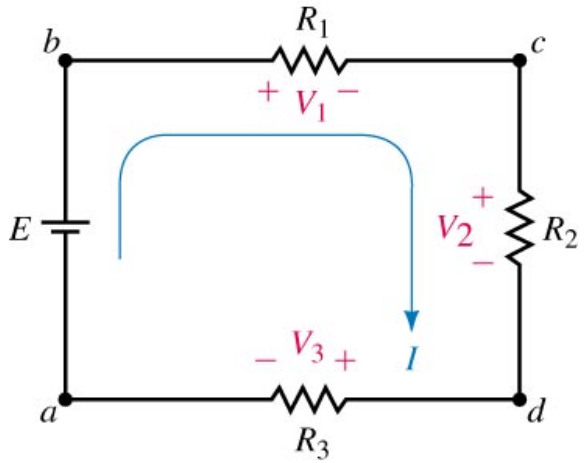
Series and Parallel Duality

Series



I is the same through E, R_1,R_2,R_3

Total Resistance: $R_T = R_1 + R_2 + R_3$

$KVL:\quad \Sigma V_{\text{closed loop}} = 0$

$\Sigma E_{rise} = \Sigma V_{drop}$

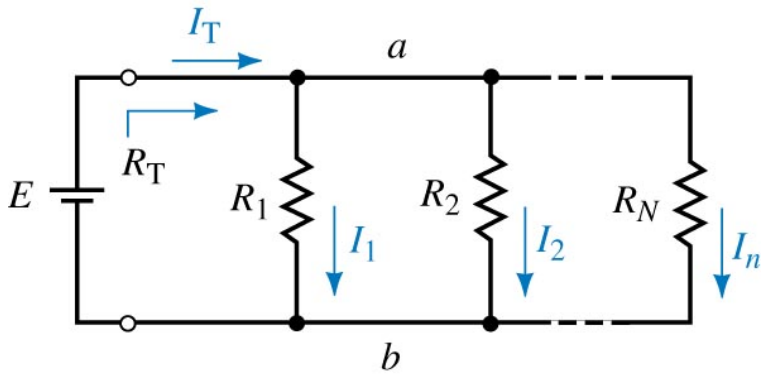
$E = V_1 + V_2 + V_3$

Voltage Divider $\quad V_x = E\dfrac{R_x}{R_T}$

R_T is the total resistance for the resistors/components that are in series.

E is the total voltage of the resistors/components that are in series.

Parallel



Voltage is the same across E, R_1,R_2,$\cdots$,R_N

Total Resistance: $R_T = \dfrac{1}{\dfrac{1}{R_1} + \dfrac{1}{R_2} + \cdots + \dfrac{1}{R_N}}$

$KCL:\quad \Sigma I_{node_a} = 0$

$\Sigma I_{in} = \Sigma I_{out}$

$I_T = I_1 + I_2 + \cdots + I_n$

Current Divider $\quad I_x = I_T\dfrac{R_T}{R_x}$

R_T is the total resistance for the resistors/components that are in parallel.

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