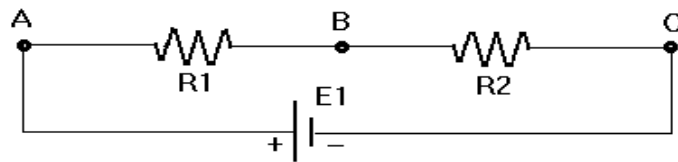


## IX. HUKUM KIRCHOFF

### Teori

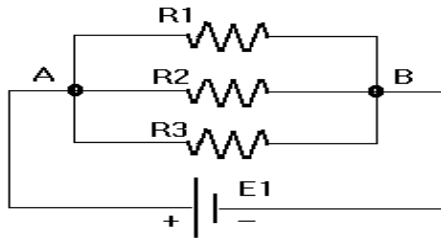
Analisa arus listrik (I) dan tegangan (E) → Kasus sederhana seri / paralel

Seri : →



$$I_{AB} = I_{BC} = I$$
$$E1 = I(R1 + R2)$$
$$R_{total} = R1 + R2$$

Paralel :

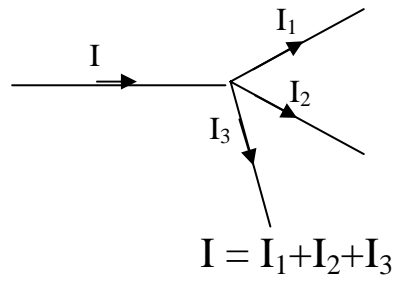


$$E_{R1} = E_{R2} = E_{R3}$$
$$I_{AB} = I_{R1} + I_{R2} + I_{R3}$$
$$\frac{1}{R_{total}} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

Analisa arus listrik (I) dan tegangan (E) → Kasus multiloop/kompleks → HKM Kirchoff

### HKM Kirchoff 1

“Pada setiap cabang, jumlah arus yang memasuki cabang sama dengan jumlah arus yang meninggalkan cabang tersebut”

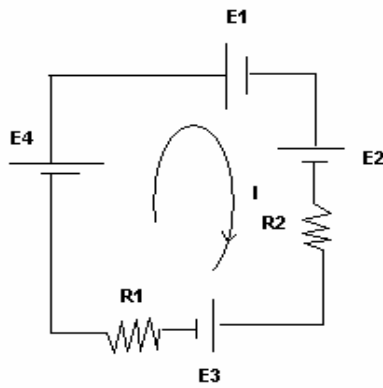


### HKM Kirchoff 2

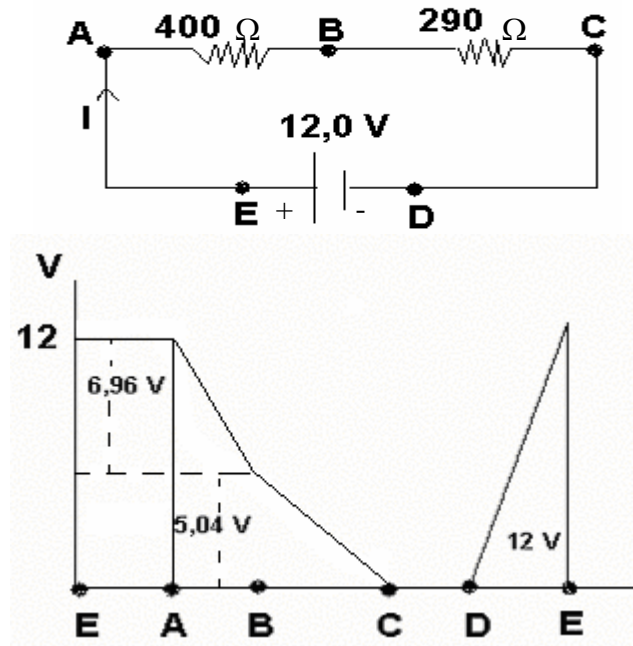
“Jumlah potensial (V) yang mengelilingi lintasan tertutup sama dengan nol”

$$\Sigma V_{\text{tertutup}} = 0$$

$$\Sigma E + \Sigma(I.R) = 0$$



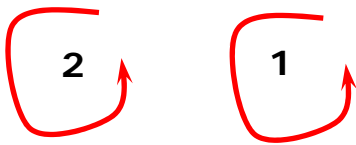
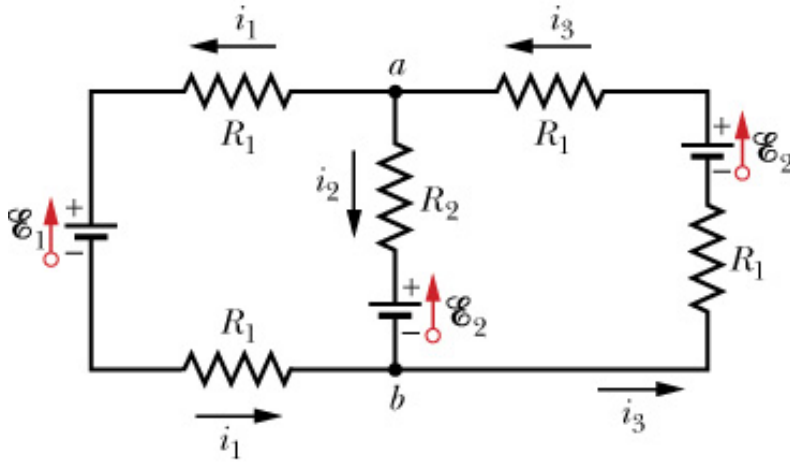
Dengan contoh sederhana



Penyelesaian masalah dengan Kirchoff

1. tanda + dan - untuk setiap sumber ggl E
2. tanda arus pada setiap cabang arah sembarang HKM  
Kirchoff 1
3. membagi loop → HKM Kirchoff 2
4. membuat arah loop → (berlawanan / searah jarum jam)
5. arus + → searah → arah loop,  
arus - → berlawanan → arah loop
6. Kutub ggl (+) → bertemu lebih dulu → ggl E  
→ +  
Kutub ggl (-) → bertemu lebih dulu → ggl E  
→ -
7. Solusi persamaan matematis :  
-Matriks  
-Substitusi

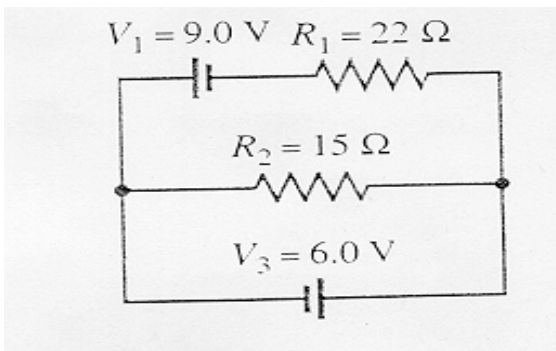
Contoh 1:



$$-I_3 R_1 - I_2 R_2 - E_2 - I_3 R_1 + E_2 = 0$$

$$-I_1 R_1 - E_1 - I_1 R_1 + E_2 + I_2 R_2 = 0$$

Contoh 2:



$$+6 - 15I_3 = 0$$

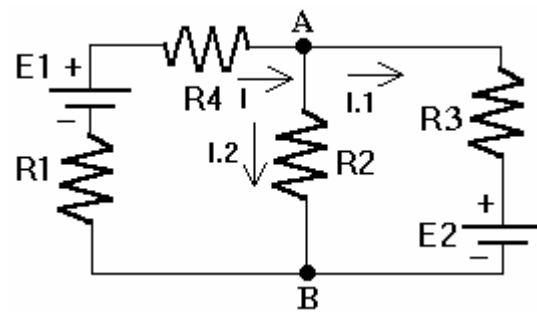
$$-22I_2 + 9 + 15I_3 = 0$$

$$I_3 = 6/15 = 0.40$$

$$I_2 = 15/22 = 0.68$$

$$I_1 = I_2 + I_3 = 1.08$$

Latihan :



Cari  $I$ ,  $I_1$ ,  $I_2$  !