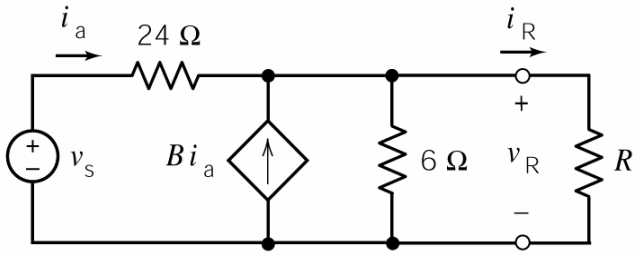
Example 1. Given that $0 \le R \le \infty$ in this circuit, consider these two observations:

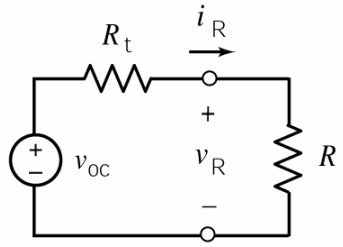


When R = 2 Ω then $v_R = 4$ V and $i_R = 2$ A.

When R = 6 Ω then $v_R = 6$ V and $i_R = 1$ A.

Determine v_{oc}, i_{sc} and R_t.

Solution: We can replace the part of the circuit to the left of the terminals by its Thevenin equivalent circuit:



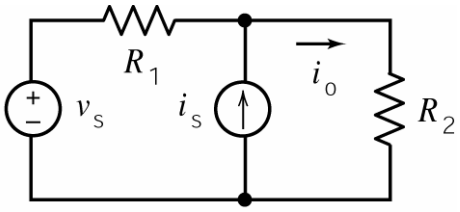
Using voltage division $v_R = \dfrac{R}{R+R_t} v_{oc}$ and using Ohm's law $i_R = \dfrac{v_{oc}}{R+R_t}$.

.Let's substitute the given data into the equation $i_R = \dfrac{v_{oc}}{R+R_t}$.

When R = 2 Ω we get $2 = \dfrac{v_{oc}}{2+R_t} \Rightarrow 4+2R_t = v_{oc}$. When R = 6 Ω we get $1 = \dfrac{v_{oc}}{6+R_t} \Rightarrow 6+R_t = v_{oc}$.

So $6+R_t = 4+2R_t \Rightarrow R_t = 2\ \Omega$ and $v_{oc} = 4+2R_t = 8$ V. Also $i_{sc} = \dfrac{v_{oc}}{R_t} = \dfrac{8}{2} = 4$ A.

Example 2. This circuit has two inputs, v_s and i_s, and one output i_o. The output is related to the inputs by the equation



$$i_o = a\,i_s + b\,v_s$$

Given the following two facts:

The output is i_o = 0.45 A when the inputs are i_s = 0.25 A and v_s = 15 V.

and

The output is i_o = 0.30 A when the inputs are i_s = 0.50 A and v_s = 0 V.

Determine the following the values of the constants *a* and *b*.

Solution:

From the 1st fact: $0.45 = a(0.25) + b(15)$

From the 2nd fact: $0.30 = a(0.50) + b(0) \Rightarrow a = \dfrac{0.30}{0.50} = 0.60$

Substituting gives $0.45 = (0.60)(0.25) + b(15) \Rightarrow b = \dfrac{0.45 - (0.60)(0.25)}{15} = 0.02$