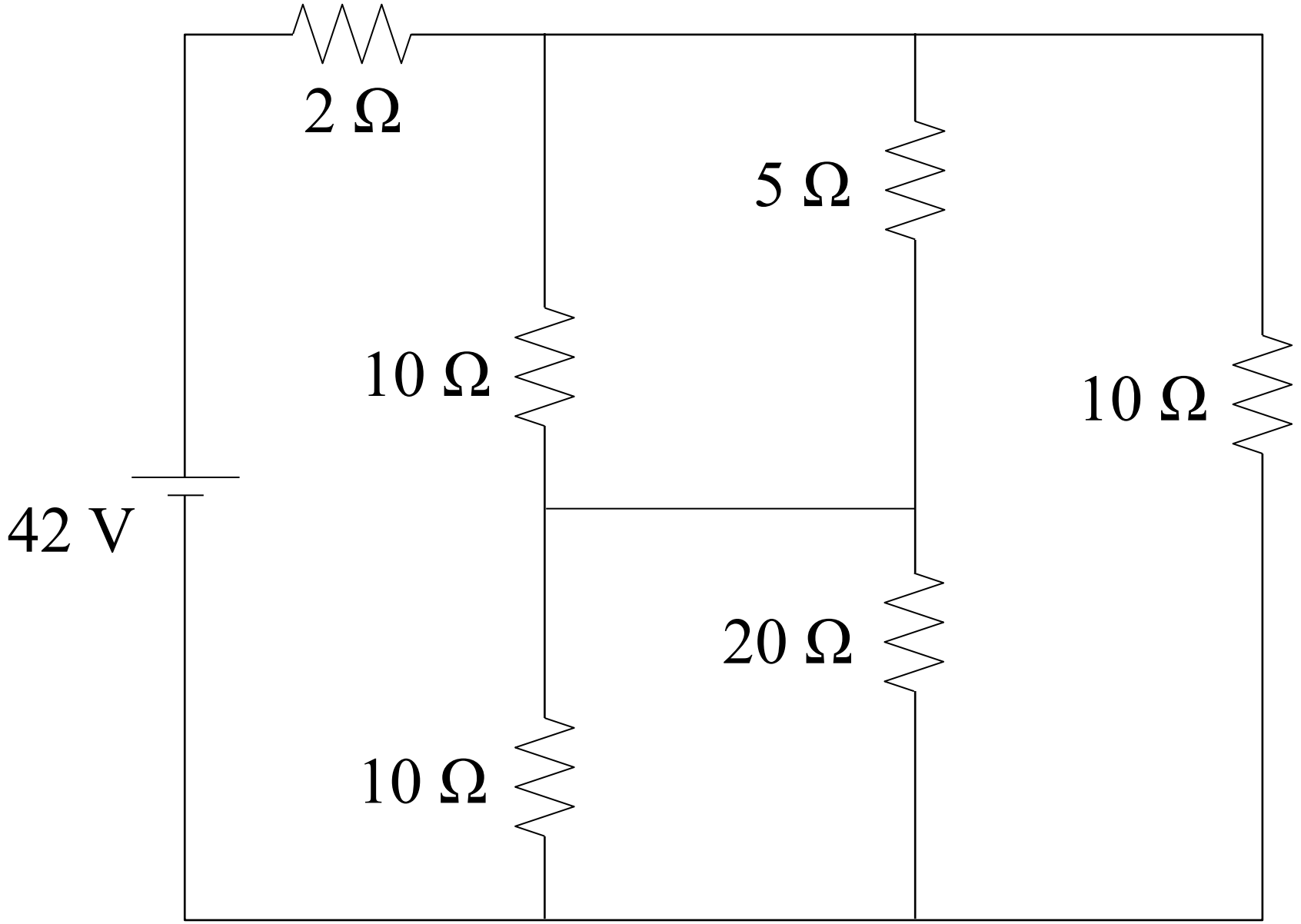
Kirchhoff's Laws

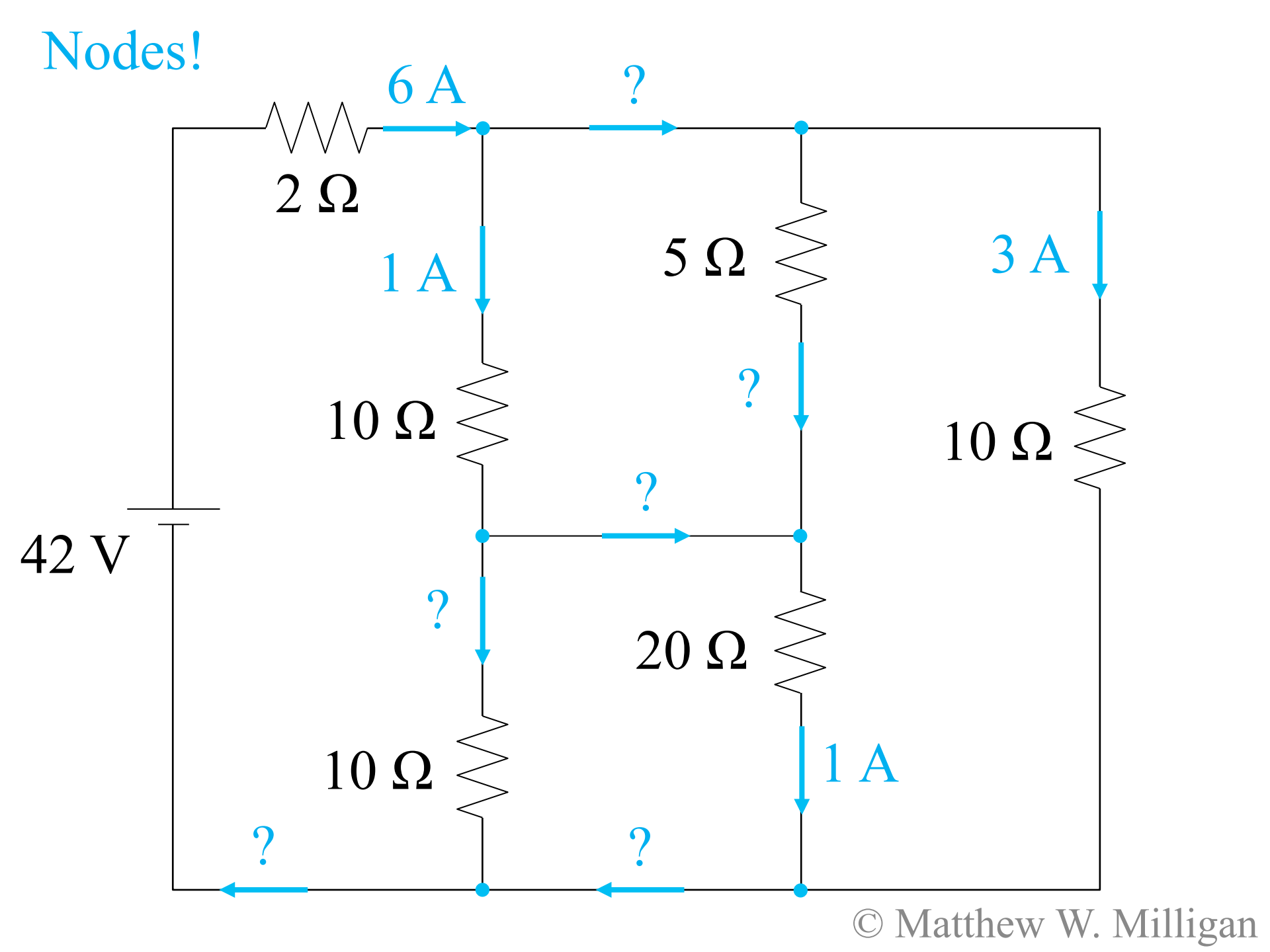
- Node Rule: The sum of currents entering a node equals the sum of currents exiting a node.

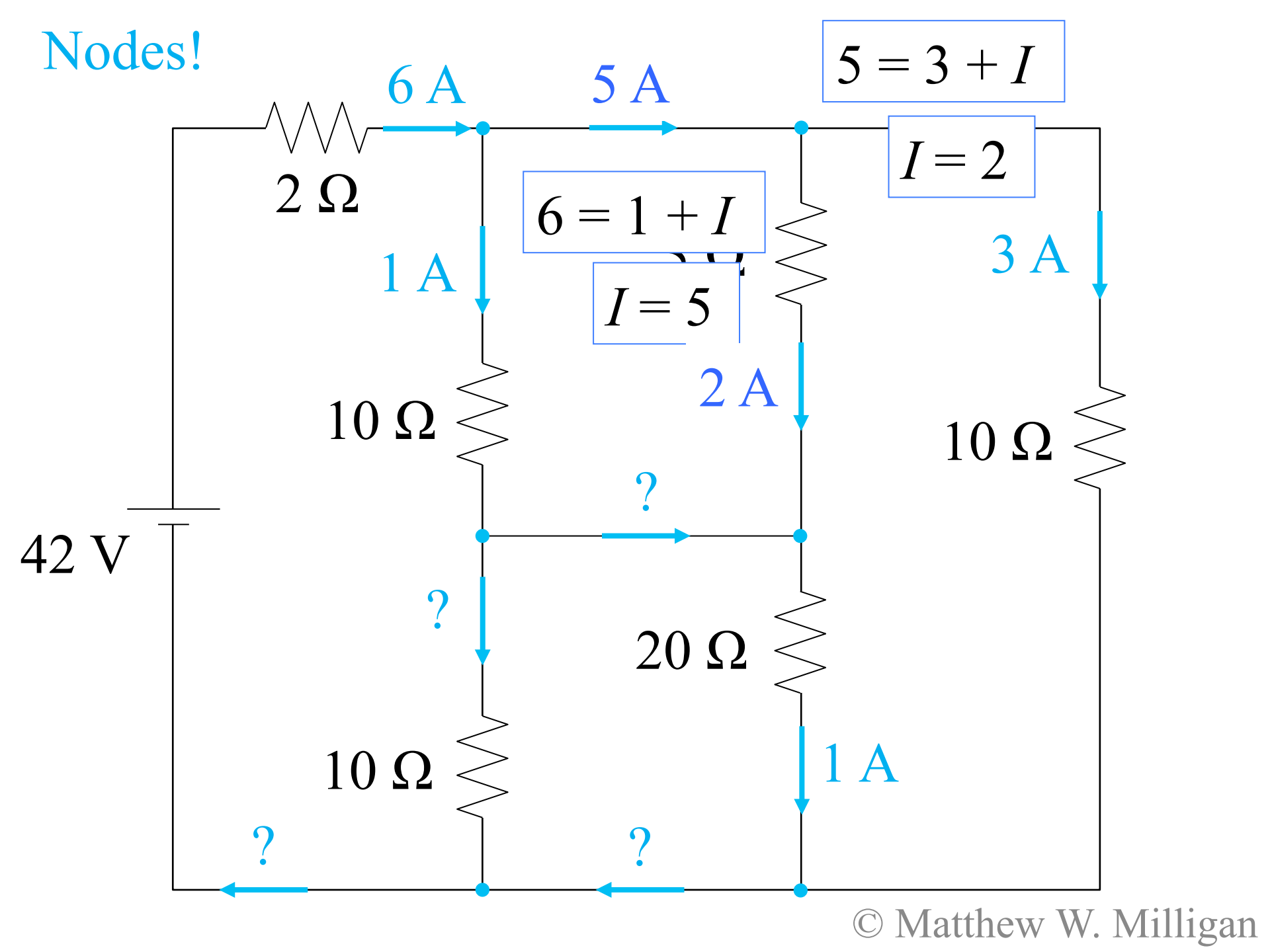
Because charge is conserved!

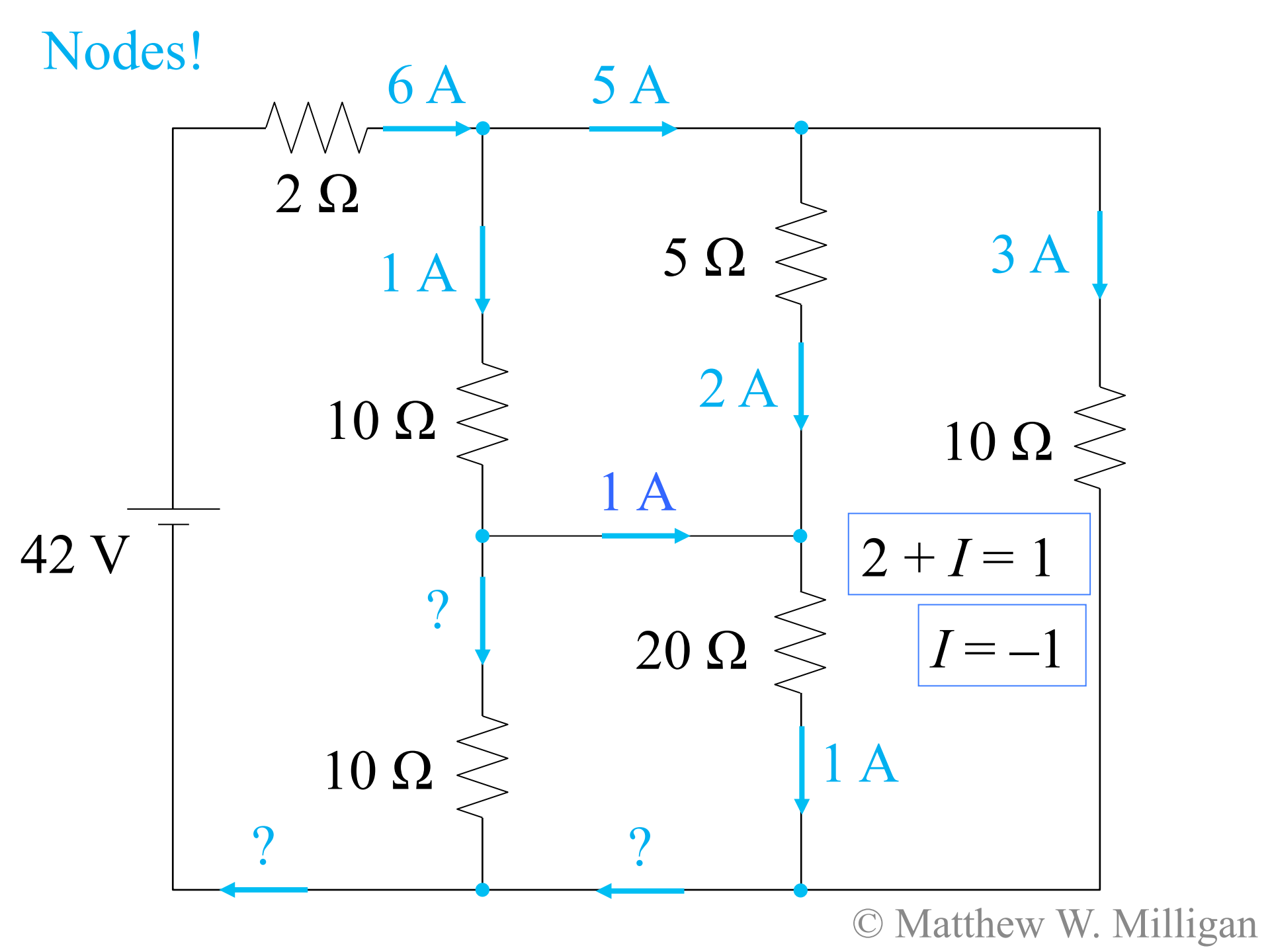
- Loop Rule: The sum of the potential differences across all elements around any loop equals zero.

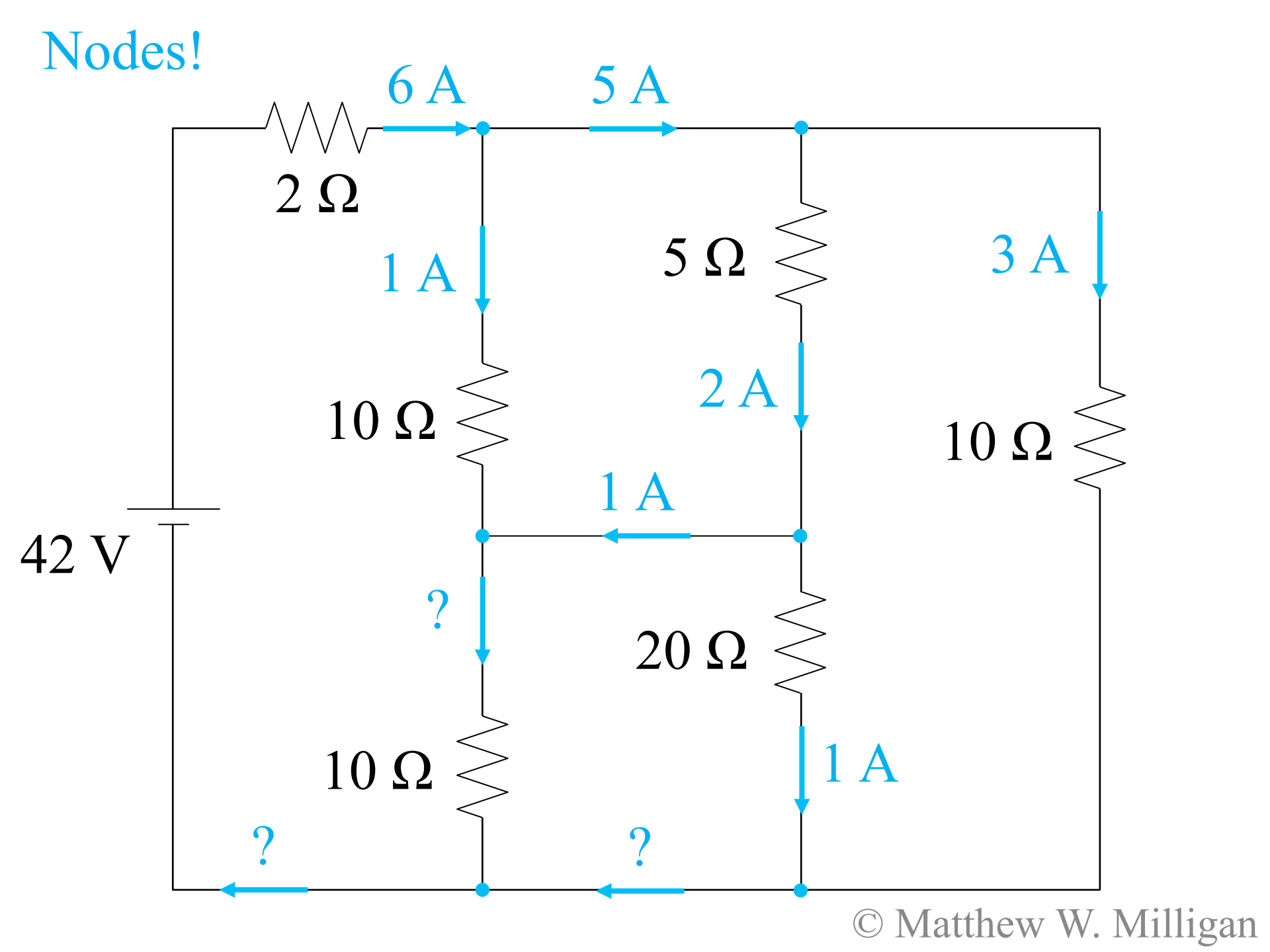
Because energy is conserved!

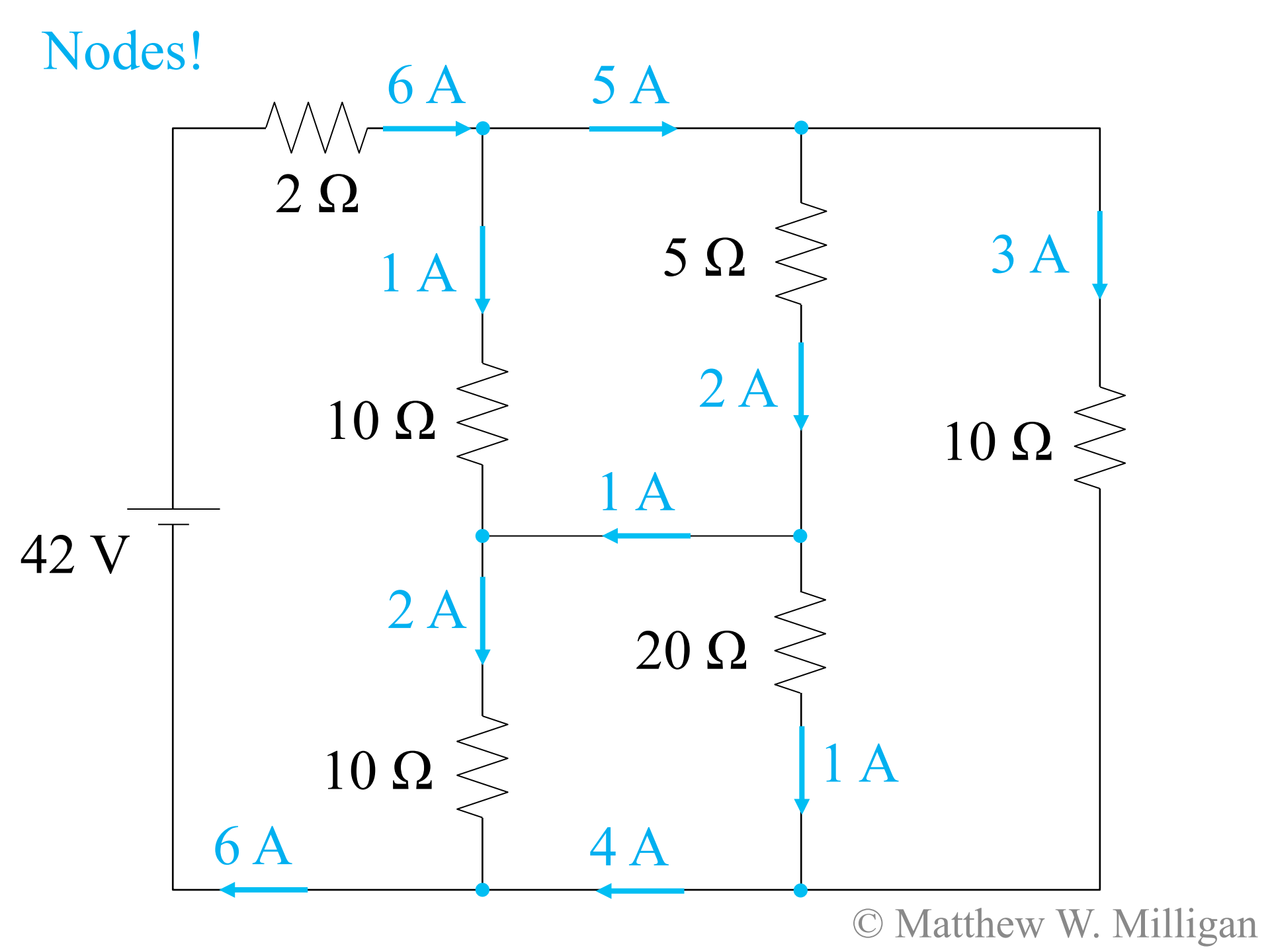




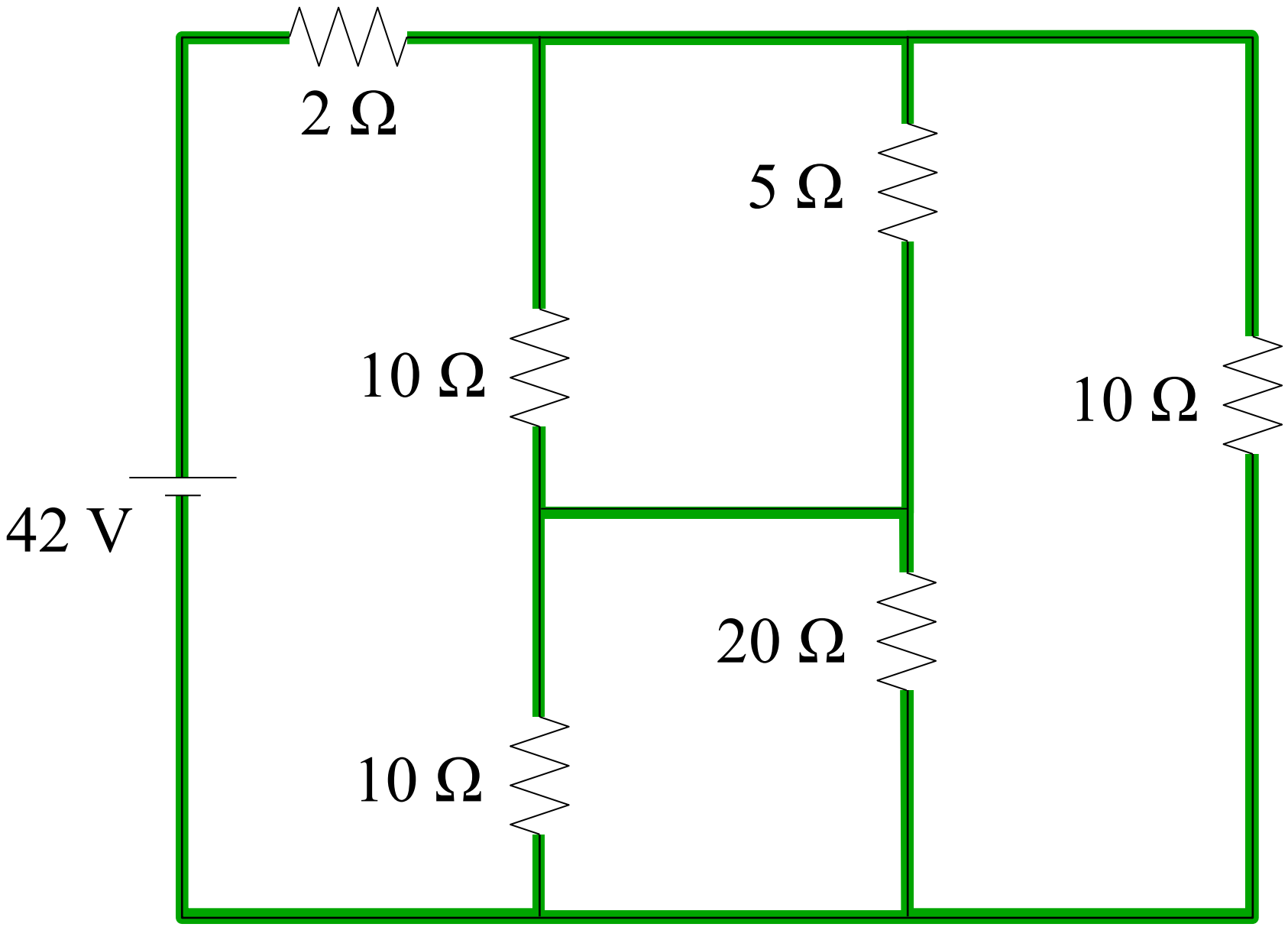


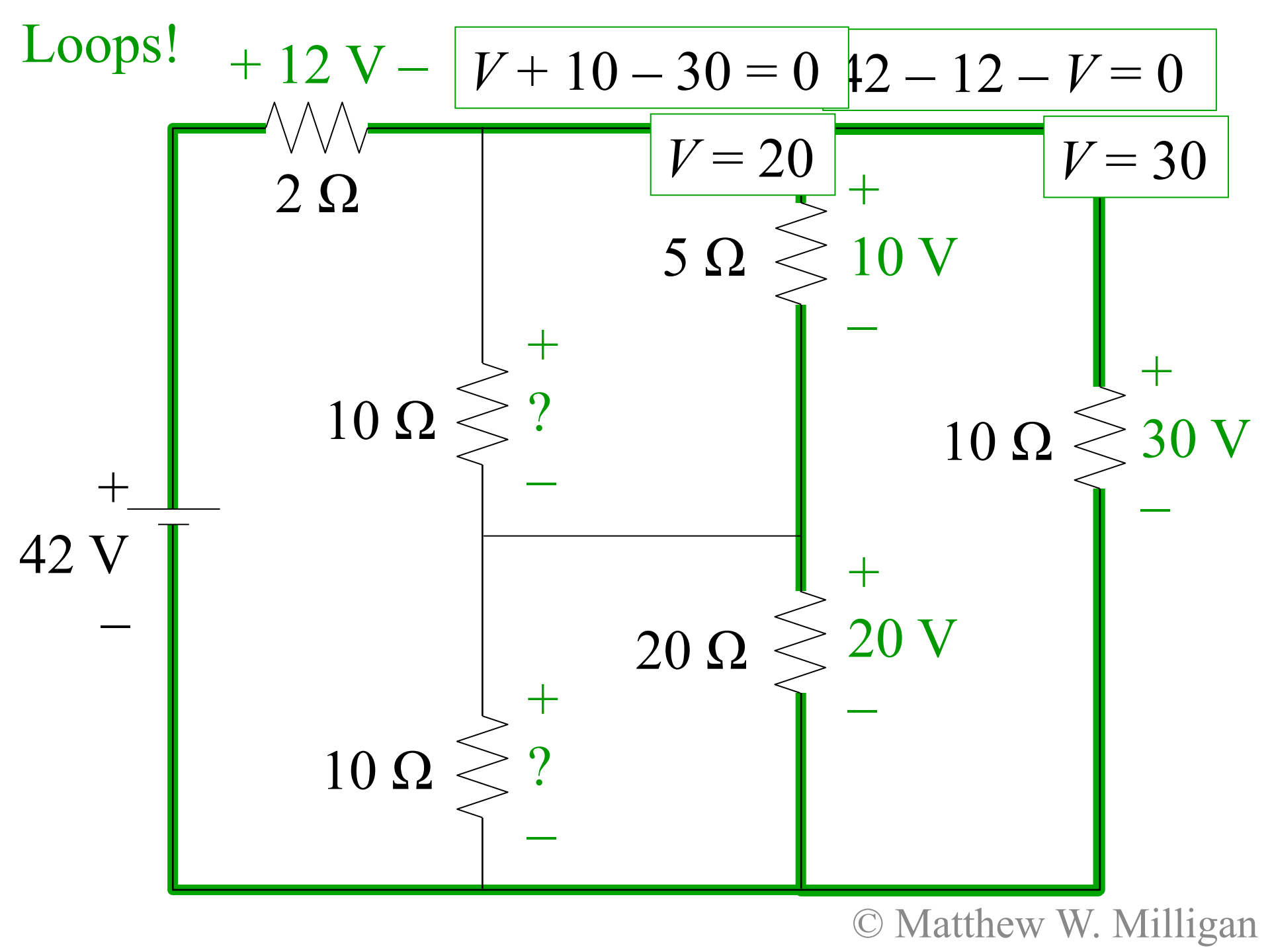


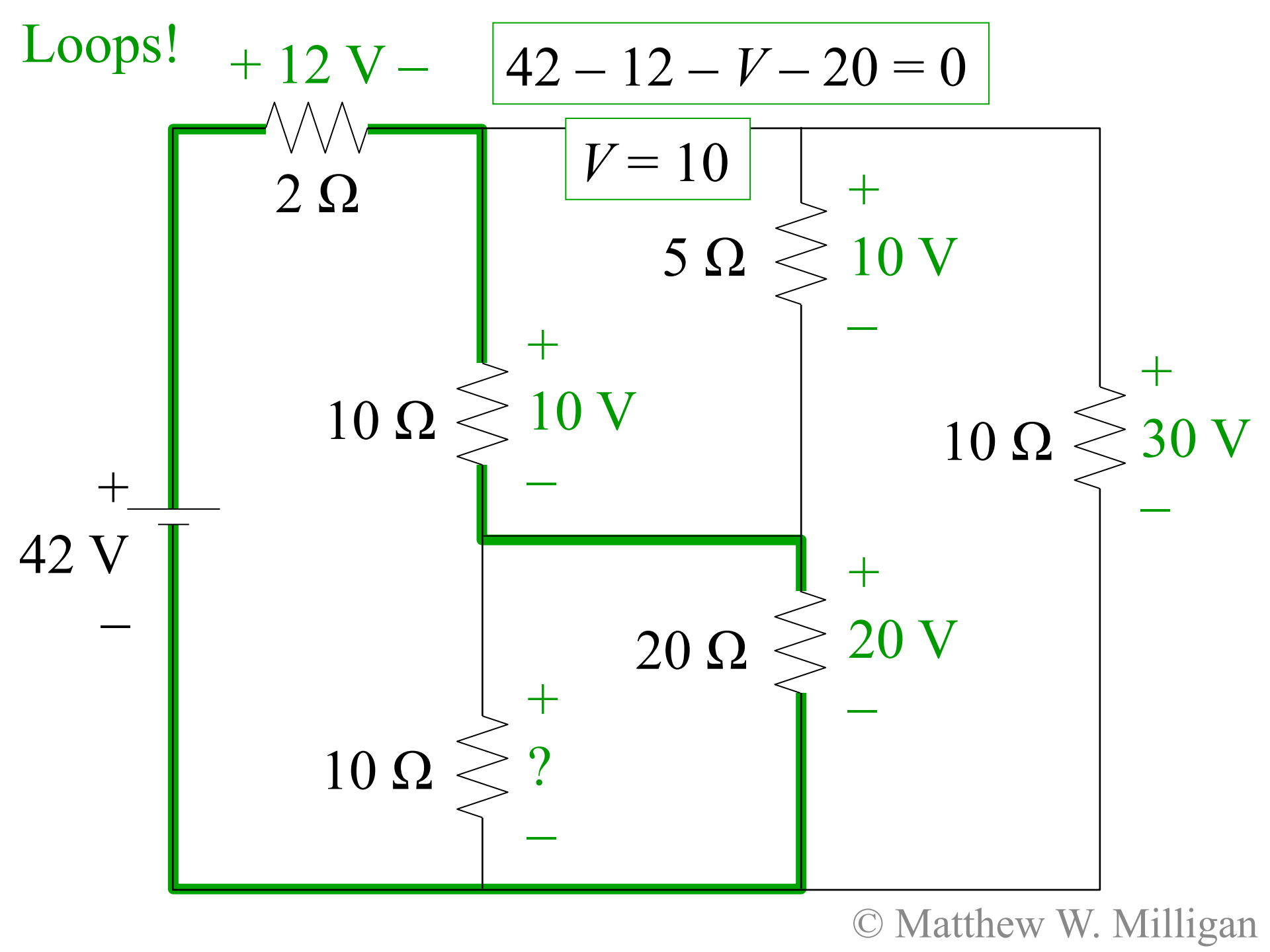


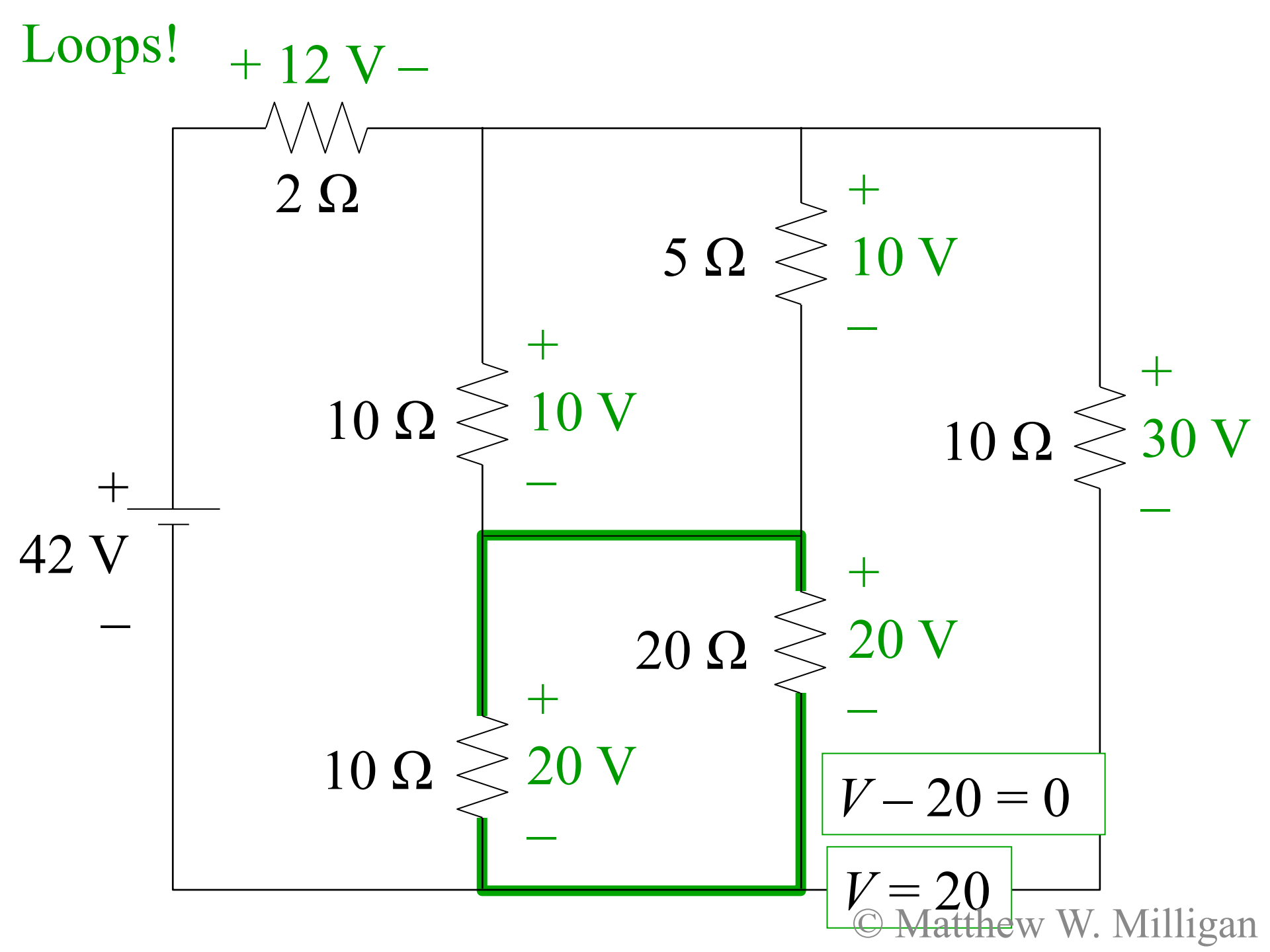


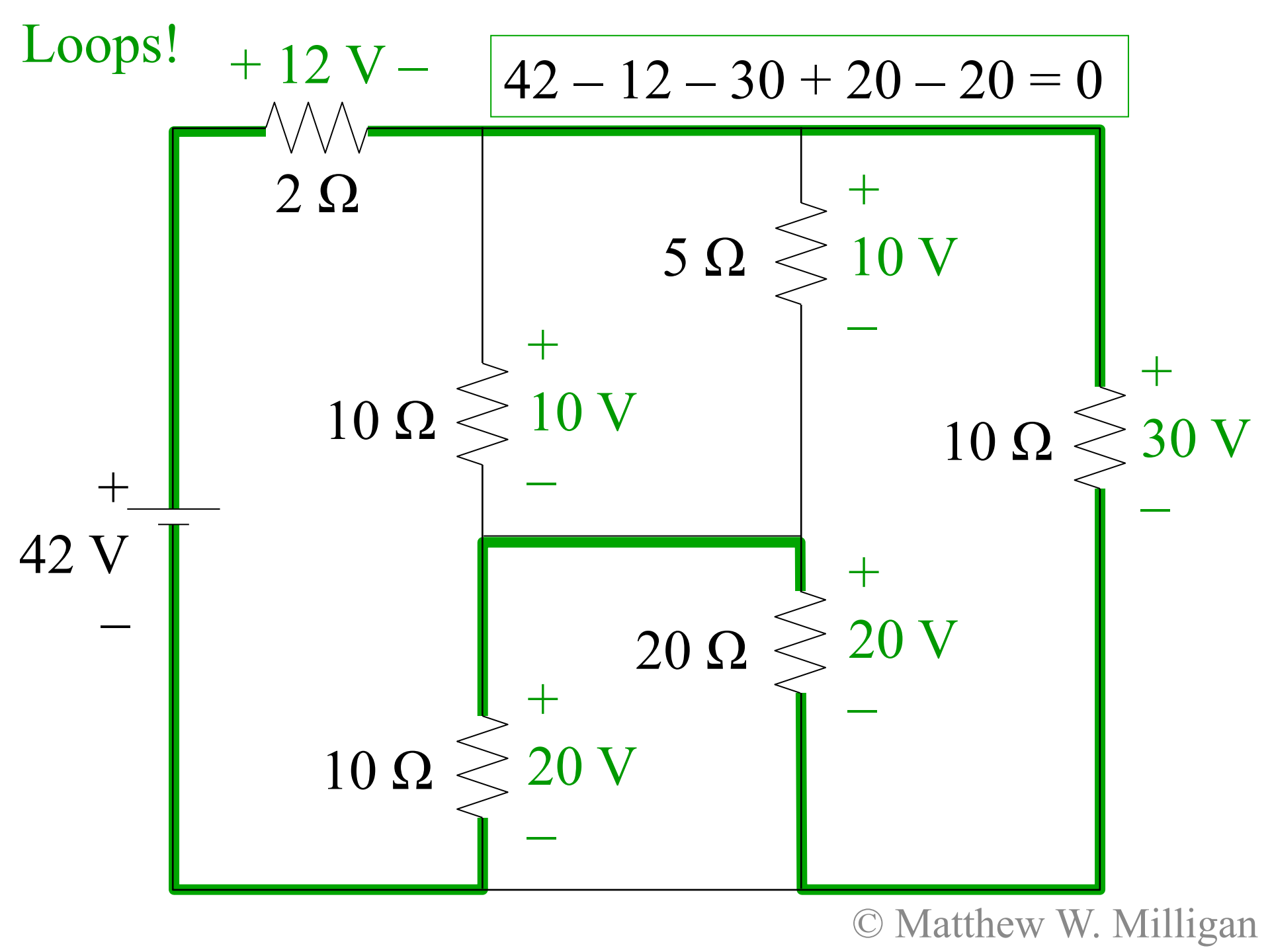
Loops!

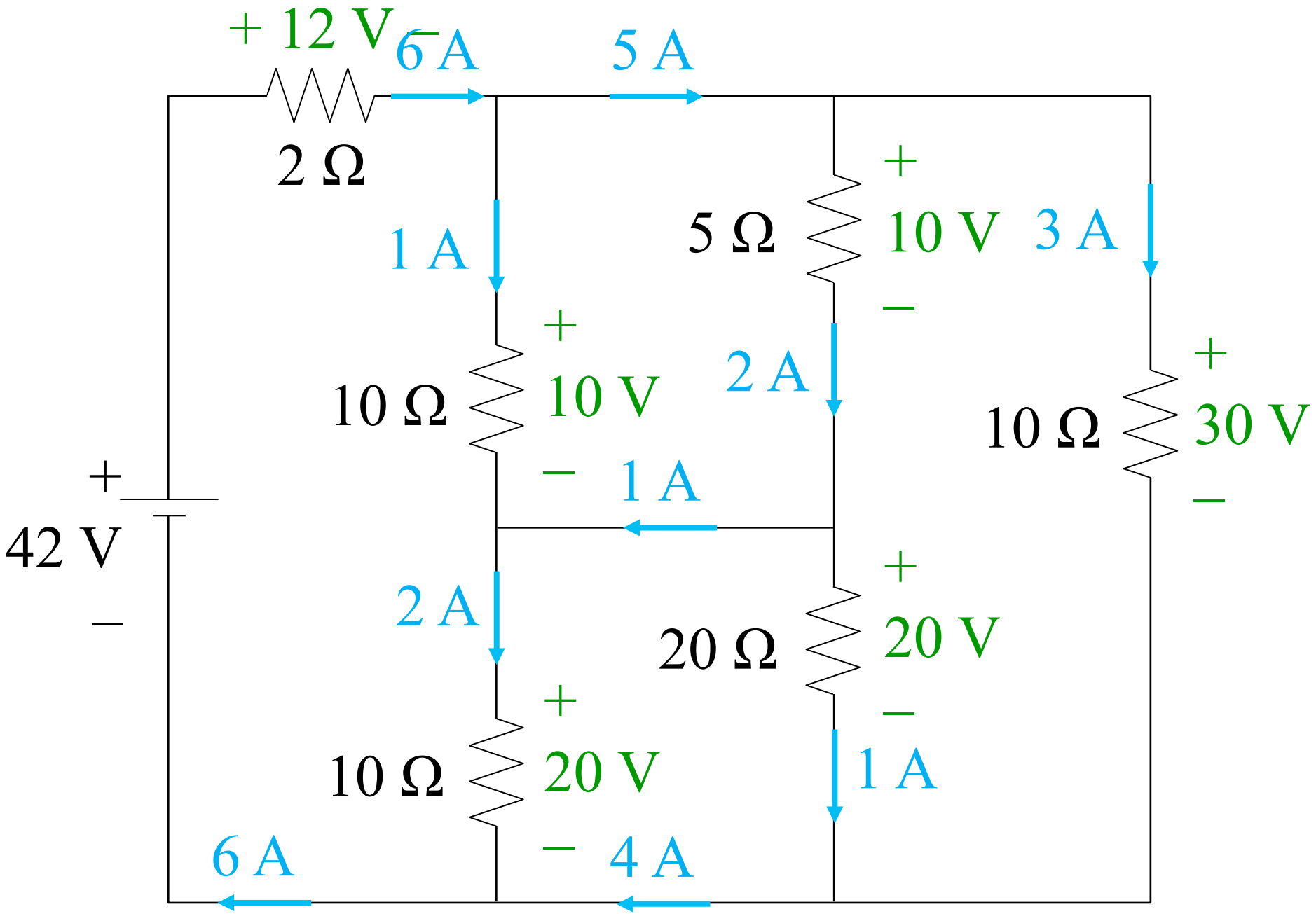


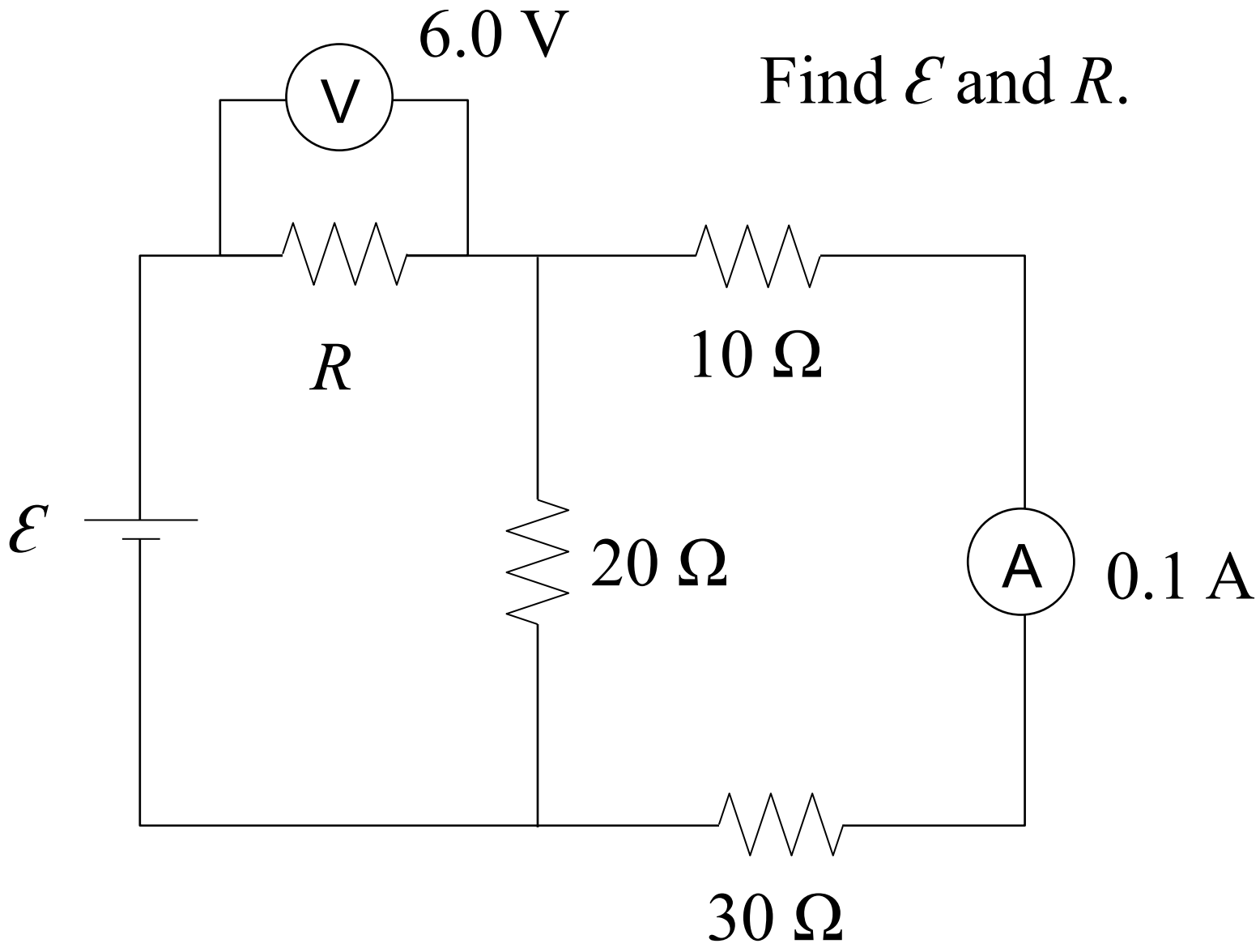


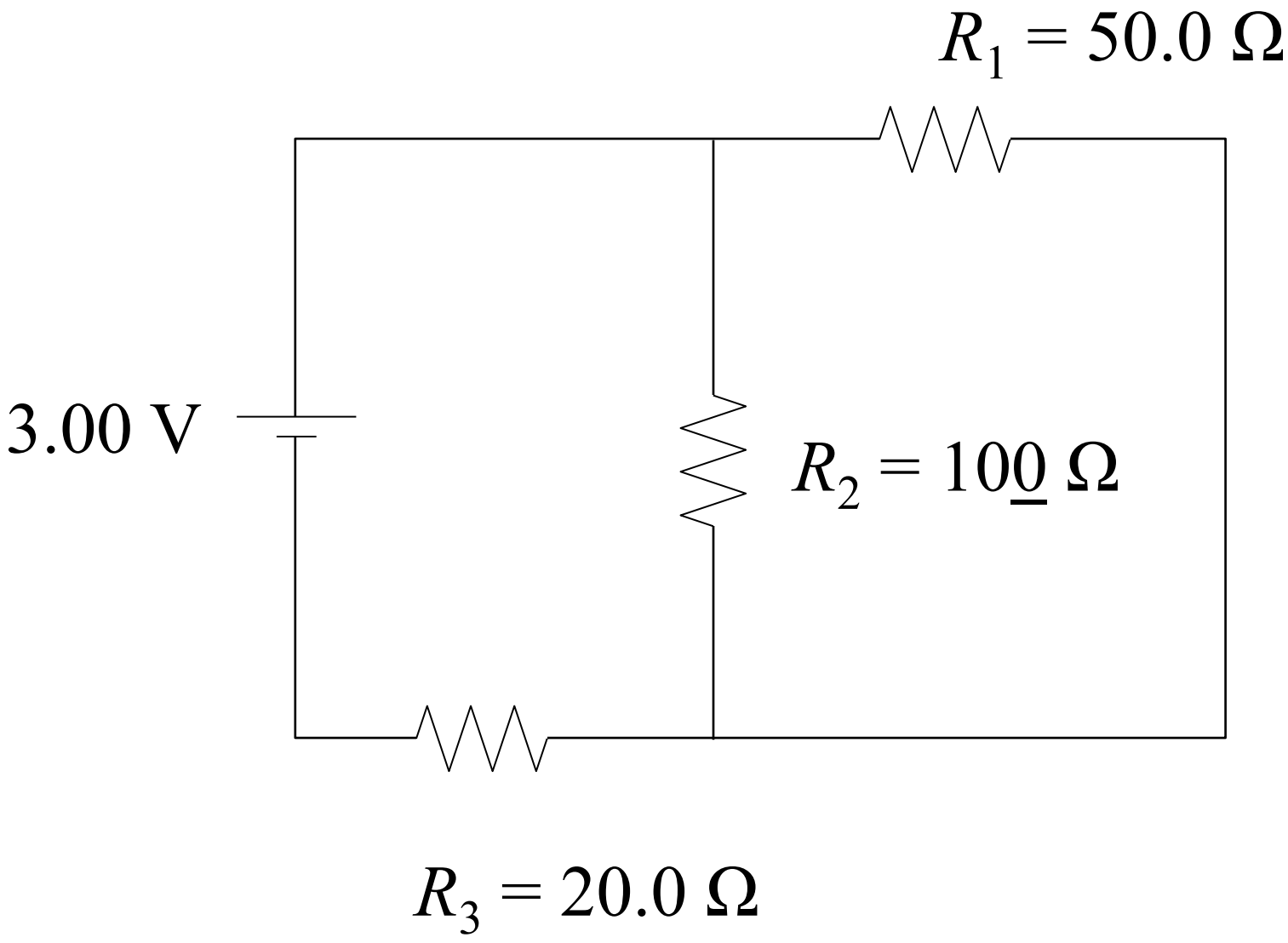


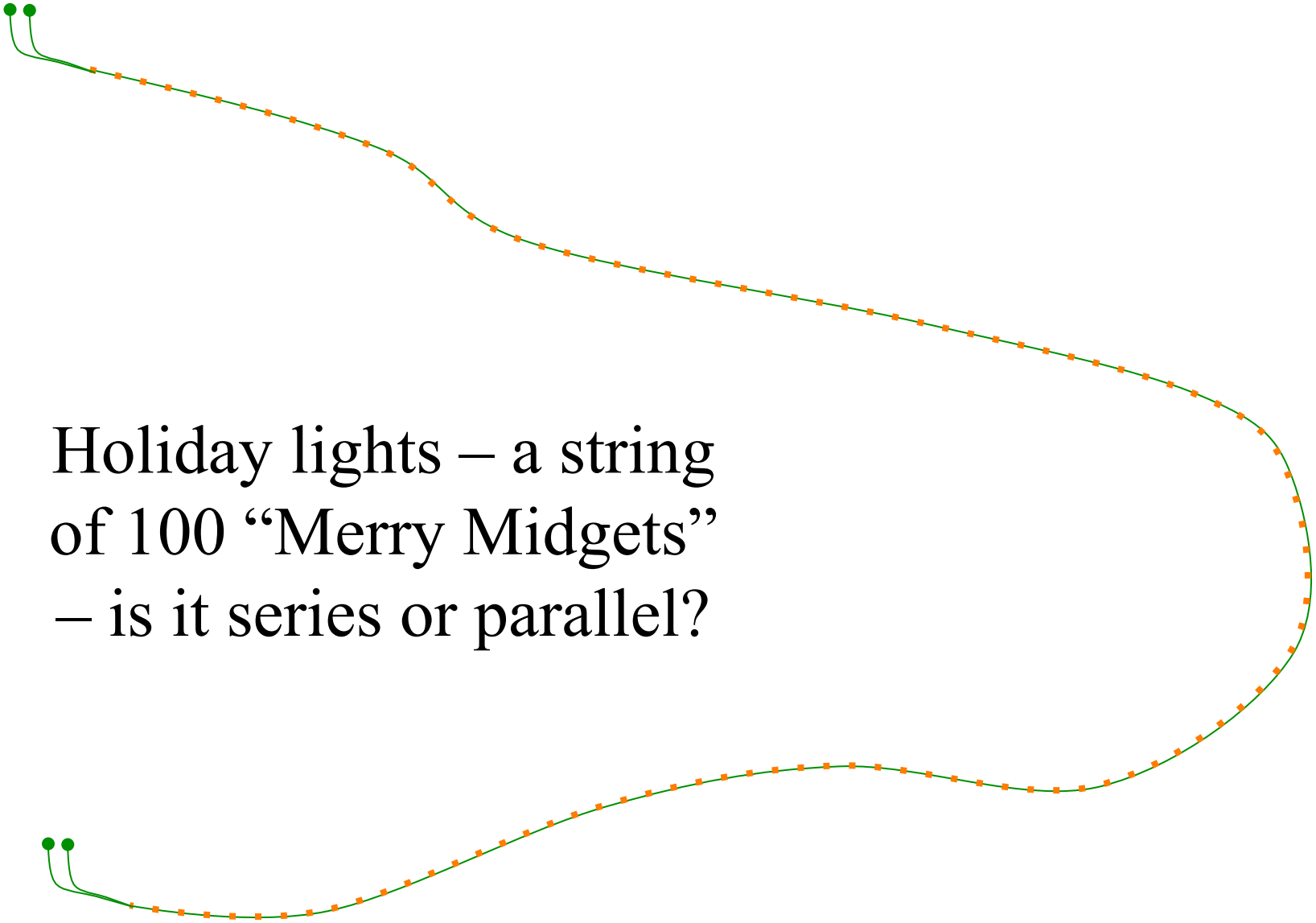




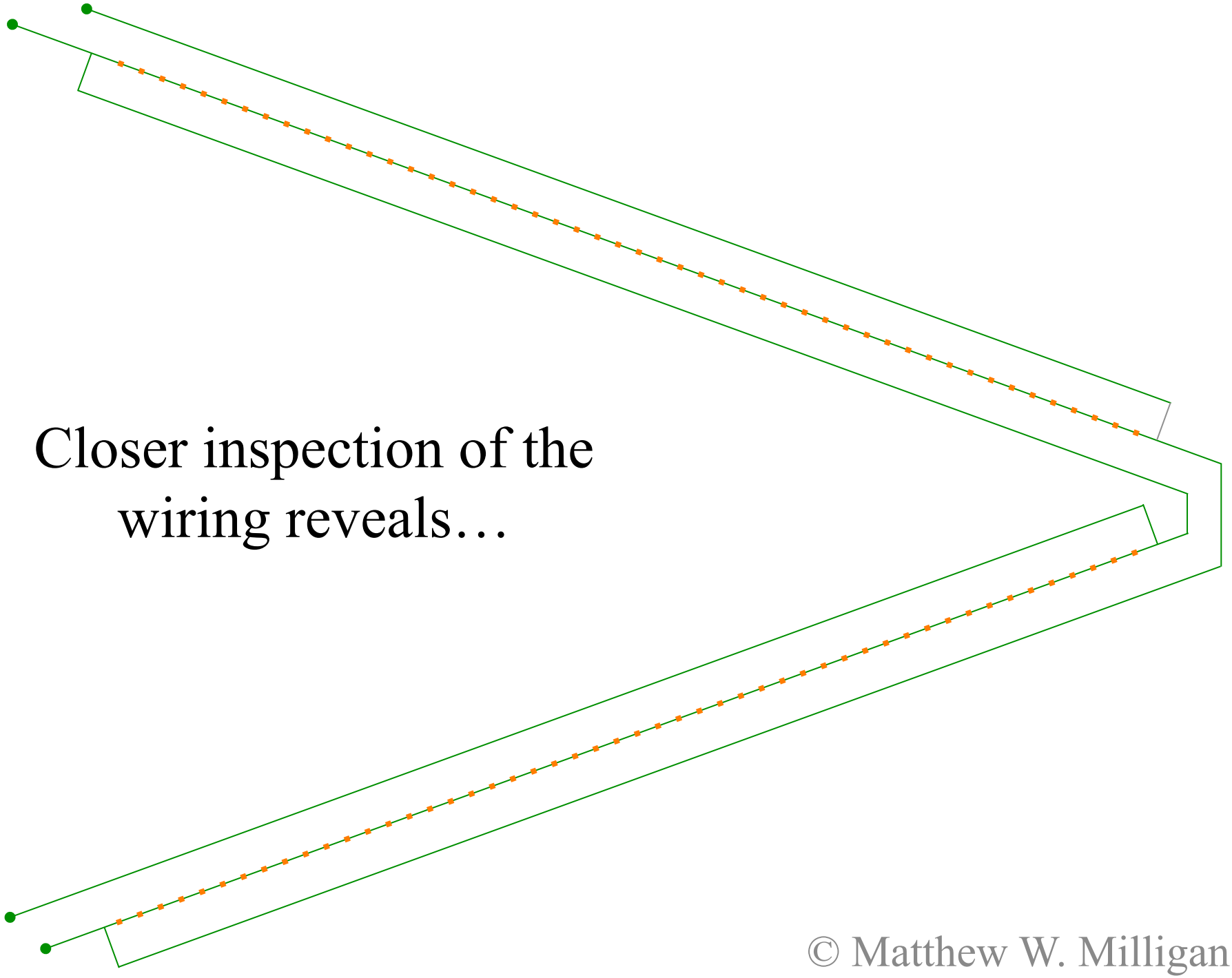






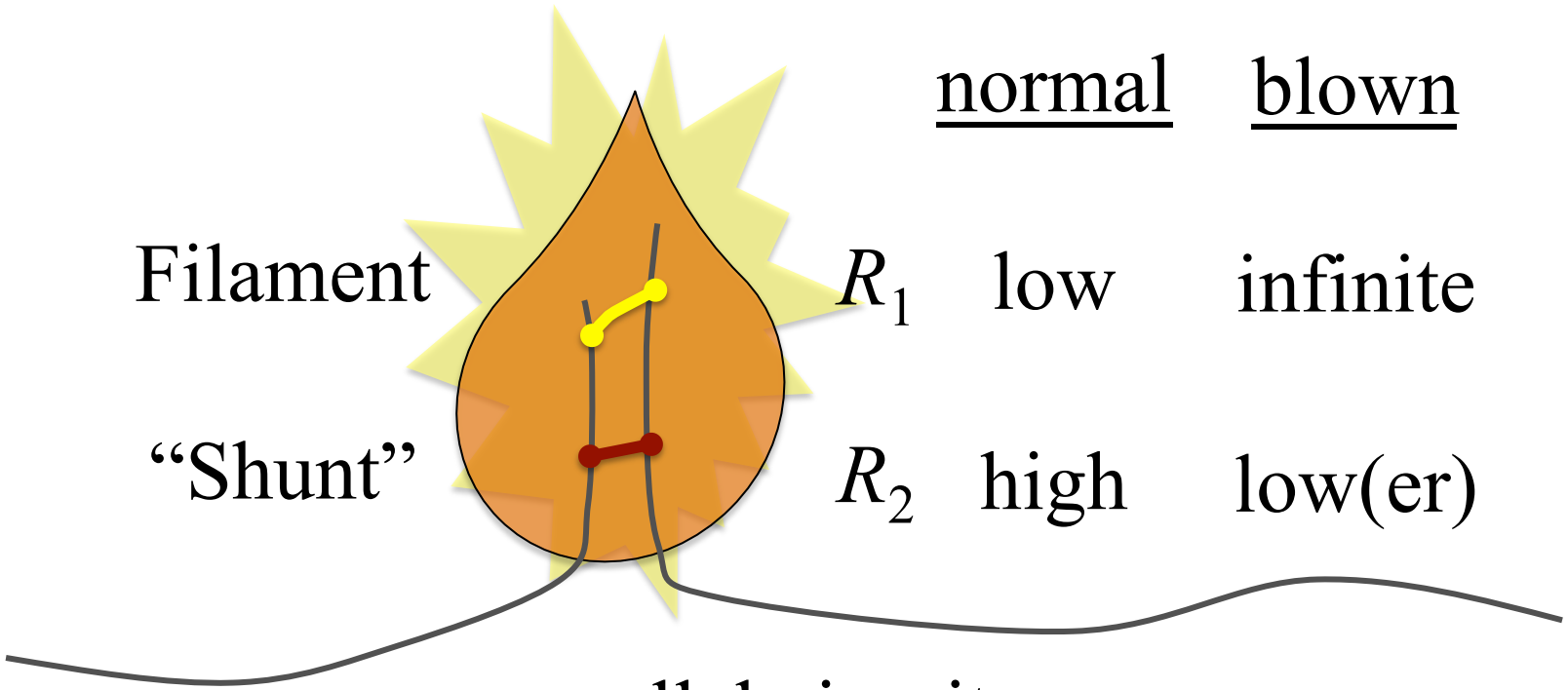


Holiday lights – a string of 100 “Merry Midgets” – is it series or parallel?

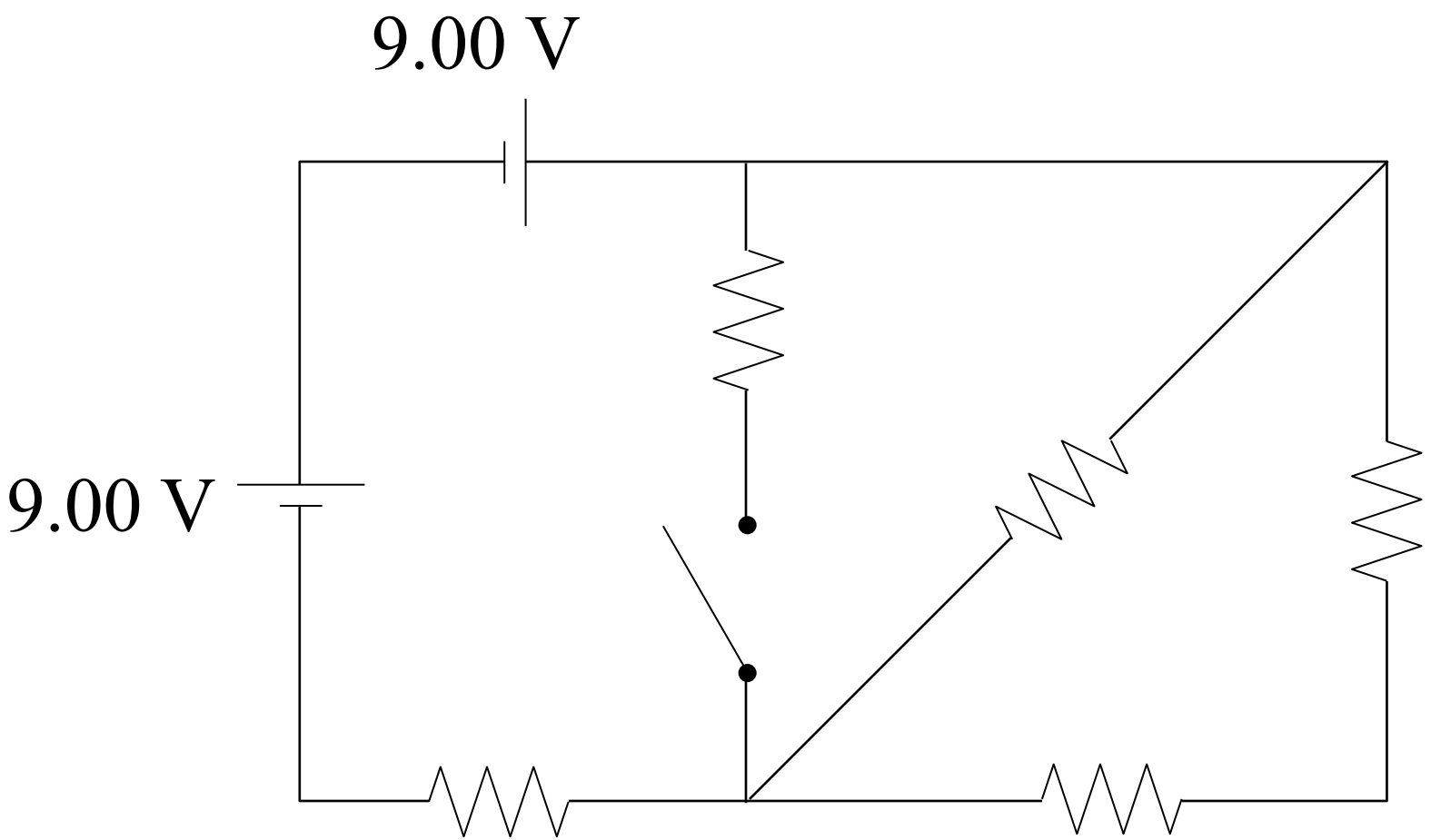


…two parallel sets of 50 bulbs in series!

But wait. Closer inspection of each bulb reveals…



…a parallel circuit within the bulb!



Each resistor in the circuit is 10.0 Ω. Determine the *change* in the power of the diagonal resistor when the switch is closed.