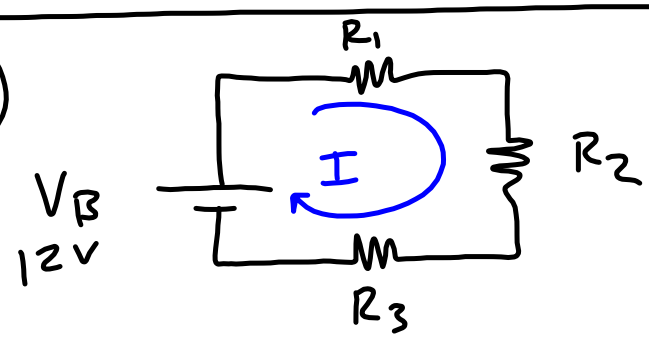
Series and Parallel Circuits

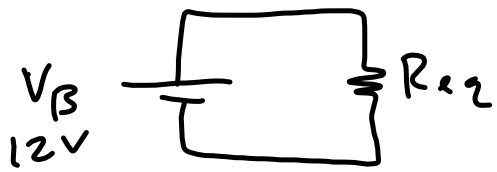
1)



$V_1 = IR_1 = (1.09A)(1\Omega) = 1.09V$

$V_2 = IR_2 = (1.09A)(4\Omega) = 4.36V$

$V_3 = IR_3 = (1.09A)(6\Omega) = 6.54V$



$R_{eq} = R_1 + R_2 + R_3$

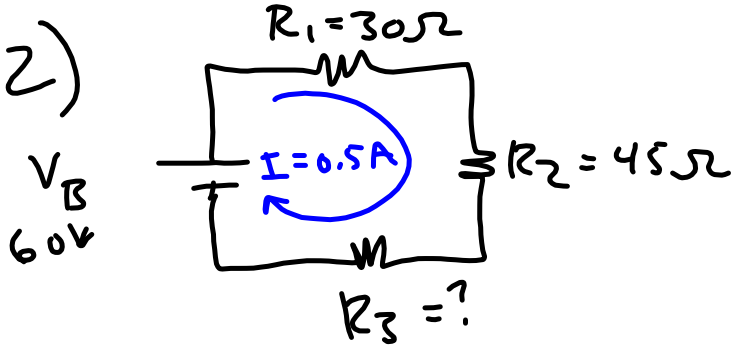
$= 1\Omega + 4\Omega + 6\Omega$

$= 11\Omega$

$I_{total} = \frac{V_B}{R_{eq}} = \frac{12V}{11\Omega} = 1.09A$

- Terms that are the same:
  - Electric potential
  - Voltage
  - Voltage drop
  - Potential difference

2)

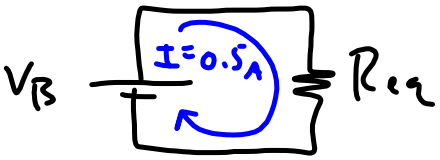


$R_{eq} = R_1 + R_2 + R_3$

$R_3 = R_{eq} - R_1 - R_2$

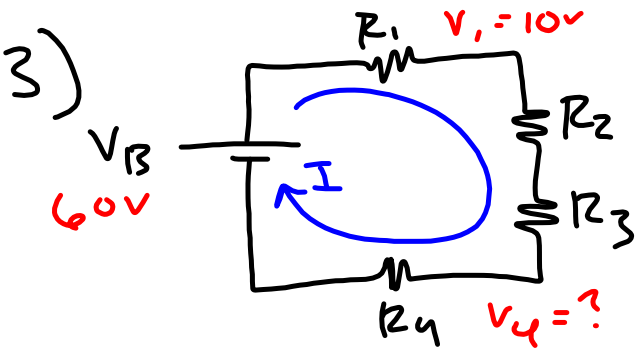
$= 120\Omega - 30\Omega - 45\Omega$

$= 45\Omega$



$R_{eq} = \frac{V_B}{I} = \frac{60V}{0.5A} = 120\Omega$

3)

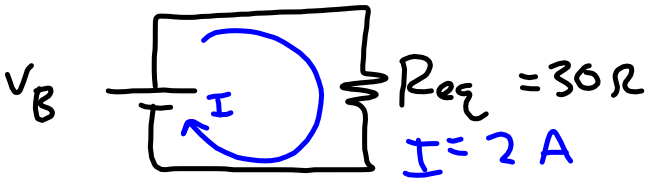


$V_B = V_1 + V_2 + V_3 + V_4$

$V_4 = V_B - V_1 - V_2 - V_3$

$= 60V - 10V - 16V - 14V$

$= 20\,V$



$V_B = I R_{eq}$

$= (2\,A)(30\,\Omega)$

$= 60\,V$

$R_1 = \frac{V_1}{I} = \frac{10\,V}{2\,A} = 5\,\Omega$

$R_2 = \frac{V_2}{I} = \frac{16\,V}{2\,A} = 8\,\Omega$

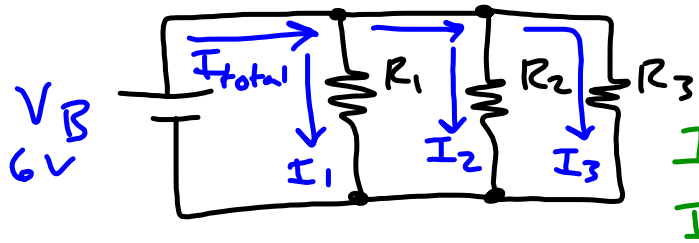
$R_3 = \frac{V_3}{I} = \frac{14\,V}{2\,A} = 7\,\Omega$

$R_4 = \frac{V_4}{I} = \frac{20\,V}{2\,A} = 10\,\Omega$

$30\,\Omega$ ✓

- Parts connected in SERIES
  - Same current through each part
  - V determined by $V = IR$
- Parts connected in PARALLEL
  - Same voltage across each part
  - I determined by $I = \frac{V}{R}$

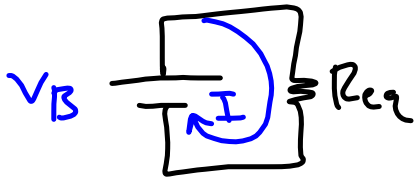
4)



$I_{total} = I_1 + I_2 + I_3$

$I_1 = \frac{V_B}{R_1} = \frac{6V}{25\Omega} = 0.24A$

$I_2 = I_3 = 0.24A$



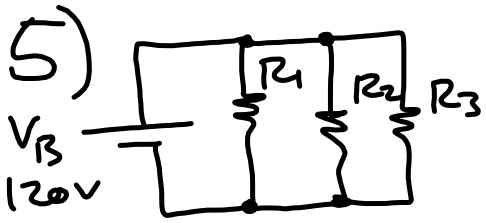
$R_{eq} = \left[\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right]^{-1}$

$= \left[\frac{1}{25\Omega} + \frac{1}{25\Omega} + \frac{1}{25\Omega}\right]^{-1}$

$= 8.33\Omega$

$I_{total} = \frac{V_B}{R_{eq}} = \frac{6V}{8.33\Omega} = 0.72A$

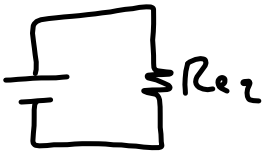
5)



$$I_1 = \frac{V_B}{R_1} = \frac{120V}{60\Omega} = 2A$$

$$I_2 = \frac{V_B}{R_2} = \frac{120V}{30\Omega} = 4A$$

$$I_3 = \frac{V_B}{R_3} = \frac{120V}{20\Omega} = 6A$$



$$R_{eq} = \left[\frac{1}{60\Omega} + \frac{1}{30\Omega} + \frac{1}{20\Omega}\right]^{-1}$$

$$= 10\Omega$$

$$I_{total} = \frac{V_B}{R_{eq}}$$

$$= \frac{120V}{10\Omega}$$

$$= 12A$$