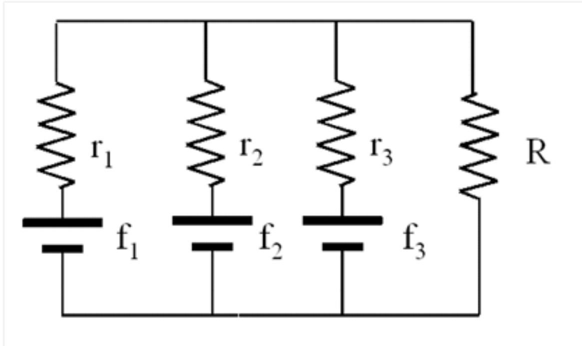
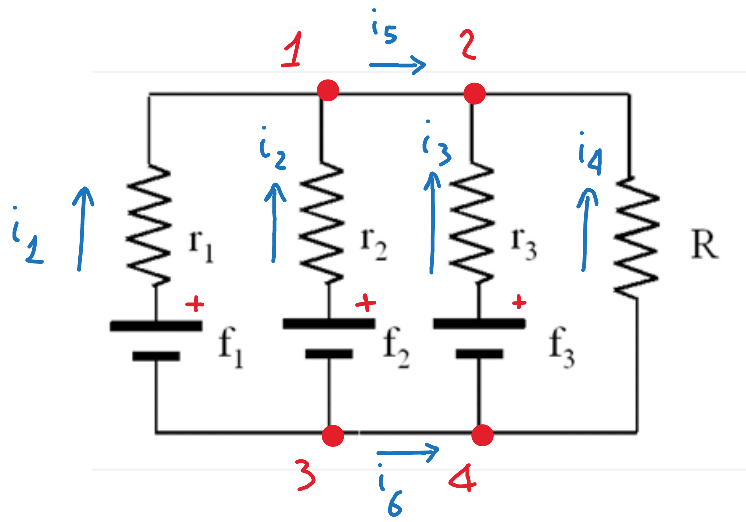
Tre generatori su una resistenza R

Determinare nel circuito mostrato in figura la corrente che scorre nella resistenza R e la corrente che scorre nel generatore più a destra.

(Dati del problema $R = 5\ \Omega$, $f_1 = 7\ V$, $r_1 = 1\ \Omega$, $f_2 = 10\ V$, $r_2 = 2\ \Omega$, $f_3 = 9\ V$, $r_3 = 3\ \Omega$,)



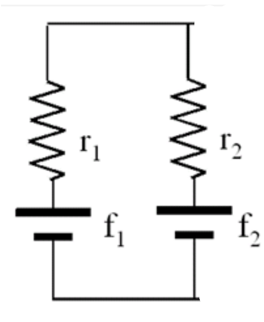
(1) First we identify the junctions and the meshes



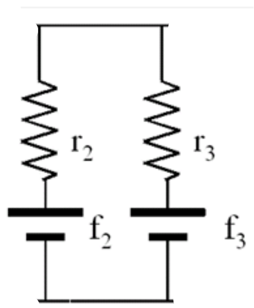
• Junction: point of connection of three or more branches.

Mesh: closed loop of circuit not divisible into smaller meshes

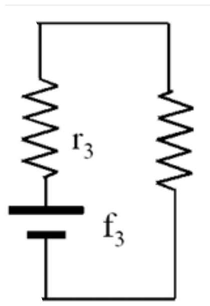
First Mesh



Second Mesh



Third Mesh



(2) Retrieve from N junctions N-1 linearly independent equations (up to now the direction of the currents is arbitrary set)

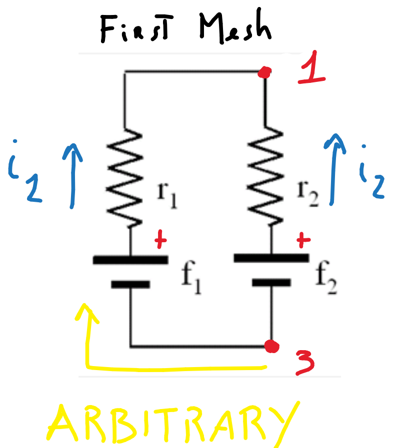
Junction 1: $i_1 + i_2 - i_5 = \emptyset$

Junction 2: $i_3 + i_4 + i_5 = \emptyset$

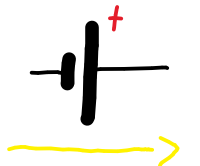
Junction 3: $-i_1 - i_2 - i_6 = \emptyset$

the equation for junction 4 is linearly DEPENDENT

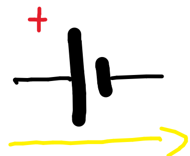
Then we need to apply KVL for each mesh of the circuit (3 equations more)



Remember



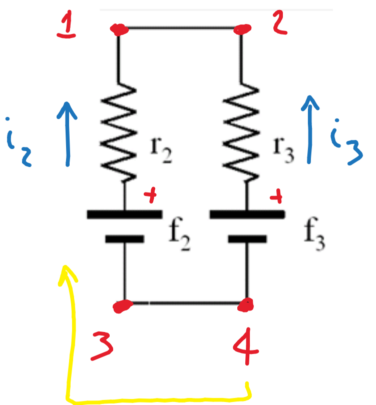
POSITIVE



NEGATIVE

$$\underbrace{R_1 i_1 - R_2 i_2}_{\text{first Turn I neglect the generators}} = \underbrace{+ f_1 - f_2}_{\text{second Turn i neglect the resistors}}$$

Second Mesh

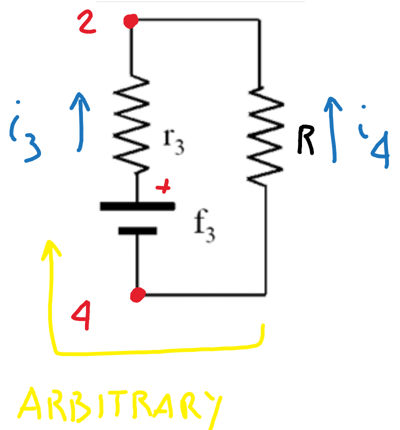


$$\underbrace{R_2 i_2 - R_3 i_3}_{\text{first Turn}} = \underbrace{+ f_2 - f_3}_{\text{second Turn}}$$

first Turn: 43124

second Turn: 43124

Third Mesh



$$R_3 i_3 - R i_4 = f_3$$

NOW WE HAVE 6 EQUATIONS AND 6 VARIABLES

$$\begin{cases} i_1 + i_2 - i_5 = 0 \\ i_3 + i_4 + i_5 = 0 \\ -i_1 - i_2 - i_6 = 0 \\ R_1 i_1 - R_2 i_2 = + f_1 - f_2 \\ R_2 i_2 - R_3 i_3 = + f_2 - f_3 \\ R_3 i_3 - R i_4 = f_3 \end{cases}$$

linear system To solve for

$i_1, i_2, i_3, i_4, i_5, i_6$