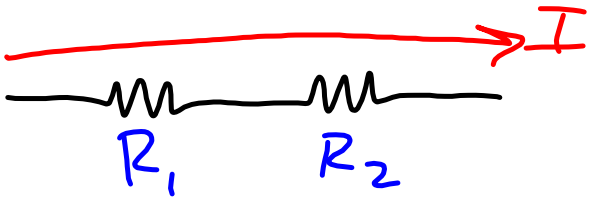
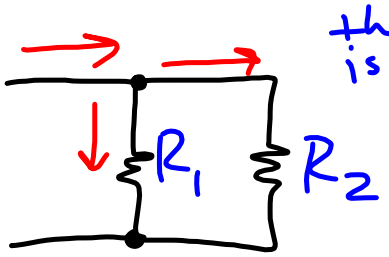
CIRCUITS

- Equivalent resistance
  - Series



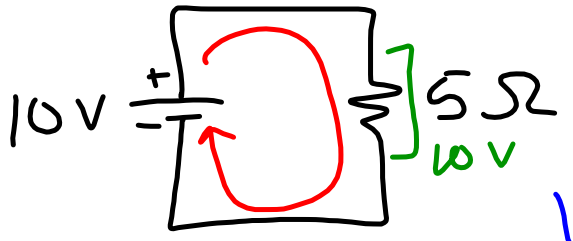
$$R_{eq} = R_1 + R_2$$

  - Parallel



$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

R_{eq} → equivalent resistance



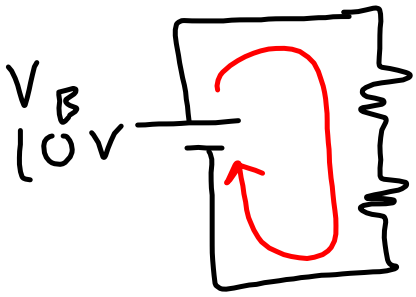
conventional current goes from + to −.

$$V = IR$$

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

V across resistor = 10 V
(voltage drop)

Variable	Letter	Unit
Electric potential (voltage)	V	Volts (V)
Current	I	Amperes (A)
Resistance	R	Ohms (Ω)



$R_1 = 7\,\Omega$

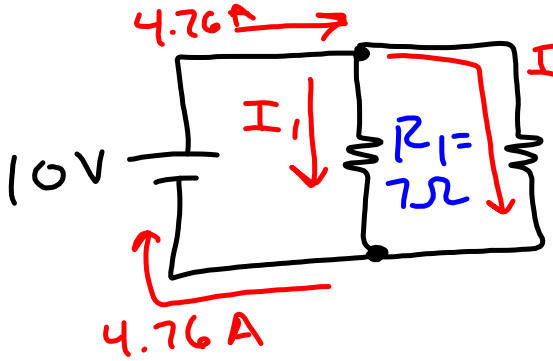
$R_2 = 3\,\Omega$

$V_1 = IR_1 = (1\,A)(7\,\Omega) = 7\,V$

$V_2 = IR_2 = (1\,A)(3\,\Omega) = 3\,V$

$R_{eq} = R_1 + R_2 = 7\,\Omega + 3\,\Omega = 10\,\Omega$

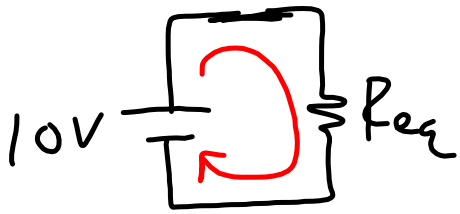
$$I_{total} = \frac{V_B}{R_{eq}} = \frac{10\,V}{10\,\Omega} = 1\,A$$



$I_{total} = I_1 + I_2$

$I_1 = \frac{V_B}{R_1} = \frac{10V}{7\Omega} = 1.4A$

$I_2 = \frac{V_B}{R_2} = \frac{10V}{3\Omega} = 3.33A$



$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

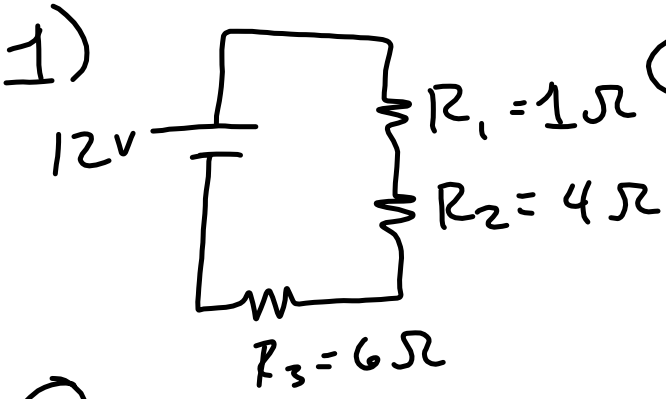
$R_{eq} = \left[\frac{1}{7\Omega} + \frac{1}{3\Omega}\right]^{-1}$

$= 2.1\Omega$

$I_{total} = \frac{V_B}{R_{eq}} = \frac{10V}{2.1\Omega} = 4.76A$

Practice – Series and Parallel Circuits

1)



① $R_{eq} = R_1 + R_2 + R_3 = 1\Omega + 4\Omega + 6\Omega = 11\Omega$

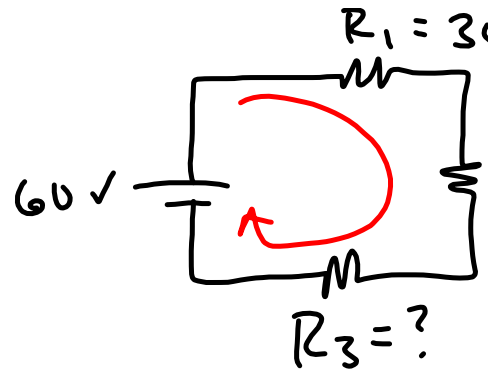
② $I_{total} = \frac{V_B}{R_{eq}} = \frac{12V}{11\Omega} = 1.09A$

③ $V_1 = I_{total} R_1 = 1.09V$

$V_2 = I_{total} R_2 = 4.36V$

$V_3 = I_{total} R_3 = 6.54V$

2)



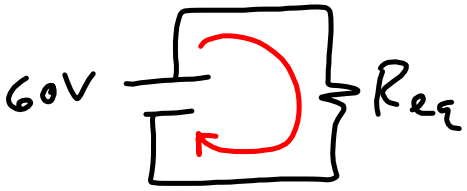
$R_{eq} = R_1 + R_2 + R_3$

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

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

$= 45\Omega$

$I_{total} = 0.5\ A$



$I_{total} = 0.5A$

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