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

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

$E = V_1 + V_2 + V_3$

Voltage Divider $V_x = E \frac{R_x}{R_T}$

$R_T$ 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 $E$, $R_1, R_2, \ldots, R_N$

Total Resistance: $R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \ldots + \frac{1}{R_N}}$

**KCL:** $\Sigma I_{\text{node}_a} = 0$

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

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

Current Divider $I_x = I_T \frac{R_T}{R_x}$

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