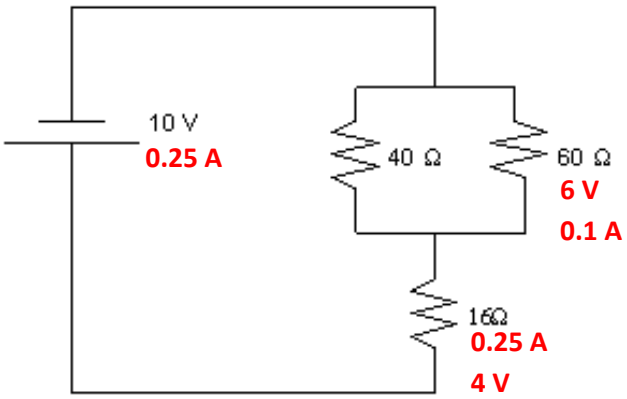
Solving Complete VIR Circuits



1. Calculate:

a) the total current in the circuit.

$R_T = \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1} + R_3$

$R_T = \left(\frac{1}{40\ \Omega} + \frac{1}{60\ \Omega}\right)^{-1} + 16\ \Omega$

$R_T = 40\ \Omega$

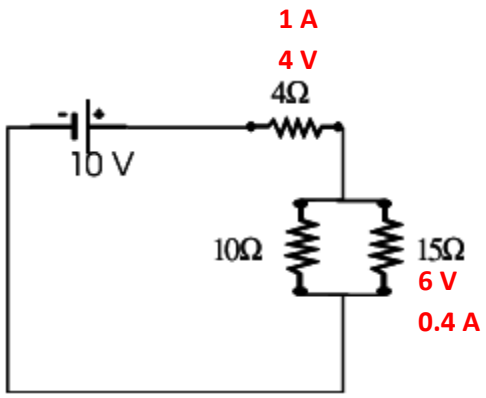
$V = IR$

$I = \frac{V}{R} = \frac{10\ V}{40\ \Omega} = 0.25\ A$

b) the current in the 60 Ω resistor.

I = 0.1 A

2. Calculate:



a) the total resistance.

$R_T = R_1 + \left(\frac{1}{R_2} + \frac{1}{R_3}\right)^{-1}$

$R_T = 4\ \Omega + \left(\frac{1}{10\ \Omega} + \frac{1}{15\ \Omega}\right)^{-1}$

$R_T = 10\ \Omega$

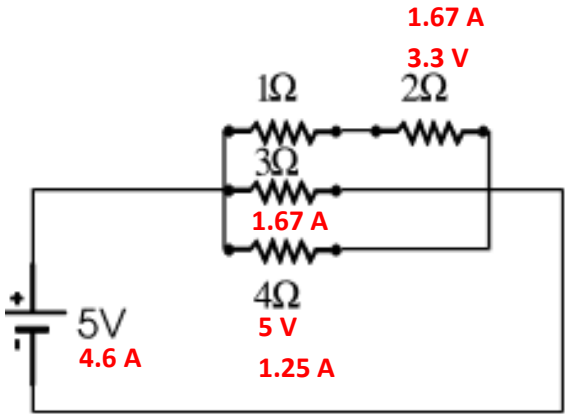
b) the total current.

$V = IR$

$I = \frac{V}{R} = \frac{10\ V}{10\ \Omega} = 1\ A$

c) the current through the 15 Ω resistor **I = 0.4 A**

3. Calculate.



a) the total resistance.

$R_T = \left(\frac{1}{R_1+R_2} + \frac{1}{R_3} + \frac{1}{R_4}\right)^{-1}$

$R_T = \left(\frac{1}{3\ \Omega} + \frac{1}{3\ \Omega} + \frac{1}{4\ \Omega}\right)^{-1}$

$R_T = 1.09\ \Omega$

b) the total current.

$V = IR$

$I = \frac{V}{R} = \frac{5\ V}{1.09\ \Omega} = 4.6\ A$

c) the current through the 4 Ω resistor. **I = 1.25 A**

d) voltage across the 2 Ω resistor. **V = 3.3 V**

4. Calculate:

a) the total resistance.

$$R_T = \left(\frac{1}{R_1+R_2} + \frac{1}{R_3+R_4}\right)^{-1}$$

$$R_T = \left(\frac{1}{3\Omega+3\Omega} + \frac{1}{4\Omega+2\Omega}\right)^{-1}$$

$$R_T = 3\Omega$$

b) the total current.

$$V = IR$$

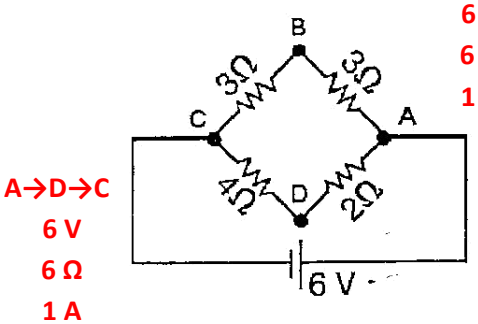
$$I = \frac{V}{R} = \frac{6\ V}{3\ \Omega} = 2\ A$$

c) the current through the 4 Ω resistor

I = 1 A

A→B→C
6 V
6 Ω
1 A

A→D→C
6 V
6 Ω
1 A



5. Calculate:

a) the total resistance.

$$R_T = R_1 + \left(\frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}\right)^{-1} + R_5$$

$$R_T = 1\Omega + \left(\frac{1}{3\ \Omega} + \frac{1}{4\ \Omega} + \frac{1}{5\ \Omega}\right)^{-1} + 2\Omega$$

$$R_T = 4.28\ \Omega$$

b) the total current.

$$V = IR$$

$$I = \frac{V}{R} = \frac{12\ V}{4.28\ \Omega} = 2.81\ A$$

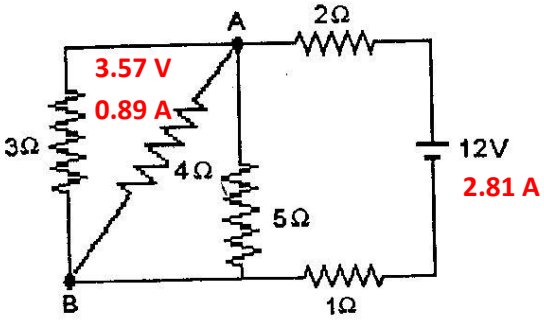
c) the current through the 4 Ω resistor.

I = 0.89 A

d) voltage across the 2 Ω resistor.

V = 5.62 V

2.81 A
5.62 V
3.57 V
0.89 A
2.81 A
2.81 A
2.81 V



6. Calculate:

a) the total resistance.

$$R_T = R_1 + \left(\frac{1}{R_2+R_3} + \frac{1}{R_4} + \frac{1}{R_5}\right)^{-1} + R_6$$

$$R_T = 6\Omega + \left(\frac{1}{15\ \Omega + 5\ \Omega} + \frac{1}{60\ \Omega} + \frac{1}{30\ \Omega}\right)^{-1} + 14\Omega$$

$$R_T = 30\ \Omega$$

b) the total current.

$$V = IR$$

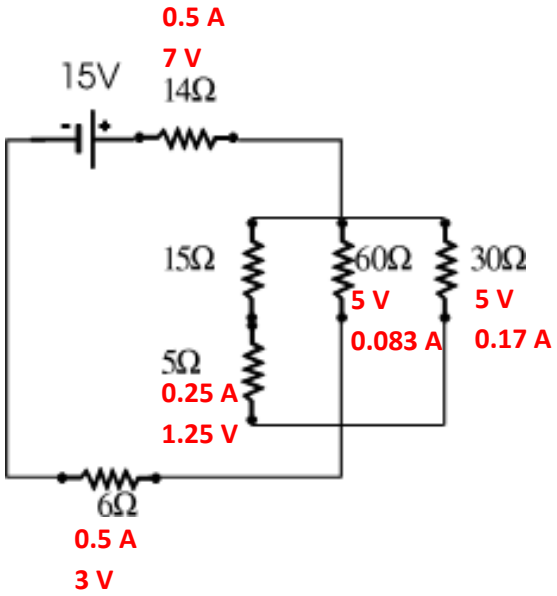
$$I = \frac{V}{R} = \frac{15\ V}{30\ \Omega} = 0.5\ A$$

c) the current through the 30 Ω resistor.

I = 0.17 A

d) the voltage across the 5 Ω resistor.

V = 1.25 V



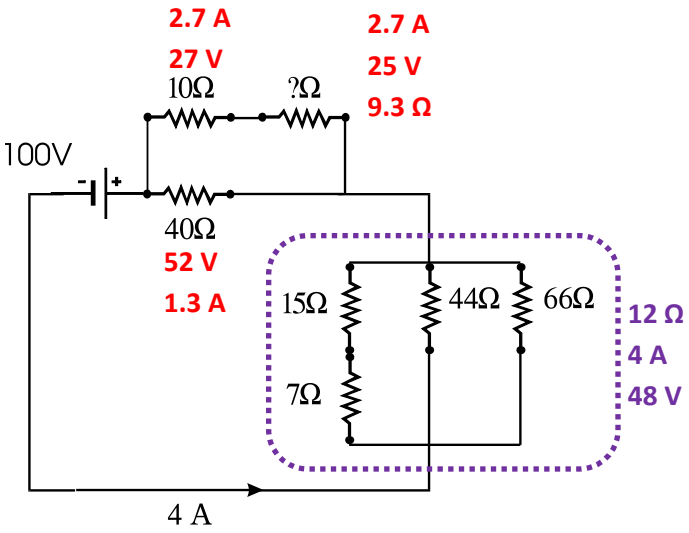
7. Calculate the value of the unknown resistor.

$$R_T = \left(\frac{1}{R_1+R_2} + \frac{1}{R_3} + \frac{1}{R_4}\right)^{-1}$$

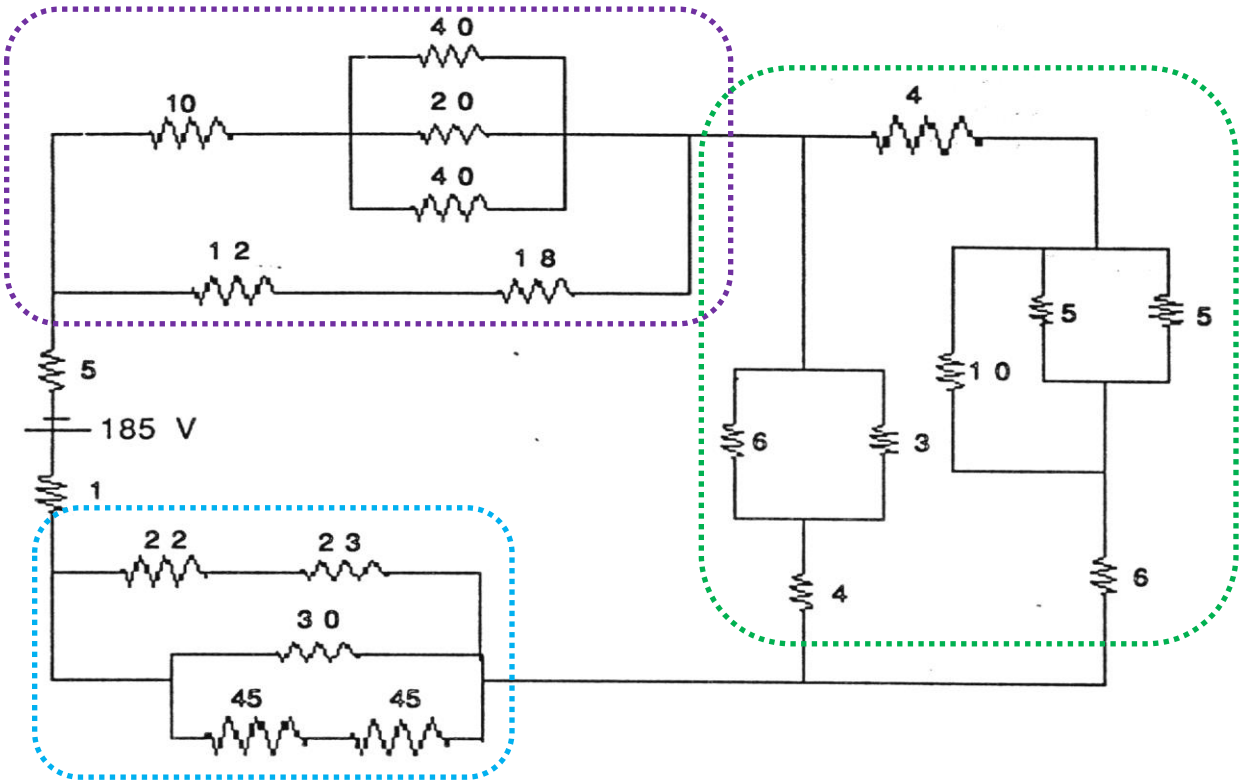
$$R_T = \left(\frac{1}{7\ \Omega + 15\ \Omega} + \frac{1}{44\ \Omega} + \frac{1}{66\ \Omega}\right)^{-1}$$

$$R_T = 12\ \Omega$$

R = 9.3 Ω



8. Solve for the current travelling through the power supply in the circuit shown.



$$R_T = \left(\frac{1}{R_1+\left(\frac{1}{R_2}+\frac{1}{R_3}+\frac{1}{R_4}\right)^{-1}}+\frac{1}{R_5+R_6}\right)^{-1}$$

$$R_T = \left(\frac{1}{10\ \Omega+\left(\frac{1}{40\ \Omega}+\frac{1}{20\ \Omega}+\frac{1}{40\ \Omega}\right)^{-1}}+\frac{1}{12\ \Omega+18\ \Omega}\right)^{-1}$$

$$R_T = 12\ \Omega$$

$$R_T = \left(\frac{1}{R_1+\left(\frac{1}{R_2}+\frac{1}{R_3}+\frac{1}{R_4}\right)^{-1}+R_5}+\frac{1}{\left(\frac{1}{R_6}+\frac{1}{R_7}\right)^{-1}+R_8}\right)^{-1}$$

$$R_T = \left(\frac{1}{4\ \Omega+\left(\frac{1}{5\ \Omega}+\frac{1}{5\ \Omega}+\frac{1}{10\ \Omega}\right)^{-1}+6\ \Omega}+\frac{1}{\left(\frac{1}{6\ \Omega}+\frac{1}{3\ \Omega}\right)^{-1}+4\ \Omega}\right)^{-1}$$

$$R_T = 4\ \Omega$$

$$R_T = \left(\frac{1}{R_1+R_2}+\frac{1}{R_3}+\frac{1}{R_4+R_5}\right)^{-1}$$

$$R_T = \left(\frac{1}{22\ \Omega+23\ \Omega}+\frac{1}{30\ \Omega}+\frac{1}{45\ \Omega+45\ \Omega}\right)^{-1}$$

$$R_T = 15\ \Omega$$

$$R_T = R_1 + R_T + R_T + R_T + R_2$$

$$R_T = 5\ \Omega + 12\ \Omega + 4\ \Omega + 15\ \Omega + 1\ \Omega$$

$$R_T = 37\ \Omega$$

$$V = IR$$

$$I = \frac{V}{R} = \frac{185\ V}{37\ \Omega} = 5\ A$$