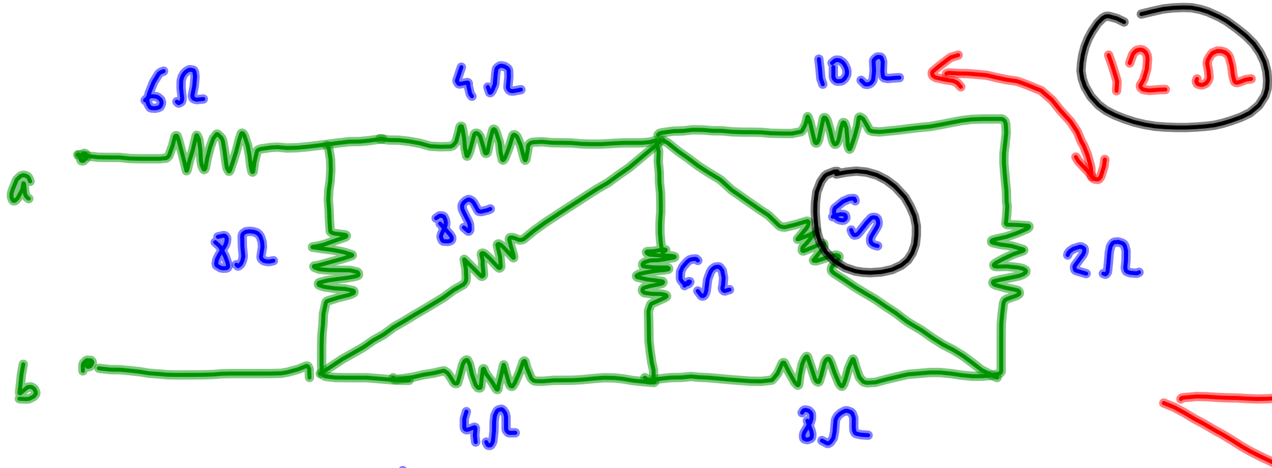
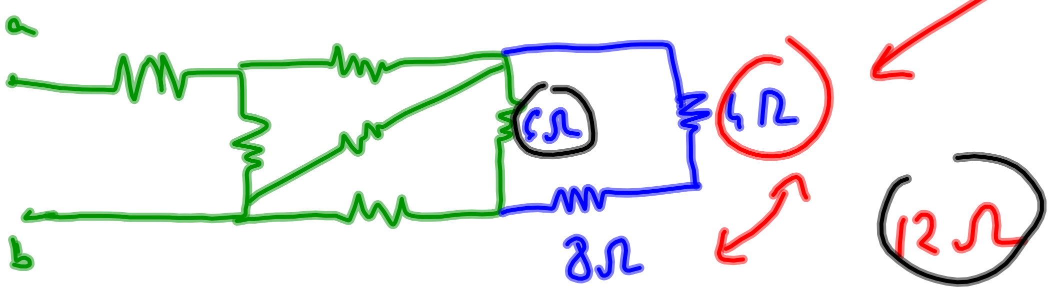
## Ex



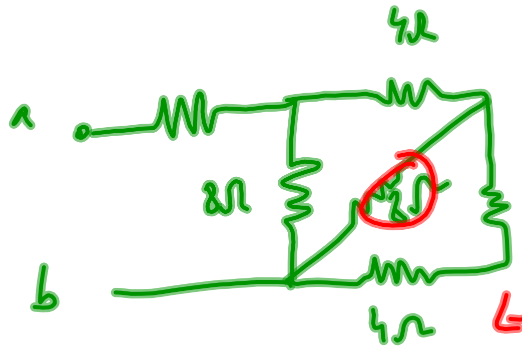

$$\frac{1}{R_{int.}} = \frac{1}{12} + \frac{1}{6}$$

$$R_{int_1} = 4\,\Omega$$




$$\frac{1}{R_{int}} = \frac{1}{6} + \frac{1}{12}$$

$$R_{int_2} = 4\,\Omega$$



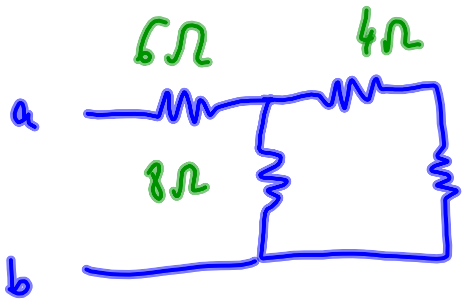

4 Ω

8 Ω

$$\frac{1}{R_{nt_3}} = \frac{1}{8} + \frac{1}{8}$$

$$R_{nt_3} = 4\ \Omega$$

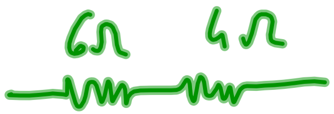
8Ω




4Ω

$$\frac{1}{R_{nt_4}} = \frac{1}{8} + \frac{1}{8}$$

$$R_{nt_4} = 4\Omega$$




$R_{eff} = 10\ \Omega$

# Magnetic field $\vec{B}$ [T]

[T] Nikola Tesla

So far we talked about $q$ & $\vec{E}$

Magnetism is also based on $q$. But there is a crucial point that distinguishes & relates electricity & magnetism:

The phenomena of magnetism involve

MOVING $q$ (electric charge).

$\vec{B}$ magnetic field

1) $\vec{B}$ is created at all points in space surrounding a current carrying wire

2) $\vec{B}$ at each point is a vector. Its magnitude is called magnetic field strength

3) $\vec{B}$ exerts force

$$\vec{F}_M = q\vec{v} \times \vec{B}$$

Remember $\vec{F}_E = q\vec{E}$

$$\boxed{\vec{F}_{\text{electromagnetic}} = q\vec{E} + q\vec{v} \times \vec{B}}$$

$\vec{v}$ velocity

The source of the magnetic field - moving charges

In case of a point charge

Biot - Savart law

$$\vec{B}_{\text{point charge}} = \left( \frac{\mu_0}{4\pi} \frac{q v \sin\theta}{r^2} , \text{ direction given by the right hand rule} \right)$$

$[T]$

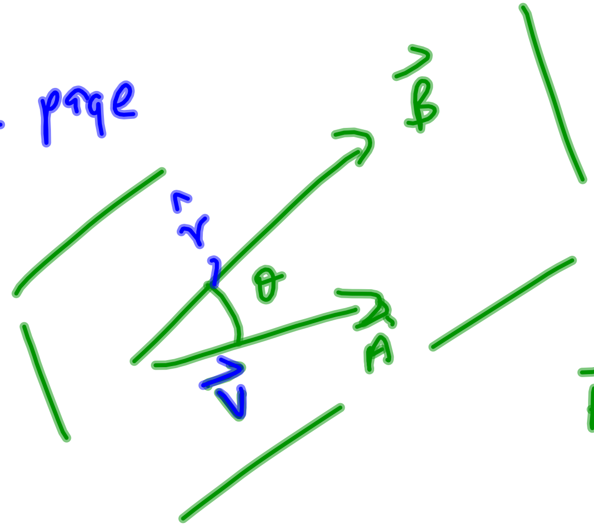
$\mu_0 = 4\pi \cdot 10^{-7}\ Tm/A$ is permeability constant

(similar to $\varepsilon_0$ permittivity constant)

$$\vec{B} = \frac{\mu_0}{4\pi}\frac{qv\sin\theta}{r^2} = \frac{\mu_0}{4\pi}\frac{q\vec{v}\times\hat{r}}{r^2}$$

$\odot$ out of the page

$\otimes$ in the page




plane

$$\vec{A}\times\vec{B} = AB\sin\theta$$

$$\vec{A}\times\vec{B} = -\vec{B}\times\vec{A}$$