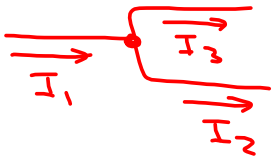
Kirchoff's Laws

1. In a steady state circuit, the total current moving into a point equals the total current leaving the point

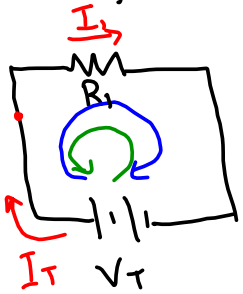
e.g.



$I_1 = I_2 + I_3$

2. The total voltage in ANY closed path equals zero.

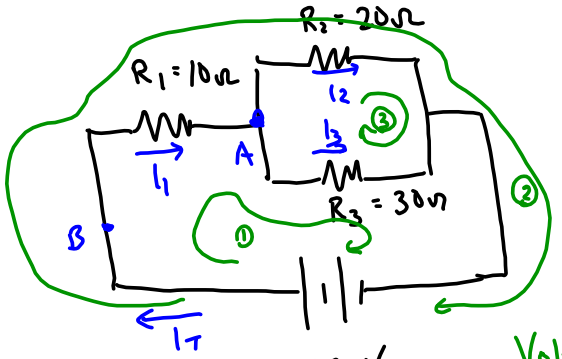
- A battery adds voltage in the direction of the current and subtracts it opposite the direction of the current
- A load subtracts voltage in the direction of the current and adds it opposite the direction of the current.



☺ $= +V_T - V_1$

$V_T = V_1$ ↔ same

☺ $= -V_T + V_1$



$R_1 = 10\Omega$ $I_1 = 5.45A$ $V_1 = 54.5V$

$R_2 = 20\Omega$ $I_2 = 3.27A$ $V_2 = 65.5V$

$R_3 = 30\Omega$ $I_3 = 2.18A$ $V_3 = 65.5V$

$R_T = 22\Omega$ $I_T = 5.45A$ $V_T = 120V$

$V_i = I_i R_i$

① Current

$I_T = I_1 = I_2 + I_3$

$I_1 = I_2 + \frac{2}{3} I_2$

$I_1 = \frac{5}{3} I_2$

$I_2 = \frac{3}{5} I_1$

$12 = I_1 + 2\left(\frac{3}{5} I_1\right)$

$= \frac{11}{5} I_1$

$I_1 = 5.45A$

$I_2 = \frac{3}{5} I_1 = 3.27A$

$I_3 = \frac{2}{3} I_2 = 2.18A$

Voltage

~~②~~ ☺ $= +120 - V_1 - V_3$

$120 = 10 I_1 + 30 I_3$ $(V = IR)$

$12 = I_1 + 3 I_3$

② ☺ $= +120 - V_1 - V_2$

$120 = 10 I_1 + 20 I_2$

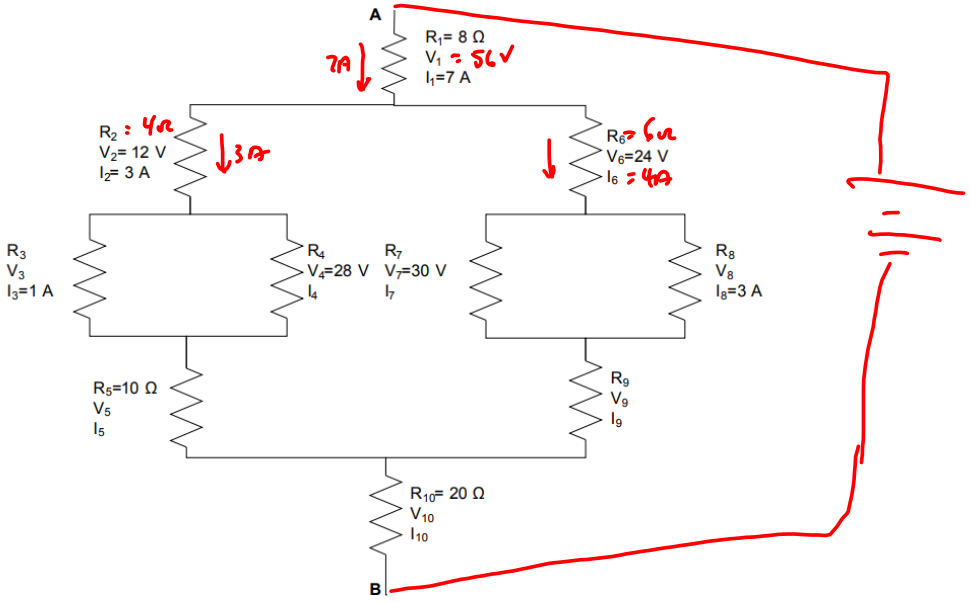
$12 = I_1 + 2 I_2$

③ ☺ $= -V_2 + V_3$ (ö!) parallel

$V_2 = V_3$

$2 I_2 = 3 I_3$

$I_3 = \frac{2}{3} I_2$


A
R_1= 8 Ω
V_1 = 56 V
I_1=7 A
7A
R_2 = 4Ω
V_2= 12 V
I_2= 3 A
3A
R_6= 6Ω
V_6=24 V
I_6 = 4A
R_3
V_3
I_3=1 A
R_4
V_4=28 V
I_4
R_7
V_7=30 V
I_7
R_8
V_8
I_8=3 A
R_5=10 Ω
V_5
I_5
R_9
V_9
I_9
R_{10}= 20 Ω
V_{10}
I_{10}
B