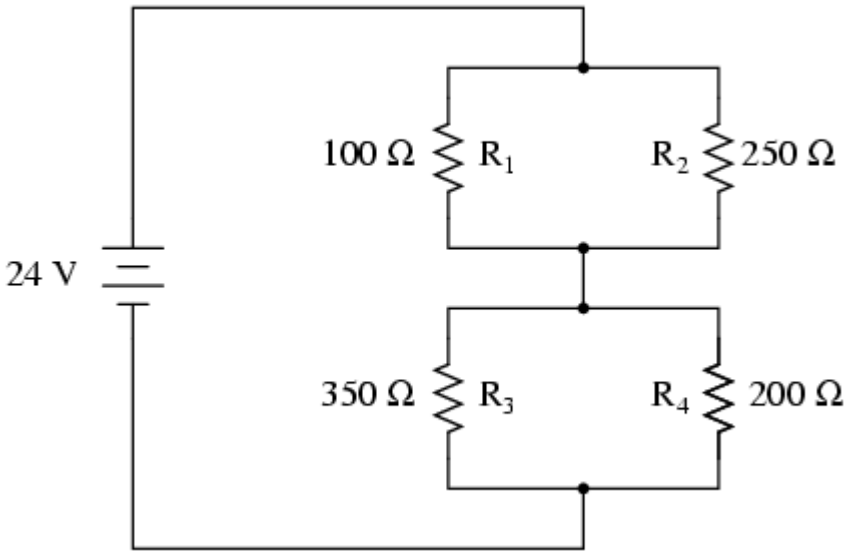
16.6
Combination Circuits



Combination Circuits

Sometimes it is useful to know the *equivalent resistance* of a circuit that has several resistors in its network.

The equivalent resistance is the value of the single resistor that would comprise the same load to the battery or power source.

Combination Circuits

To analyze a combination circuit, follow these steps:

1. **Reduce the original circuit to a single equivalent resistor, re-drawing the circuit in each step of reduction as simple series and simple parallel parts are reduced to single, equivalent resistors.**

2. **Solve for total resistance.**

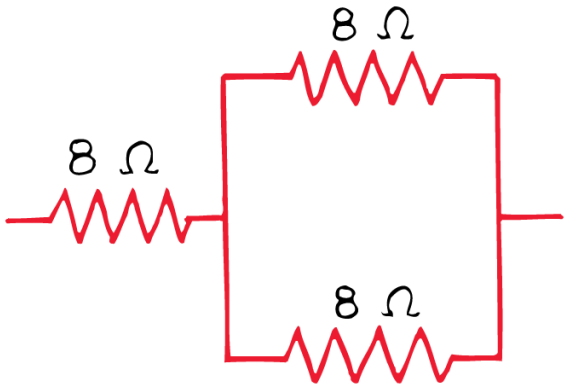
3. **Solve for total current (I=V/R).**

4. **Determine equivalent resistor voltage drops and branch currents one stage at a time, working backwards to the original circuit configuration again.**

Combination Circuits

Example #1

Find the equivalent resistance of the following:

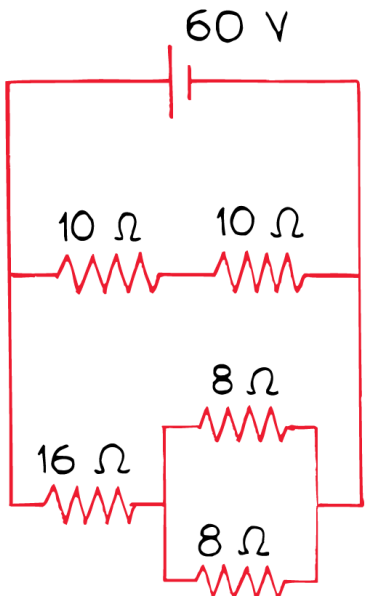


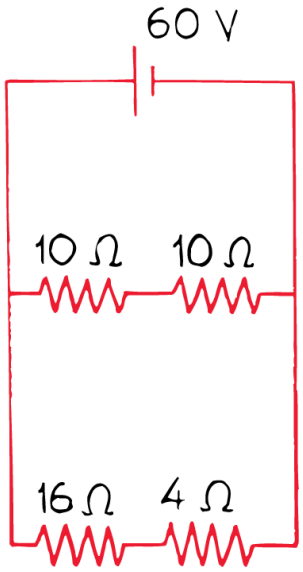
Combination Circuits

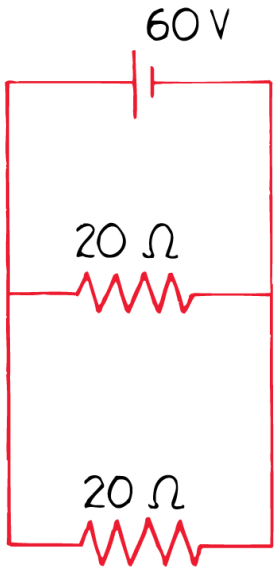
Example #2

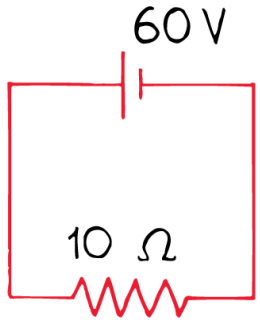
Find the following:

a. **Equivalent resistance of the circuit**
b. **Total Current**





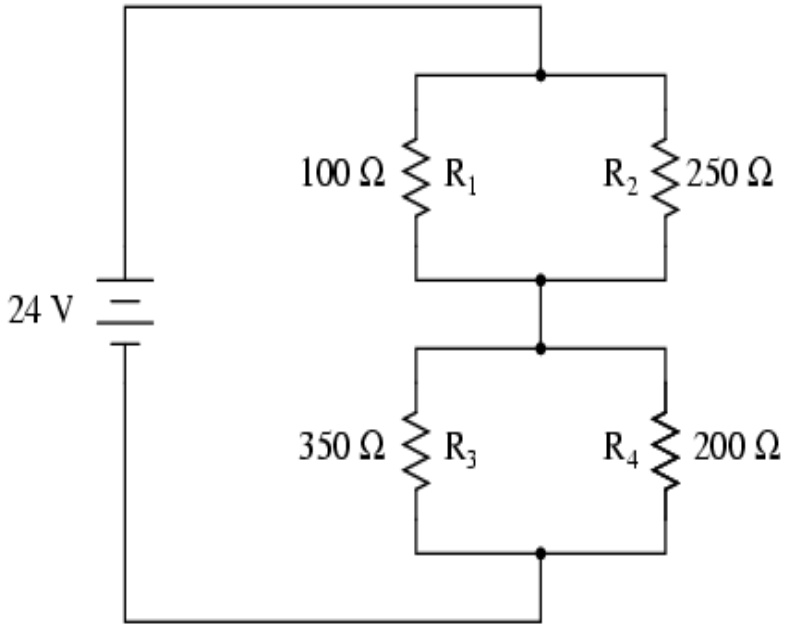


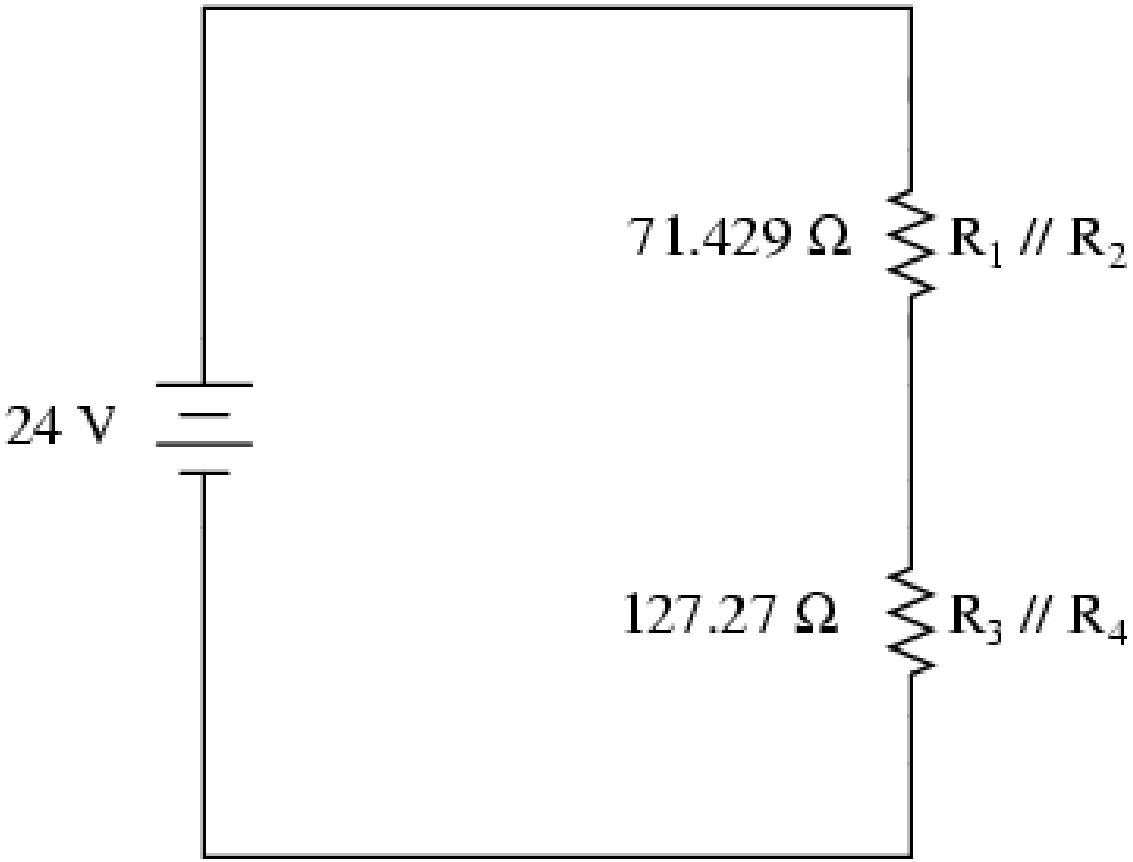


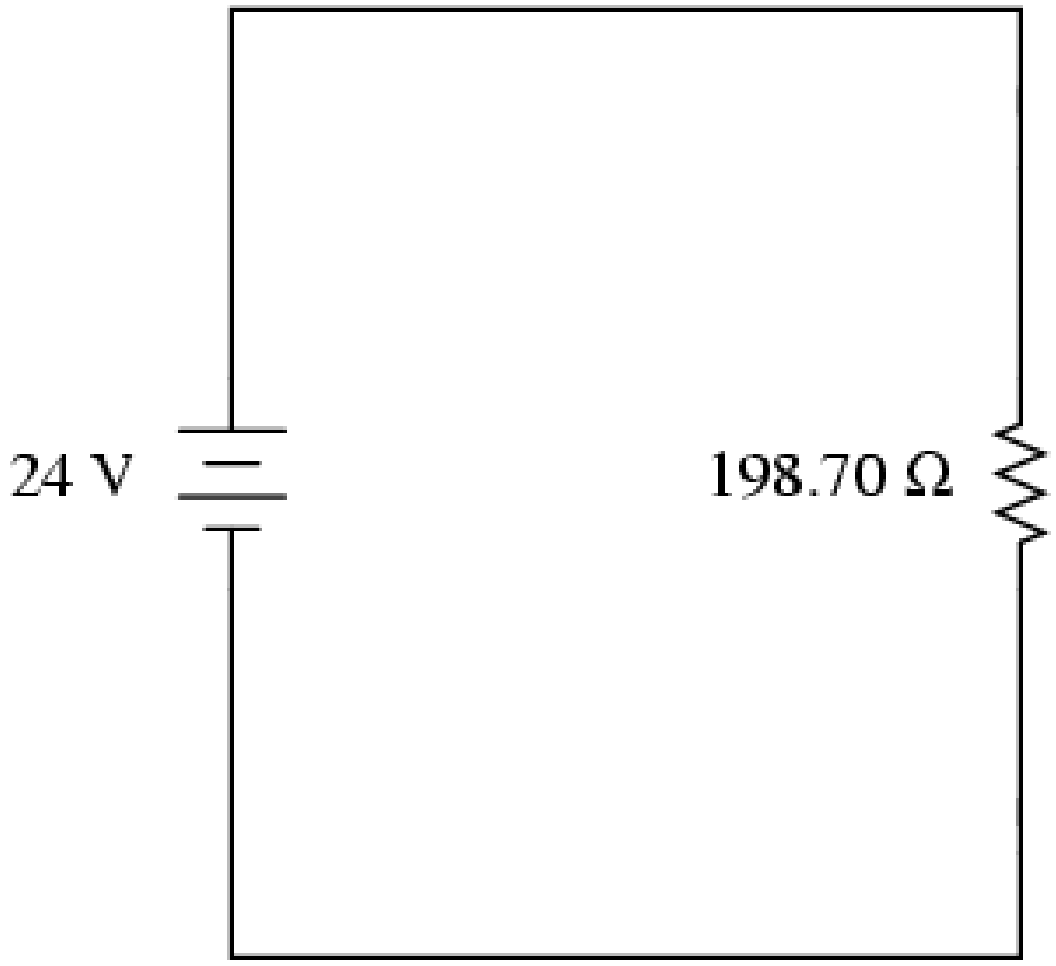
Example #3

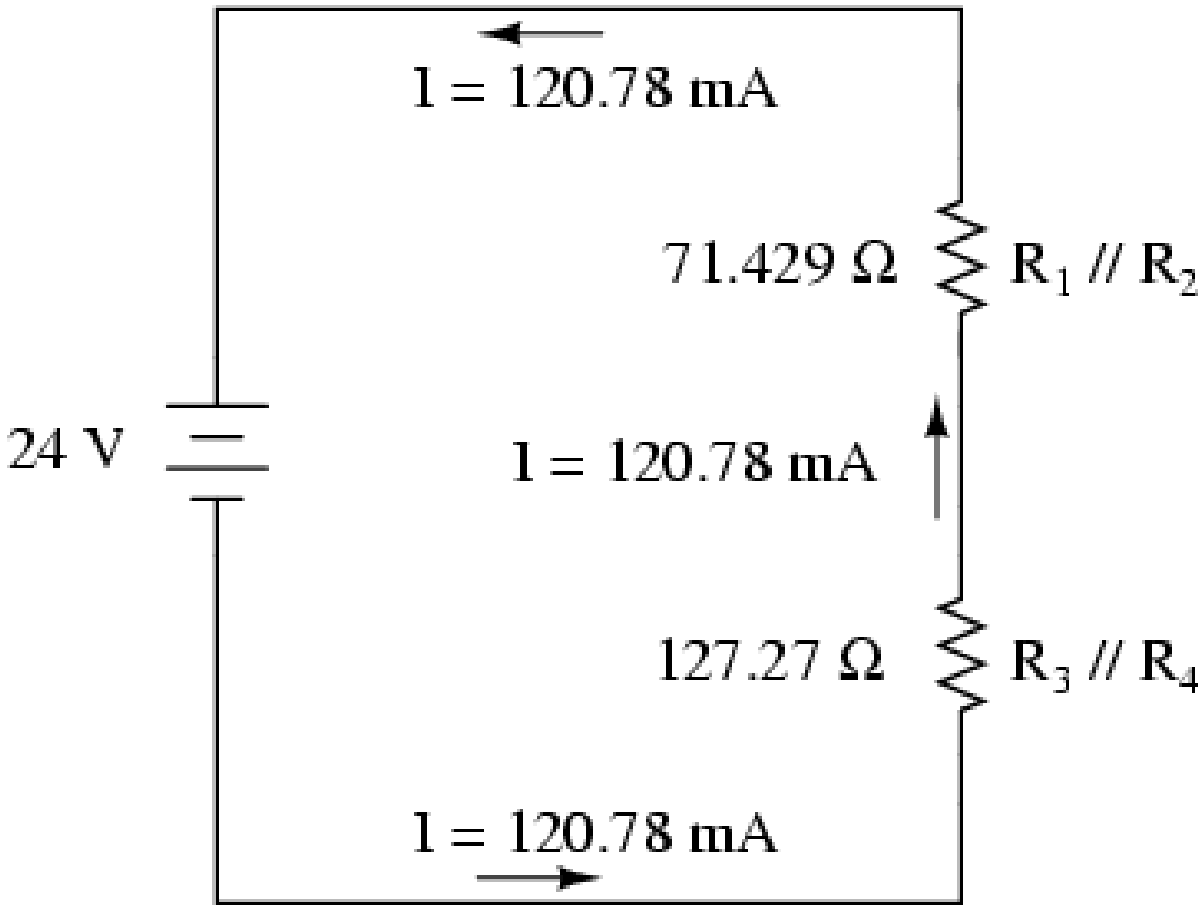
Find the following:

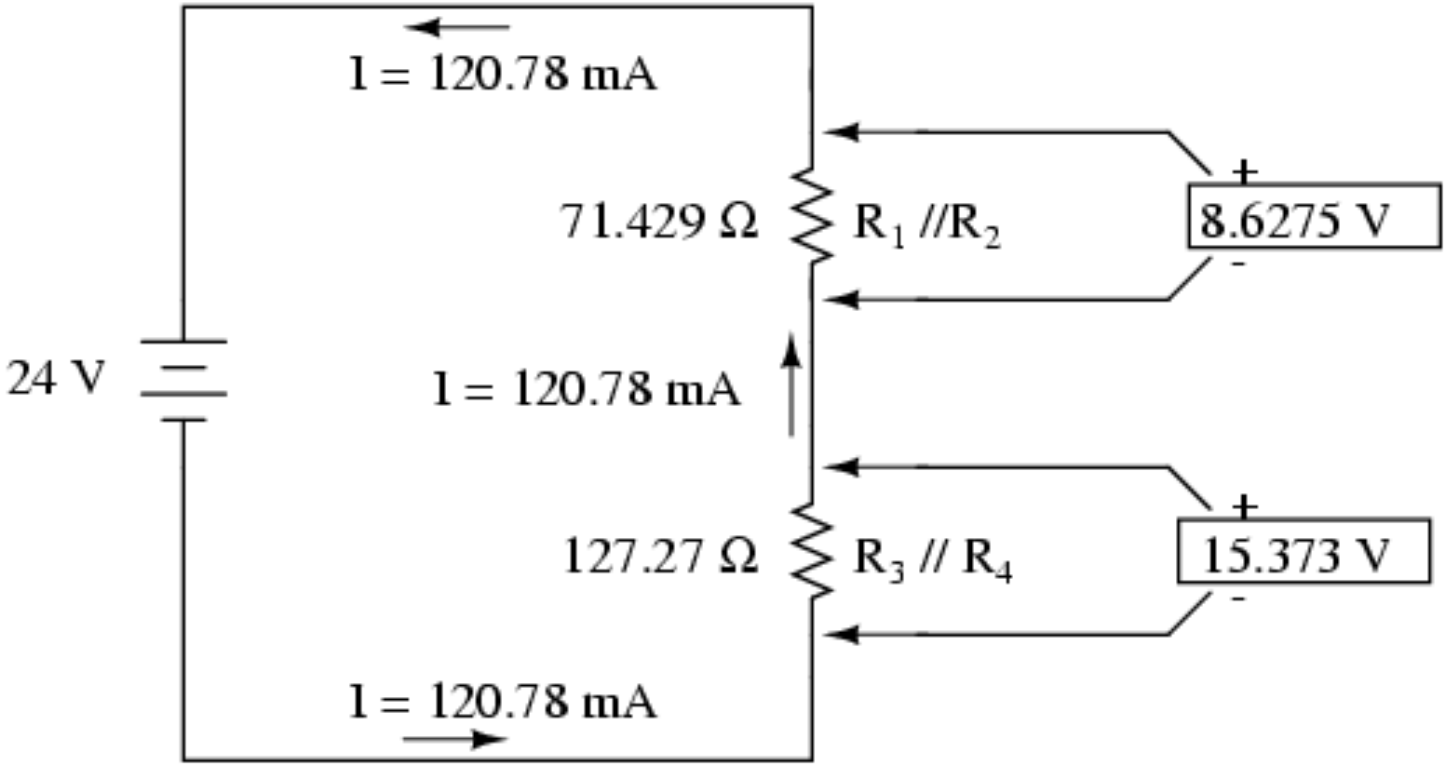
a. *Equivalent resistance of the circuit*
b. *Total Current*
c. *Voltage on the 250-Ω resistor*
d. *Voltage on the 200-Ω resistor*
e. *Current thru the 250-Ω resistor.*

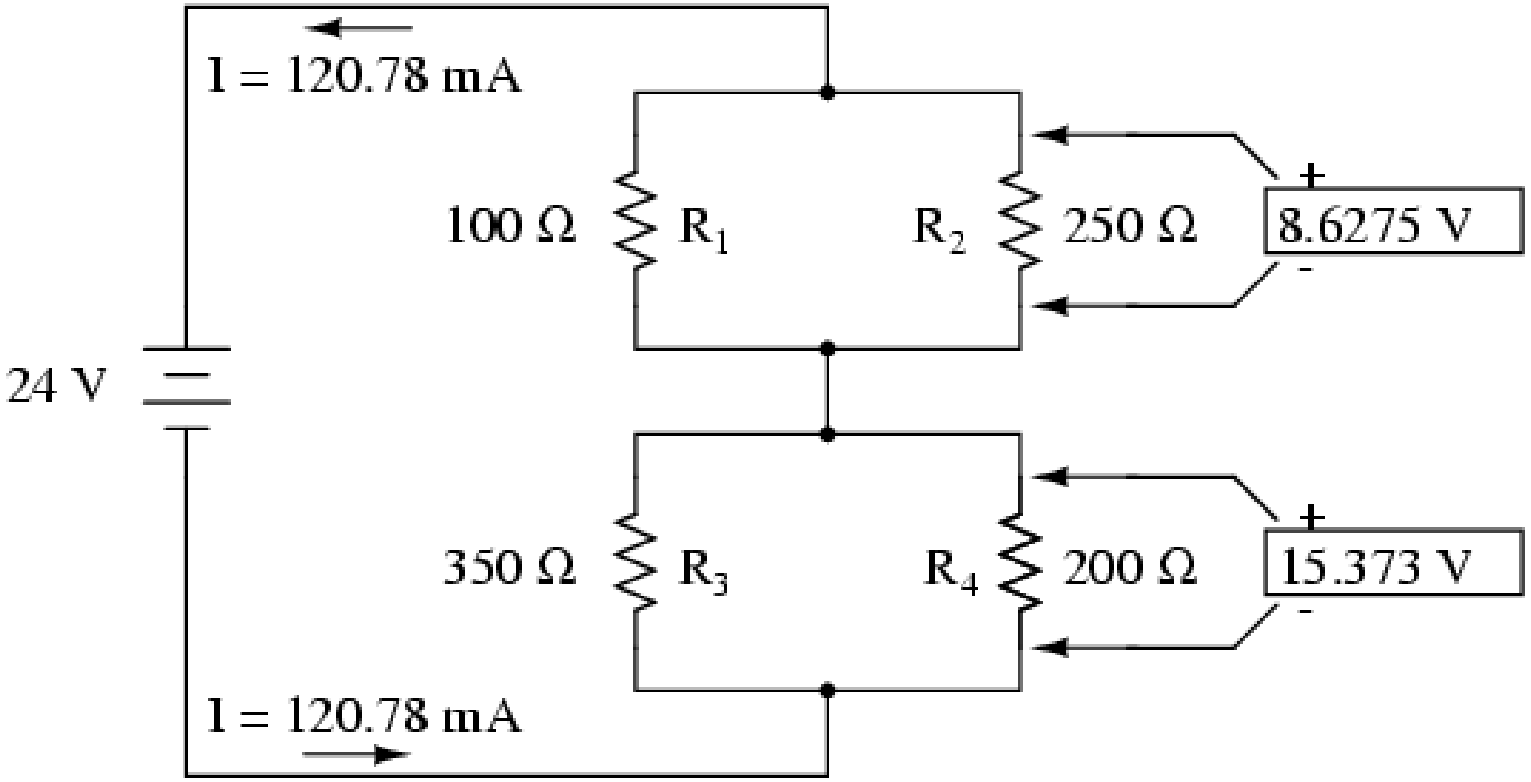


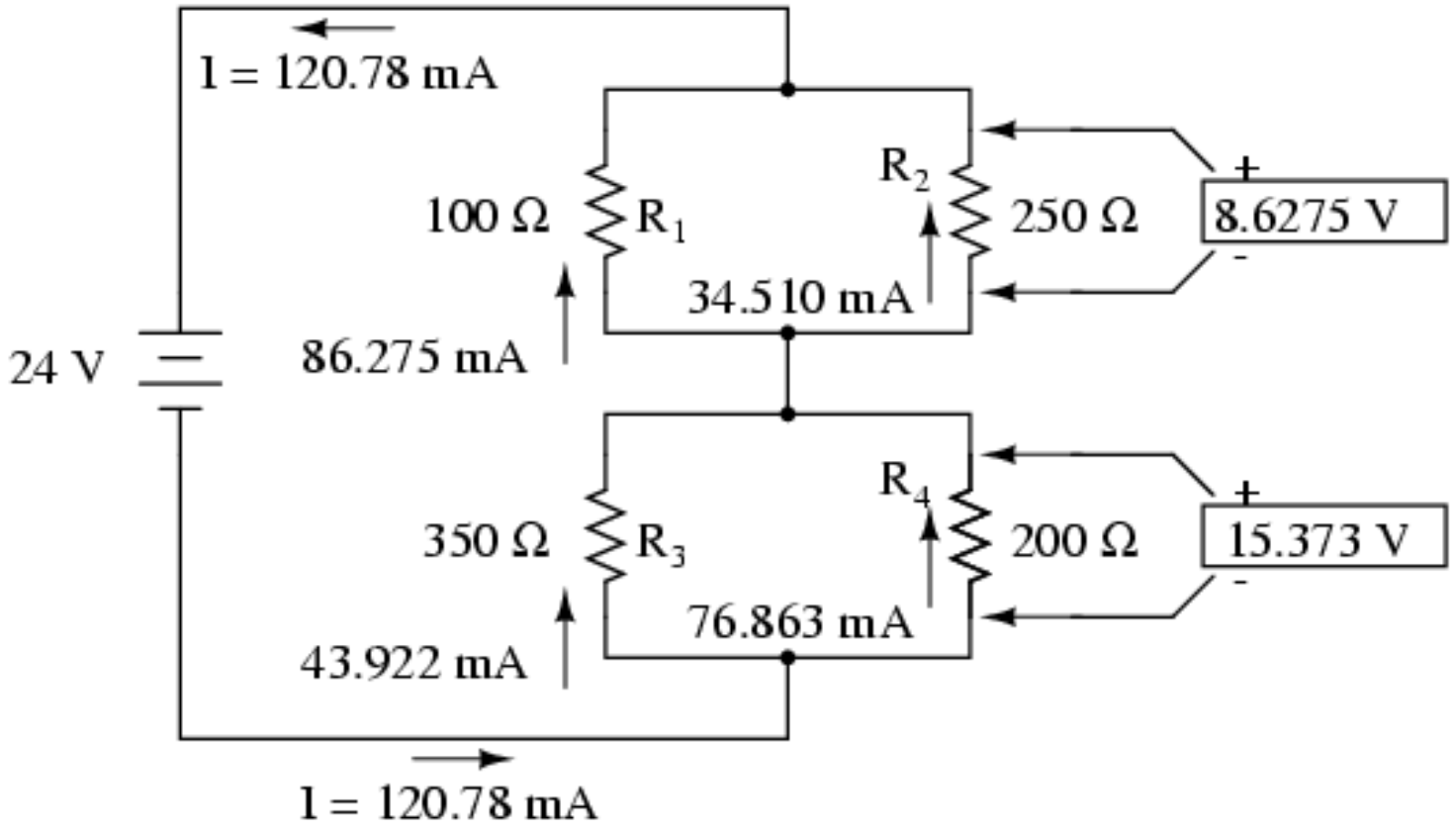

71.429 Ω
R1 // R2
24 V
127.27 Ω
R3 // R4


24 V
198.70 Ω


I = 120.78 mA
71.429 Ω
R1 // R2
24 V
I = 120.78 mA
127.27 Ω
R3 // R4
I = 120.78 mA


I = 120.78 mA
71.429 Ω
R1 //R2
+
8.6275 V
-
24 V
I = 120.78 mA
127.27 Ω
R3 // R4
+
15.373 V
-
I = 120.78 mA


I = 120.78 mA
100 Ω
R1
R2
250 Ω
+
8.6275 V
-
24 V
350 Ω
R3
R4
200 Ω
+
15.373 V
-
I = 120.78 mA


I = 120.78 mA
100 Ω
R1
R2
250 Ω
+
8.6275 V
-
34.510 mA
24 V
86.275 mA
R4
350 Ω
R3
200 Ω
+
15.373 V
-
76.863 mA
43.922 mA
I = 120.78 mA