

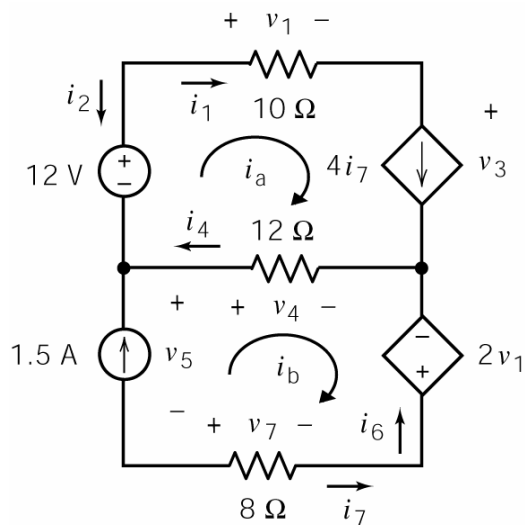
How Can We Check...mesh currents?

1. The reference directions of the element currents and voltages are labeled on this circuit drawing. The subscripts suggest a numbering of the 7 elements of this circuit. That numbering has been used to tabulate the values of the voltage and current of each circuit element.

Computer analysis of this circuit indicates that the mesh currents are

$$i_a = -6 \text{ A} \text{ and } i_b = 1.5 \text{ A}$$

- a. Check to see if the mesh currents satisfy the constitutive equations of the circuit elements.
- b. Check to see if the mesh currents satisfy agree with the tabulated values of the element currents and voltages.
- c. Verify that power is conserved.



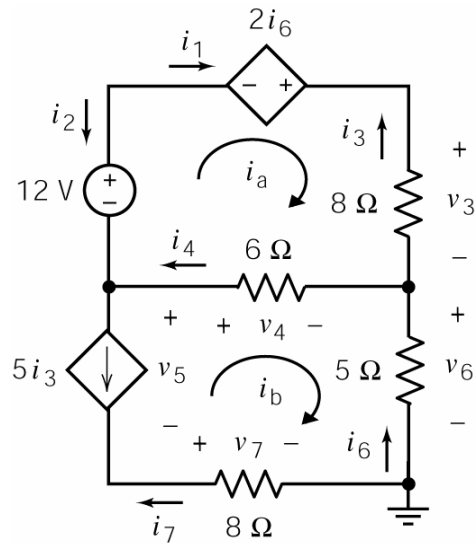
	$v, \text{ V}$	$i, \text{ A}$	$p = iv, \text{ W}$
1	-60.0	-6.0	360
2	12.0	6.0	72
3	162.0	-6.0	-972
4	90.0	-7.50	-675
5	222.0	1.50	333
6	-120.0	-1.50	180
7	-12.0	-1.50	18

2. Computer analysis of this circuit indicates that the mesh currents are

$$i_a = 0.222 \text{ A} \text{ and } i_b = -1.111 \text{ A}$$

The reference directions of the element currents and voltages are labeled on this circuit drawing.

The subscripts suggest a numbering of the 7 elements of this circuit. That numbering has been used to set up a table for the values of the voltage and current for each circuit element. Complete the table.



	v, V	i, A	$p = iv, \text{W}$
1			
2			
3			
4			
5			
6			
7			

Solutions:

1.

For example we can check:

Ohm's law: $v_4 = -12(i_4) = -12(i_a - i_b) = -12(-6 - 1.5) = 90 \text{ V}$

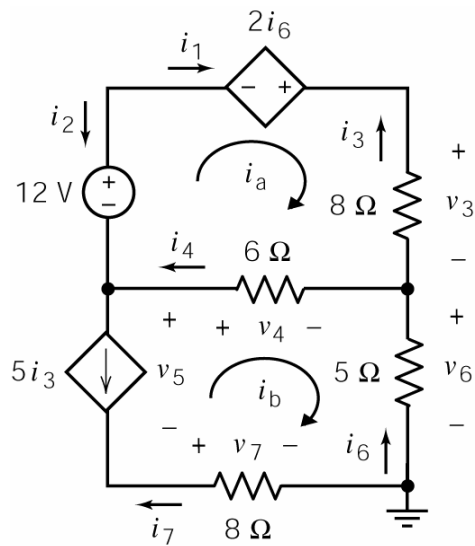
KVL for mesh b:

$$\begin{aligned} v_4 - v_6 - v_7 - v_5 &= 0 \Rightarrow v_5 = v_4 - 2v_1 - v_7 \\ &= -12(i_a - i_b) - 2(10i_a) - (-8i_a) \\ &= -32i_a + 20i_b = -32(-6) + 20(1.5) = 222 \text{ V} \end{aligned}$$

The constitutive equation of the CCCS:

$$i_3 = 4i_7 = 4(-i_b) = 4(-1.5) = -6 \text{ A}$$

2.



	$v, \text{ V}$	$i, \text{ A}$	$p = iv, \text{ W}$
1	-2.222	0.2222	-0.4937
2	12	-0.2222	-2.6664
3	1.778	-0.2222	-0.3951
4	-8.00	1.333	-10.664
5	-22.44	1.111	-24.933
6	-5.559	1.111	6.176
7	8.889	-1.111	9.8757