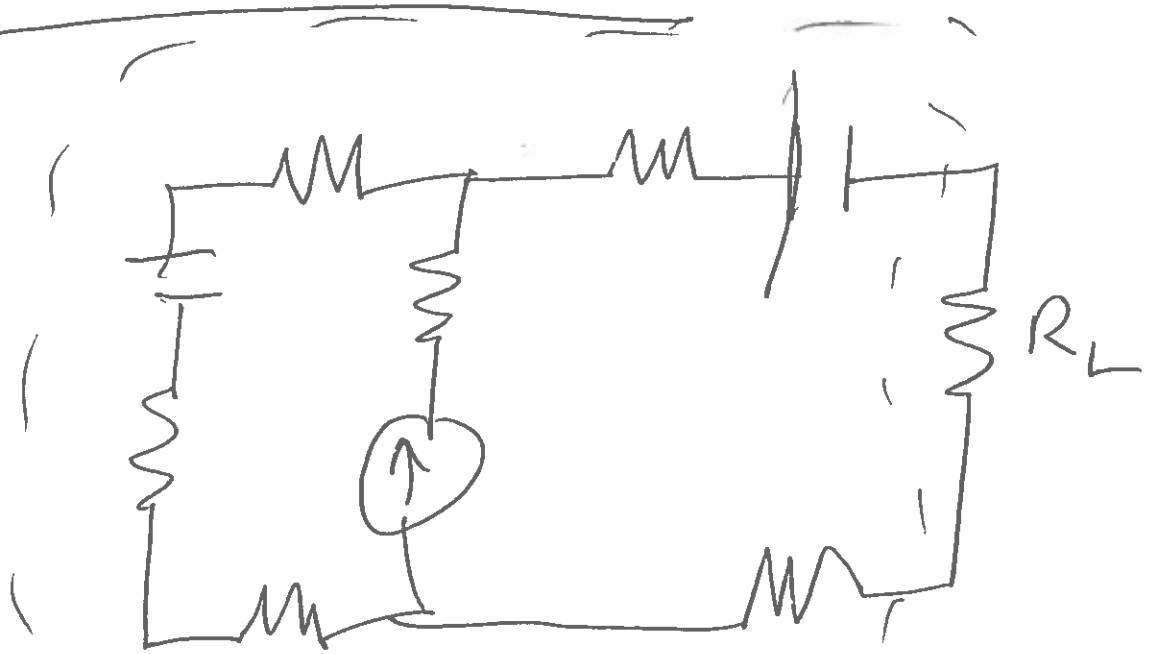
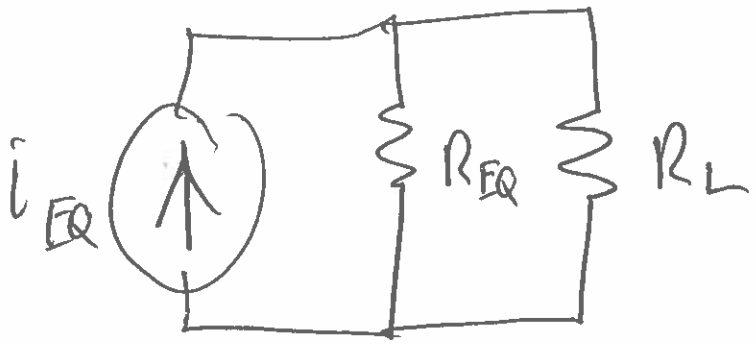
EQUIVALENT CIRCUITS



Load resistance

V_{RL}, I_L is unchanged



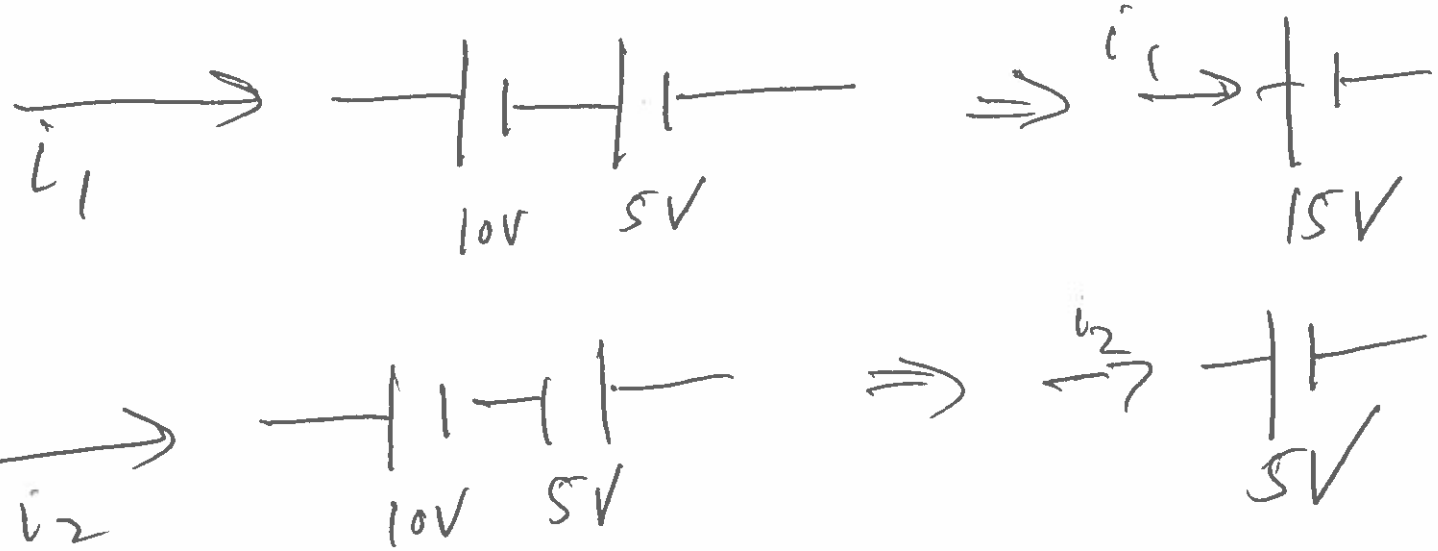
1) Simplify Series resistances and Parallel resistances

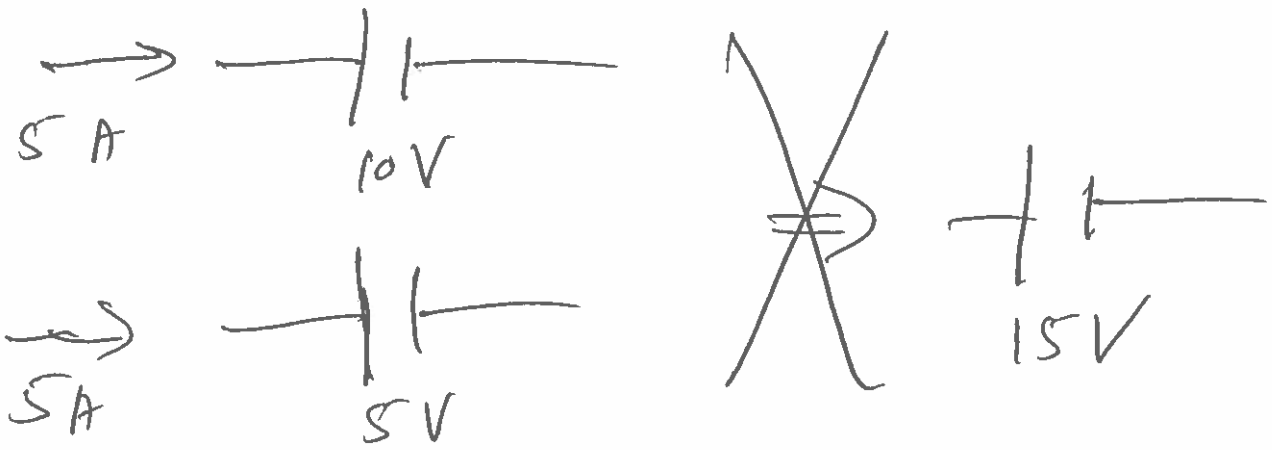
$$R_{series} = R_1 + R_2 + \cdots R_{sn}$$

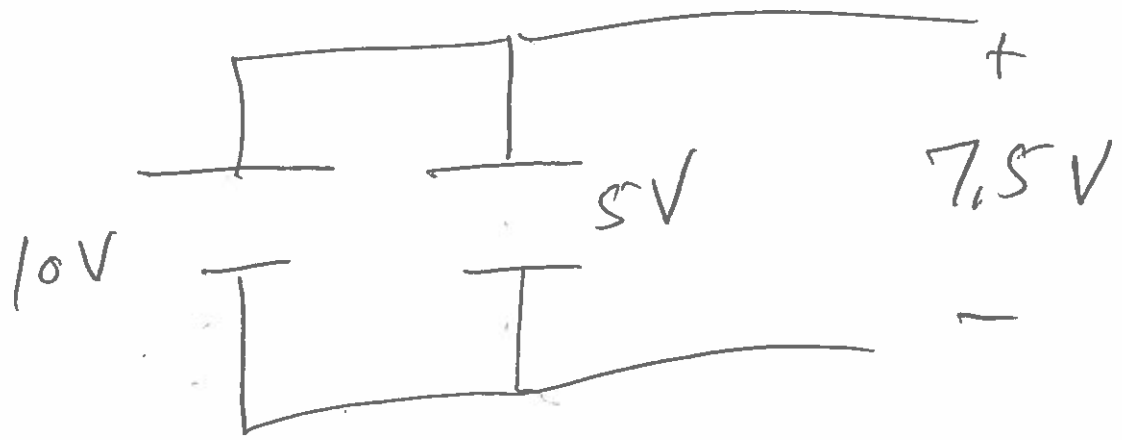
$$R_{parallel} \Rightarrow \frac{1}{R_{Parallel}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_{pn}}$$

Adding components to simplify circuits

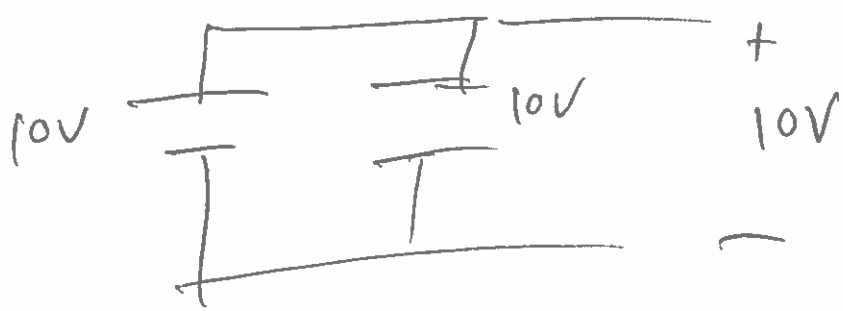
1) if current is common you can add Voltage components observing polarity



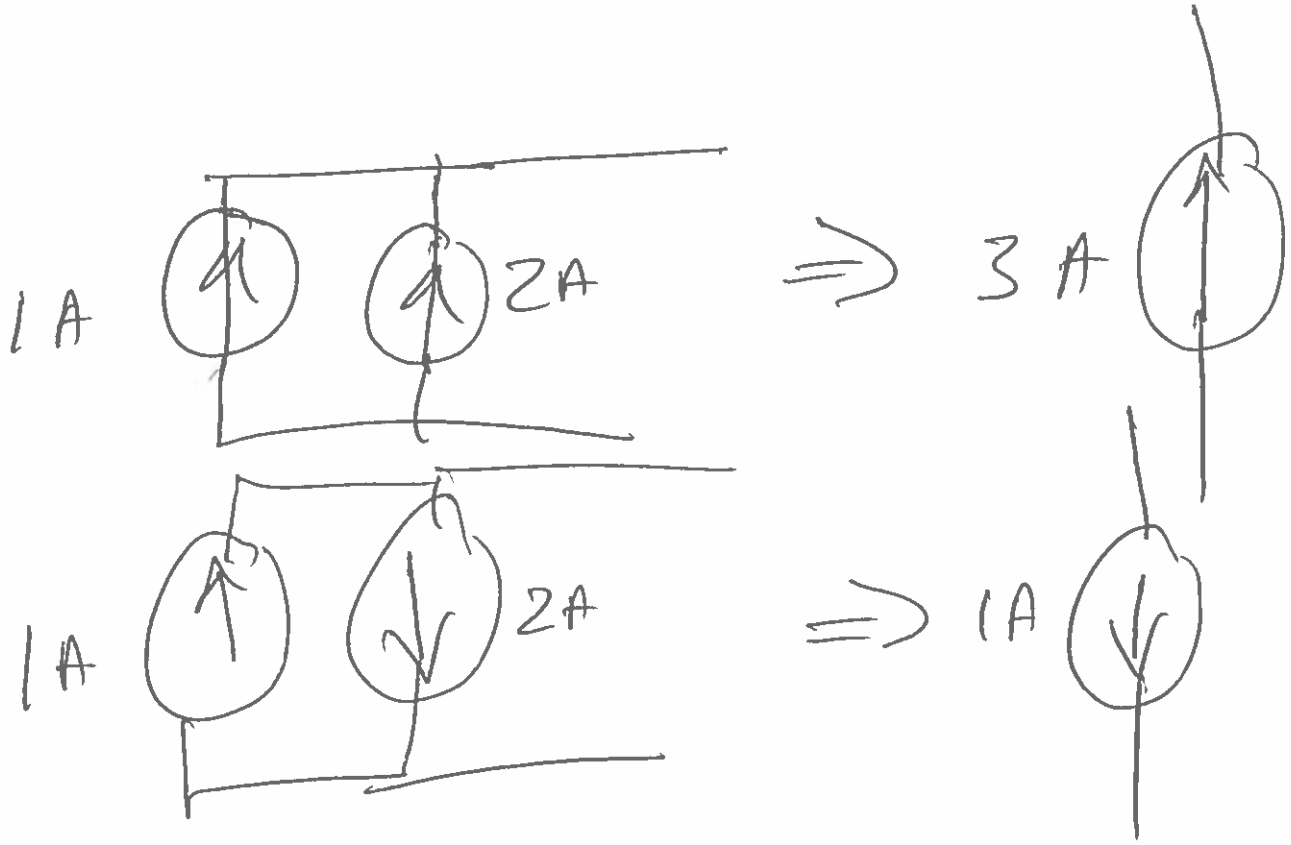

5 A
10 V
5A
5 V
15 V

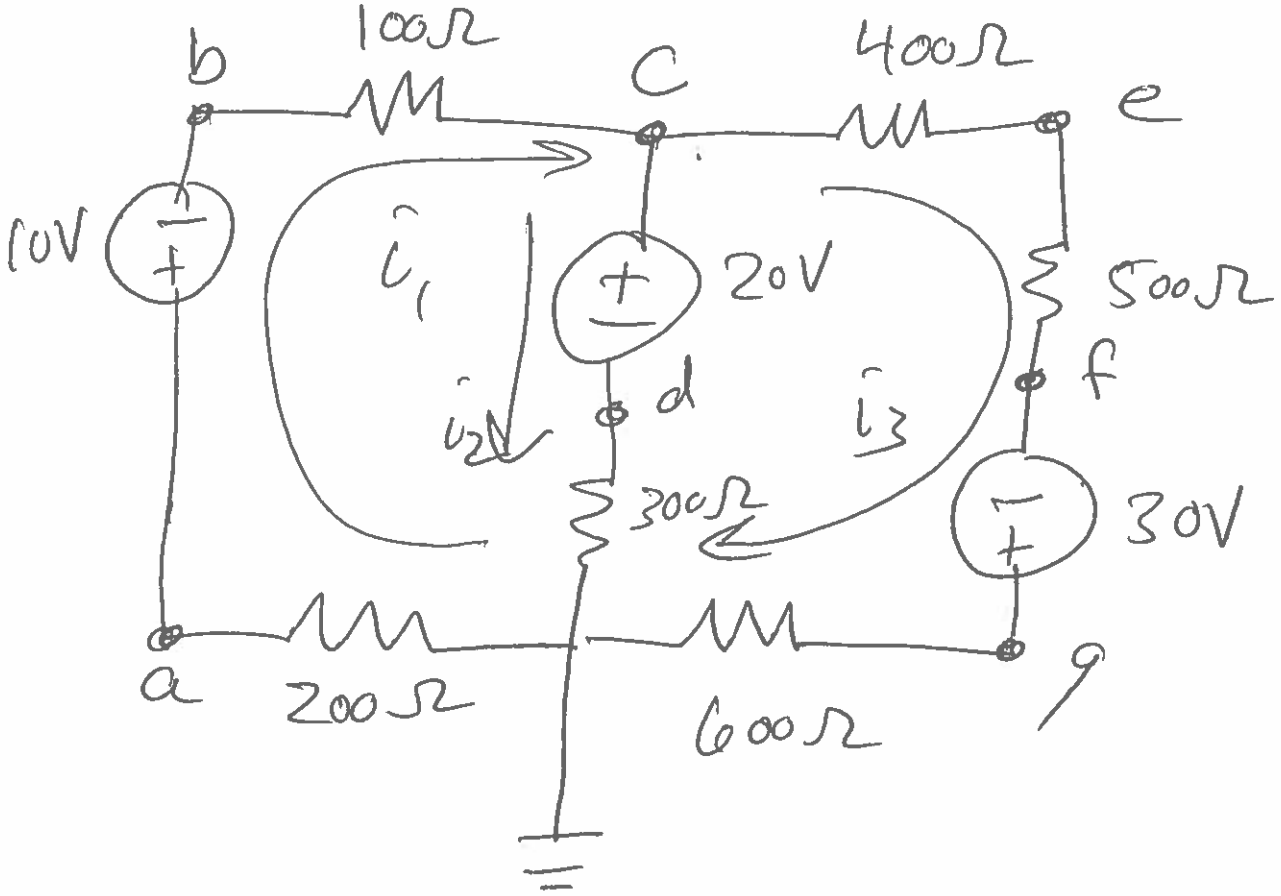

+
5 V
7,5 V
10 V
−


10 V
5 V
15 V


10 V
10 V
+
10 V
−

2) current objects can be added in parallel if voltage across is same





at c

$$i_1 = i_2 + i_3$$

Left loop start a clockwise

$$-10V - i_1(100\Omega) - 20V - i_2(300\Omega) - i_1(200\Omega) = 0$$

Right loop start c clockwise

$$-i_3(400\Omega) - i_3(500\Omega) + 30V - i_3(600\Omega) + i_2(300\Omega) + 20V = 0$$

$$i_1 - i_2 - i_3 = 0$$

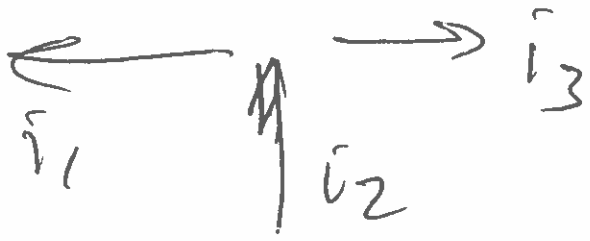
$$i_1(200\Omega + 100\Omega) + i_2(300\Omega) = -(20V + 10V)$$

$$i_2(300\Omega) - i_3(400\Omega + 500\Omega + 600\Omega) = -(30V + 20V)$$

$$i_1 = -0.039394\ A = -39.4\ mA$$

$$i_2 = -0.060606\ A = -60.6\ mA$$

$$i_3 = +0.021212\ A = +21.2\ mA$$



$$V_{ac} = -10V - i_1(100\Omega)$$

$$= -10V - (-.0394\ A)(100\Omega)$$

$$= -10V + 3.94V = -6.06V$$

$$V_{a \to c_2} = + i_1(200\Omega) + i_2(300\Omega) + 20V$$

$$= \left(-(0.0394A)(200\Omega) \right) + \left(-(0.0606A) \right)(300\Omega)$$

$$+ 20V$$

$$- \quad 7.8V - 18.18V + 20V$$

$$- 6.02V$$