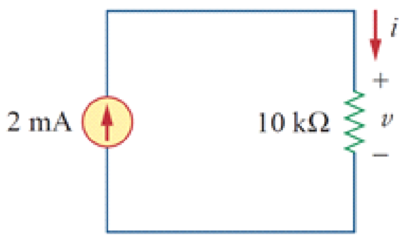
[Alexander and Sadiku, 2009, PP2.2]

Tuesday, June 11, 2013 7:13 PM



The 2mA current source forces clockwise 2mA current through the circuit (which, luckily, is one simple loop) The arrow of i agrees with the clockwise direction of the forced 2mA current. Hence, $i = 2\text{mA}$.

(not -2mA)

Note that the arrow of i and the polarity $(+,-)$ of v conforms with the passive sign convention.

(↳ arrow flows from + to −)

This implies $p = iv$ and $v = iR$.

(not $p = -iv$) (not $v = -iR$)

Here, $i = 2\text{mA}$ and $R = 10\text{ k}\Omega$.

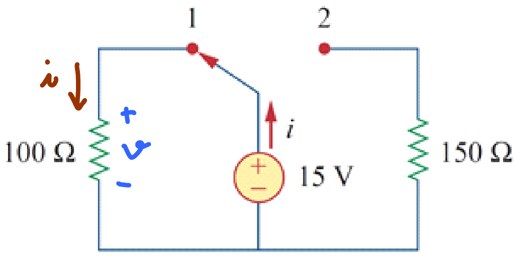
Therefore, $v = iR = 2\text{mA} \times 10\text{ k}\Omega = 20\text{ V}$ and

$p = iv = 2\text{mA} \times 20\text{ V} = 40\text{ mW}$.

[Alexander and Sadiku, 2009, Q2.4]

Tuesday, June 11, 2013 7:15 PM

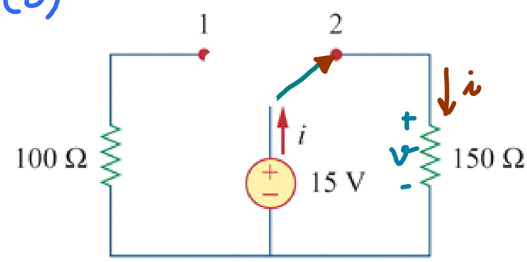
(a)



We need to apply Ohm's law. First, note that the i that we draw near the resistor is the same as the i that is coming out of the voltage source.
We also add the voltage v across the resistor to use with the Ohm's law. Note that v is connected directly to the 15 V source and their polarity matched. Therefore, $v = 15$ V.

The arrow of i and polarity of v satisfies the passive sign convention. Hence, $v = iR$. So, $i = \frac{v}{R} = \frac{15V}{100\,\Omega} = 0.15$ A or 150 mA.

(b)



The same reasoning in part (a) also applies to this part except that now the current i is flowing through a new loop in the clockwise direction

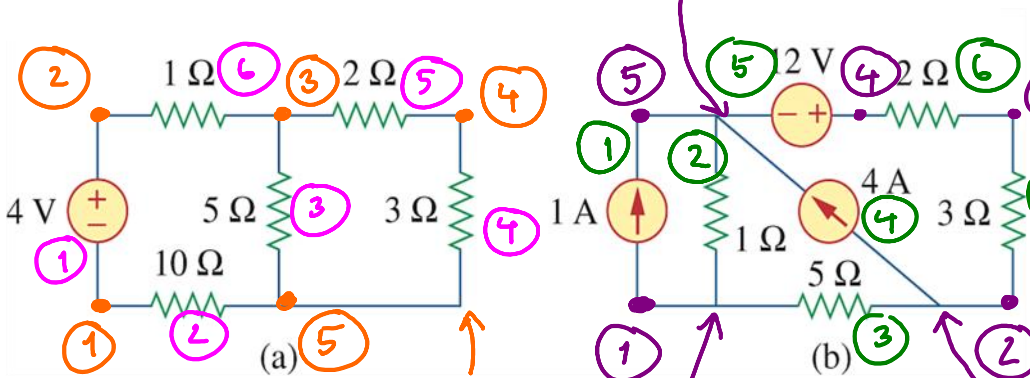
$$i = \frac{v}{R} = \frac{15\,V}{150\,\Omega} = 0.1 \text{ A}$$

or 100 mA.

[Alexander and Sadiku, 2009, Q2.7]

Monday, June 10, 2013 7:55 PM

same as node 5



same as node 5

same as node 2

$\#$ branches = 6

$\#$ nodes = 5

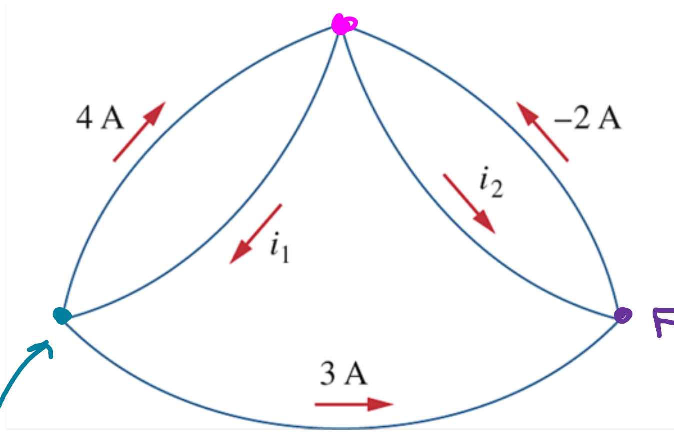
$\#$ branches = 7

$\#$ nodes = 5

same as node 1

[Alexander and Sadiku, 2009, Q2.10]

Monday, June 10, 2013 7:55 PM



Applying KCL at this node, we have ($\sum i = 0$)

$$-2 - i_2 - 3 = 0$$

$$i_2 = -5\text{ A}$$

Applying KCL at this node, we have ($\sum i = 0$)

$$4 + (-i_1) + 3 = 0$$

$$i_1 = 7\text{ A}$$

We may check the answers by applying KCL ($\sum i = 0$) at the top node:

$$-4 + i_1 + i_2 - (-2) = 0$$

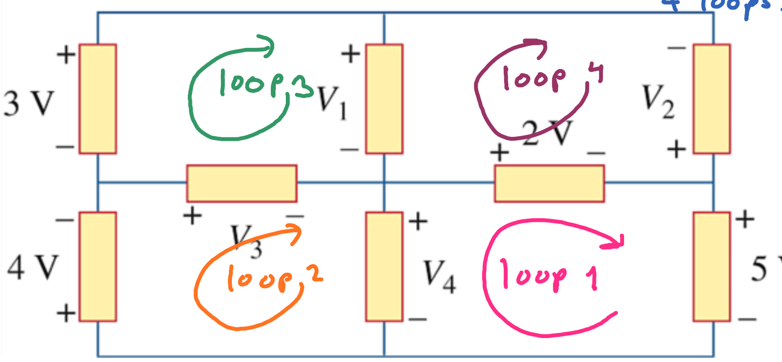
$$-4 + 7 - 5 + 2 = 0 \checkmark$$

use i_1, i_2 that we know.

[Alexander and Sadiku, 2009, Q2.14]

Monday, June 10, 2013 7:55 PM

As hinted, we need to apply KLV. $(\Sigma v = 0)$
Because there are four unknowns, we need at least 4 loops.



We will try to start with a loop that involves minimum # of unknown variables

So, we start with "loop 1":

(only one unknown variable)

$$\underbrace{+V_4}_{\substack{\text{With respect to the loop direction, we move from the} \\ \text{"-" to "+" terminals of } V_4\text{.} \\ \text{So, we "gain" } V_4 \text{ by moving in such direction}}} \underbrace{-2}_{\substack{\text{With respect to the loop direction,} \\ \text{we move from the "+" to the "-" terminals of the 2V.} \\ \text{So, we "lose" 2V by moving in such direction.}}} - 5 = 0$$

$$V_4 = 7V$$

Because we already know V_4, "loop 2" now has only one unknown variable (V_3):

$$-4 - V_3 - \underbrace{V_4}_{7V} = 0$$

$$V_3 = -4 - V_4 = -11\ V$$

Similarly, when we know V_3, "loop 3" has only one unknown variable (V_1):

$$+3 - V_1 + \underbrace{V_3}_{-11\ V} = 0$$

$$V_1 = 3 - 11 = -8\ V$$

Finally, from "loop 4":

$$+\underbrace{V_1}_{-8V} + V_2 + 2 = 0$$

$$V_2 = 8 - 2 = 6\ V$$

$$\boxed{\begin{aligned} V_1 &= -8\ V \\ V_2 &= 6\ V \\ V_3 &= -11\ V \\ V_4 &= 7\ V \end{aligned}}$$