

Circuitry I

1. By how much is the resistance reduced if you change the circuitry of three $20\ \Omega$ resistors in series to three $20\ \Omega$ resistors in parallel?

Three $20\ \Omega$ resistors in Series $R = 60\ \Omega$

Three $20\ \Omega$ resistors in Parallel

$$\frac{1}{R_{eq}} = \frac{1}{20} + \frac{1}{20} + \frac{1}{20}$$

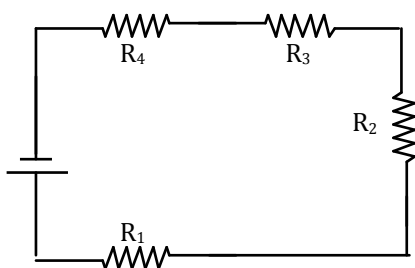
$$\frac{1}{R_{eq}} = \frac{3}{20}$$

$$R_{eq} = \frac{20}{3}$$

$$R_{eq} = 6.66\ \Omega$$

Resistance is reduced by $53.34\ \Omega$ if you change the circuitry from series to parallel.

2. The circuit below has a $24\ \text{V}$ battery connected to resistors $R_1 = 6\ \Omega$, $R_2 = 10\ \Omega$, $R_3 = 9\ \Omega$, $R_4 = 5\ \Omega$. Calculate the current and voltage through each resistor.



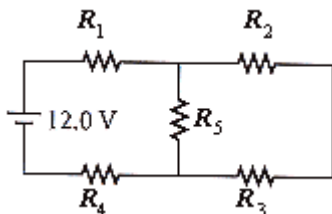
$$V_{tot} = 24\ \text{V}$$

$$R_{eq} = 30\ \Omega$$

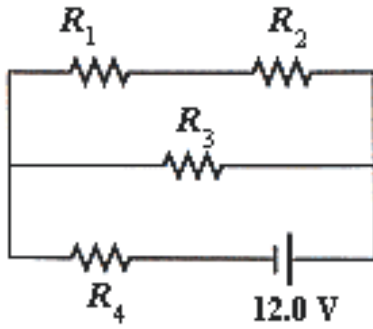
$$I_{eq} = 0.80\ \text{A}$$

Resistor	Resistance(Ω)	Current (A)	Voltage(V)
R_1	6	0.8	4.8
R_2	10	0.8	8.0
R_3	9	0.8	7.2
R_4	5	0.8	0.4

3. Re-draw the schematic diagram below, and then find the equivalent resistance of the circuit. Let $R_1 = 8.0\ \Omega$, $R_2 = 6.0\ \Omega$, $R_3 = 7.0\ \Omega$, $R_4 = 6.0\ \Omega$ and $R_5 = 4.5\ \Omega$. (Your answer should be between $15 - 20\ \Omega$)



4. Four resistors are connected to a battery with a terminal voltage of 12.0 V, as shown in the figure below. Assume that $R_1 = 30.0\ \Omega$, $R_2 = 80.0\ \Omega$, $R_3 = 100.0\ \Omega$ and $R_4 = 15.0\ \Omega$)



- (a) Redraw the circuit
- (b) Determine the equivalent resistance and the net current in the circuit. (Your answer should be between 50 – 70 Ω , and 0 – 1 A, respectively.)
- (c) Determine the potential difference in the 30 Ω resistor. (Your answer should be between 2 – 3 V)