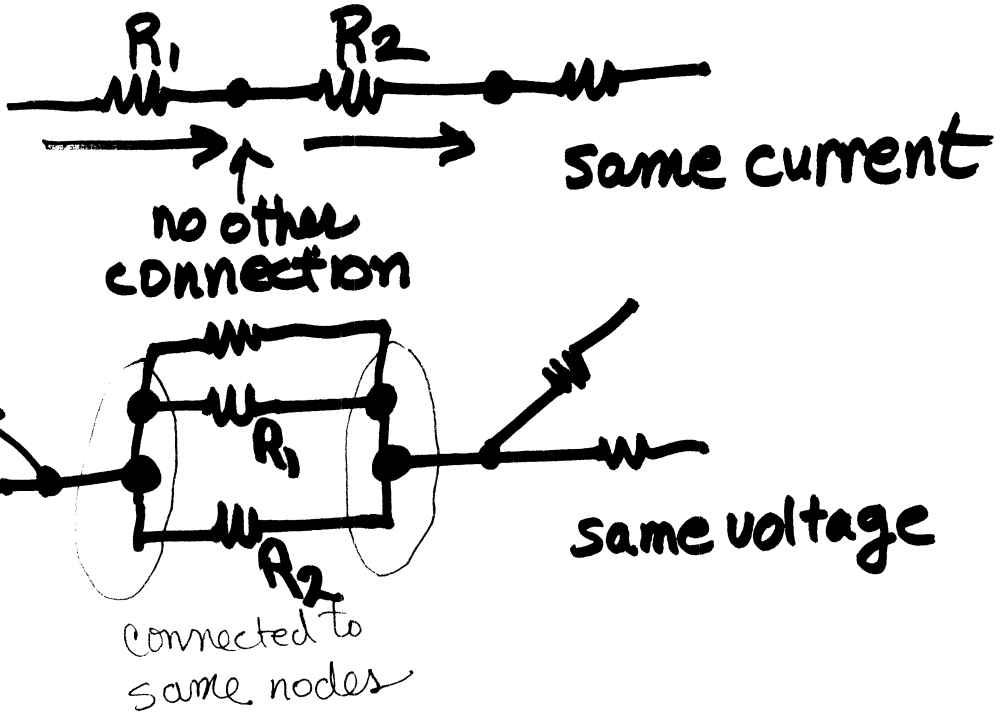
Series resistance

Parallel resistance

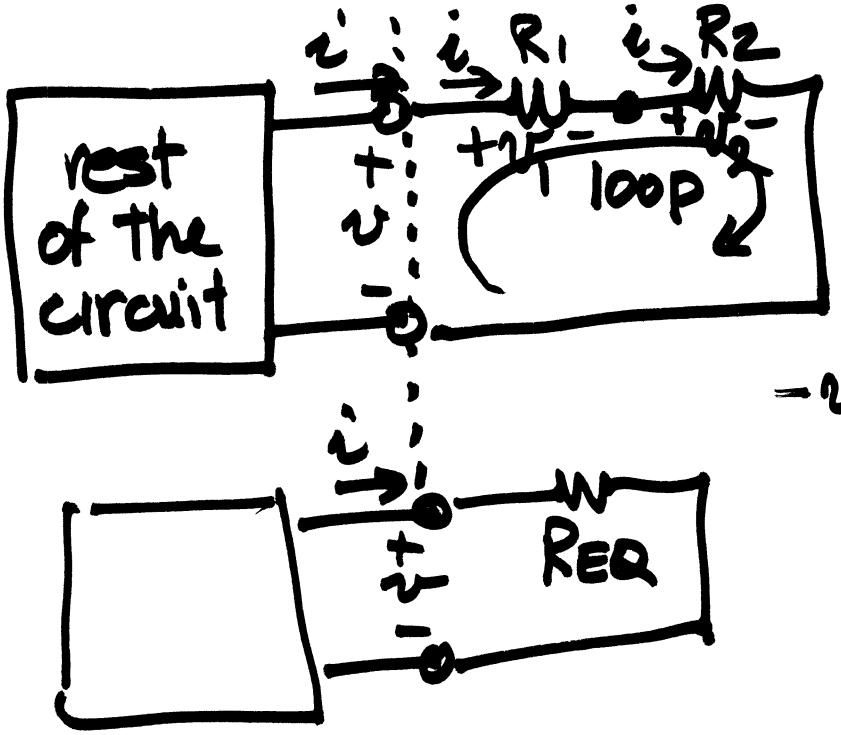


Simplify circuits

series: $R_{EQ} = R_1 + R_2$

parallel: $\frac{1}{R_{EQ}} = \frac{1}{R_1} + \frac{1}{R_2}$

equivalent resistance (series)



$v_1 = iR_1$

$v_2 = iR_2$

KVL $\circlearrowright \sum v = 0$

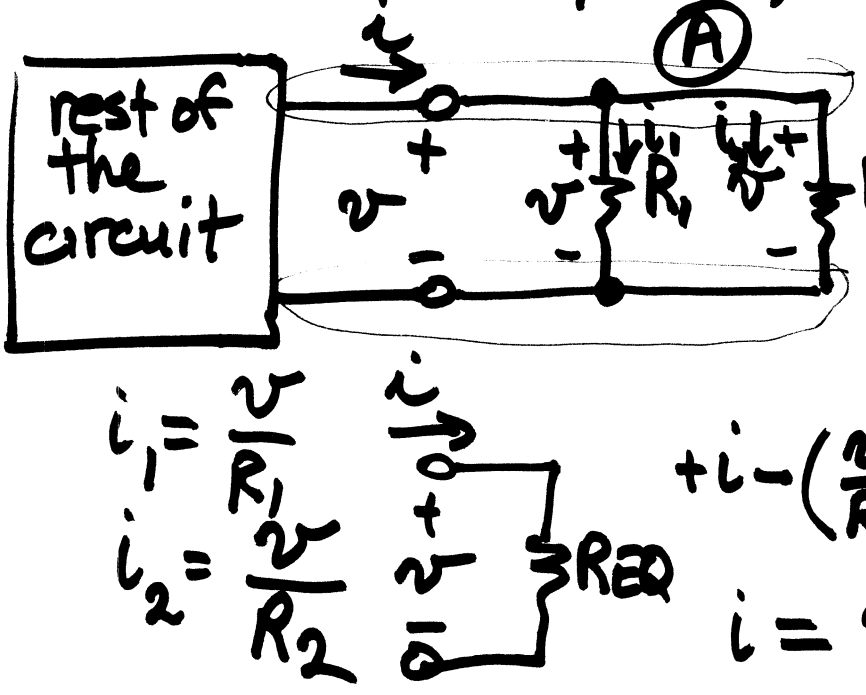
$-v + v_1 + v_2 = 0$

$-v + iR_1 + iR_2 = 0$

$v = i(R_1 + R_2)$

$v = i R_{EQ}$

Equivalent resistance (parallel)



KCL uppernode

$\sum i = 0$ (A)

$+i_n$

$+i - i_1 - i_2 = 0$

$i_1 = \frac{v}{R_1}$

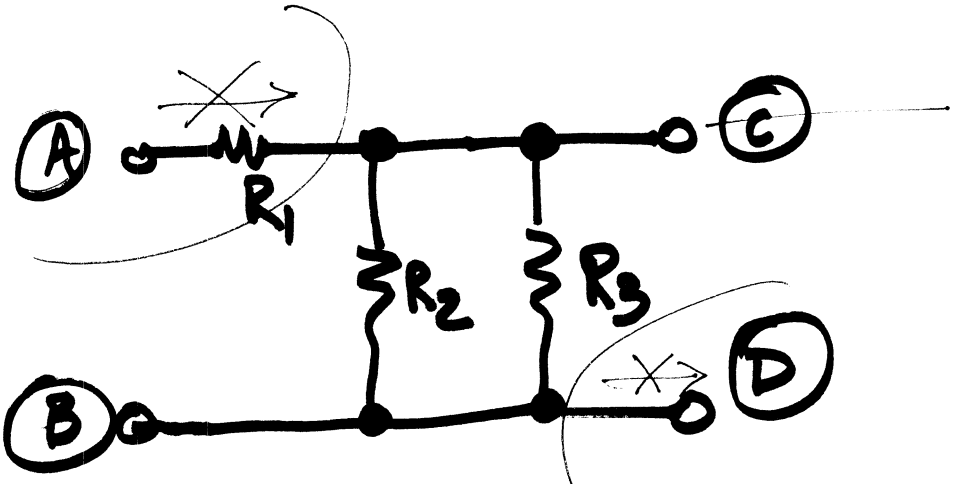
$i_2 = \frac{v}{R_2}$

$+i - \left(\frac{v}{R_1}\right) - \left(\frac{v}{R_2}\right) = 0$

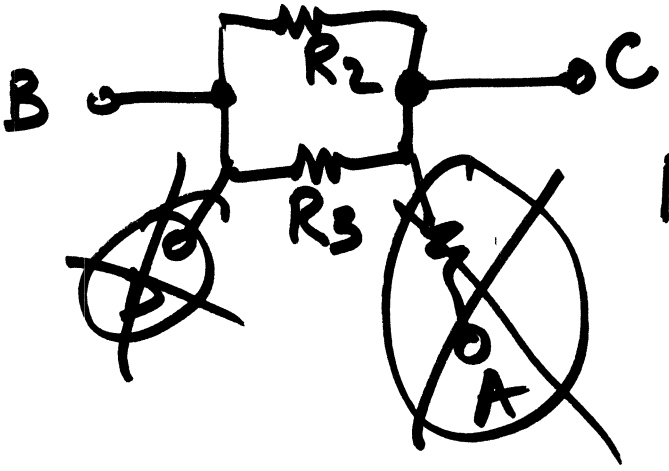
$i = v\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

$i = \frac{v}{R_{EQ}}$ $\quad \frac{1}{R_{EQ}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$

$R_{EQ} = \frac{R_1 R_2}{R_1 + R_2}$

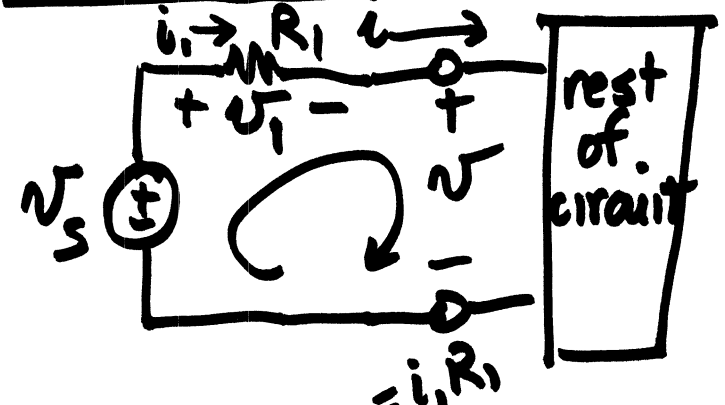


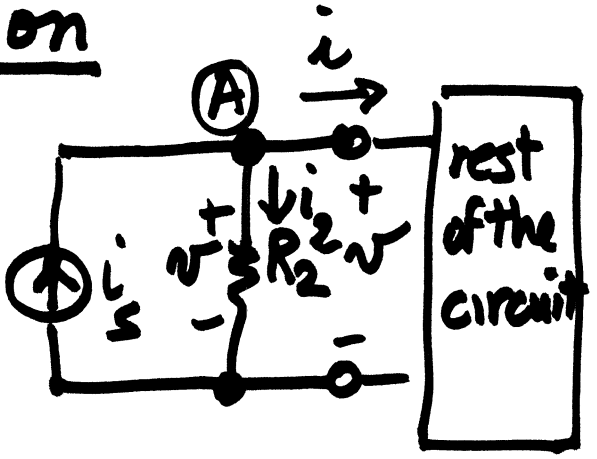
Resistance between C - B



$$R_{EQ} = \frac{R_2 R_3}{R_2 + R_3}$$

Source Transformation





KVL $-v_s + v_1 + v = 0$ $\quad v_1 = iR_1$

$-v_s + iR_1 + v = 0$

$v = v_s - iR_1$

@A $\sum i = 0$ $\quad i_2 = \frac{v}{R_2}$

$+i_s - i_2 - i = 0$

$+i_s - \frac{v}{R_2} - i = 0$

$v = (i_s - i)R_2$

$v = i_s R_2 - iR_2$

require

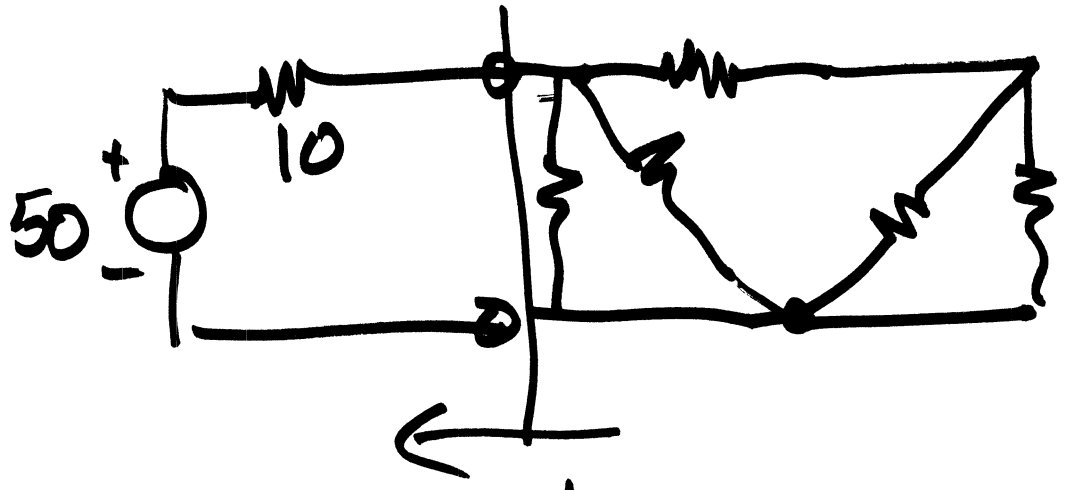
$v_s = i_s R_2$

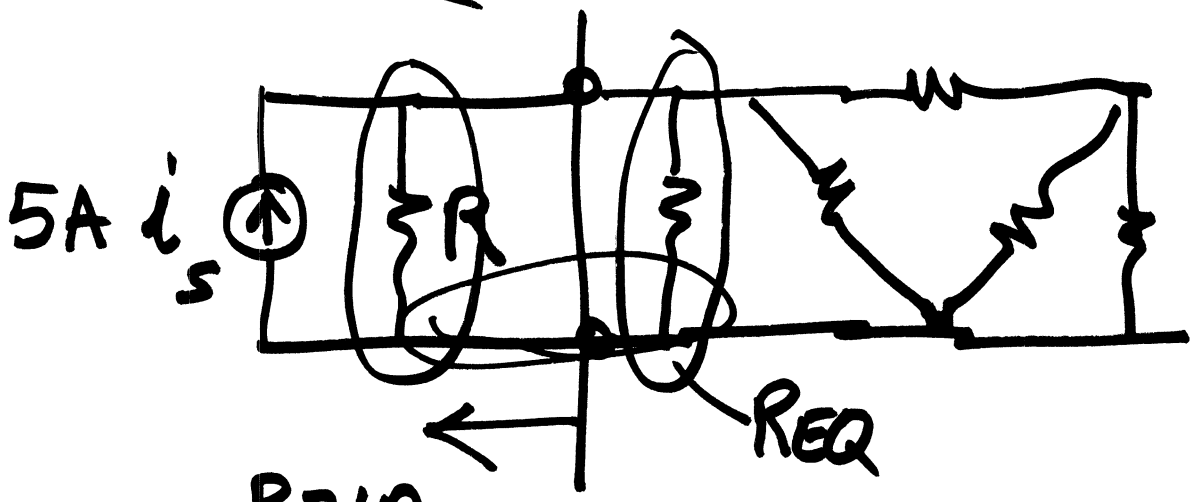
$R_1 = R_2$

$iR_1 = v_s - v$

$i = \frac{v_s}{R_1} - \frac{v}{R_1}$

$i_s = \frac{v_s}{R}$





$R = 10$

$$i_s = \frac{v}{R} = \frac{50}{10} = 5A.$$