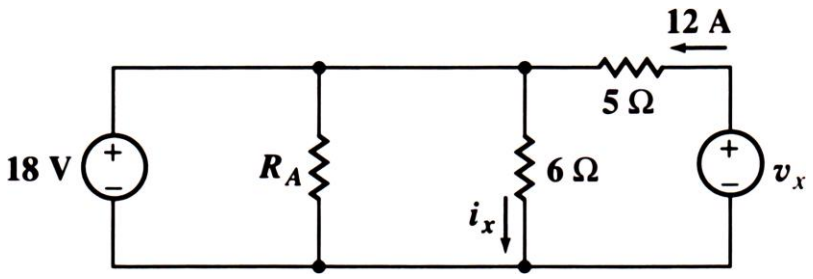
Practice problems for Lesson 2

Numeric-from-symbolic, with *solve*

HK5's Figure 1-24a (*solve*)

Determine i_x and v_x in the following circuit:



I named the nodes thus: bottom is **0**, top left is **1**, top right is **2**. I named the elements according to their value: this facilitates remembering who's who in the circuit. I also defined the resistors' nodes in the direction of the current indicated in the diagram.

```
s\dc("e18,1,0,18:ra,1,0,ra:r6,1,0,6:r5,2,1,5:evx,2,0,vx")
```

Explore the answers. Since **ir5** (which we know is 12A) is in terms of v_x, we can find v_x:

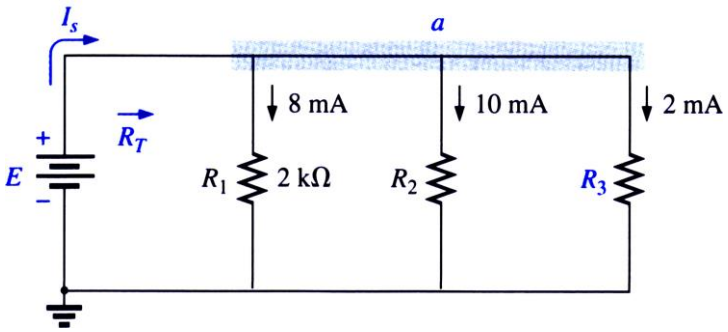
```
solve(ir5=12,vx)
```

We get that v_x is **78** V, which is correct. Evaluating `ir6` we find that i_x is **3** A. The fact that we can find numerical answers in this problem can be quite puzzling until one realizes that ignoring the value of R_A doesn't matter: due to the circuit's structure, it is not needed it to answer the two questions we have been asked.

Numeric-from-symbolic, with *Expert*

B11's Example 6.19 (Expert)

a. Determine the source current I_s.
b. Find the source voltage E.



This problem, having three unknown element values and three known answers, is a perfect candidate for the expert mode. Below is my circuit description.[1]

```
s\ex("e1,1,0,e:r1,1,0,2'k:r2,1,0,rr2:r3,1,0,rr3")
```

Select DC. Add these three equations:

```
ir1=8'm and ir2=10'm and ir3=2'm
```

Add these unknowns:

```
e,rr2,rr3
```

Press Enter and Enter. When Symbulator is *Done*, find I_S and E by asking:

```
approx(-ie1)
```

We get that I_S is **0.02** A.

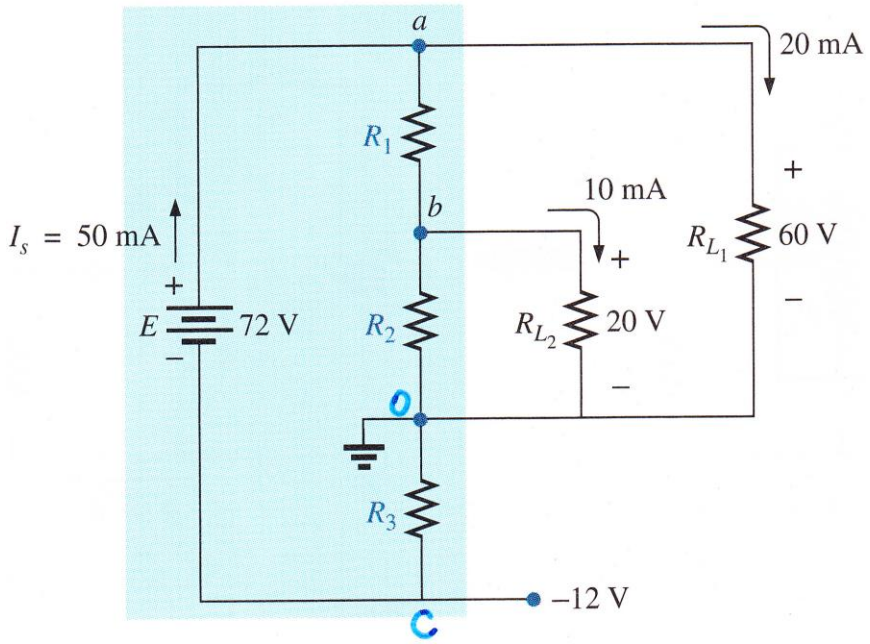
```
e
```

We get that E is **16** V. These are correct.

[1] In the expert mode, we avoid using as values to be solved any variable between r1 and r99, which are *reserved variable*s.

B11's Example 7.12 (Expert)

Determine R_1, R_2 and R_3 for the voltage divider supply. Can 2W resistors be used?



This problem is also perfect for the expert mode, because: (a) the target is to obtain numerical values, and (b) we have N unknown element values, and in turn we are given N numerical answers. Here is how I solved it:

```
s\ex("e,a,c,72:r1,a,b,rr1:r2,b,0,rr2:r3,0,c,rr3:rl1,a,0,rl1:rl2,b,0,rl2")
```

Choose DC. Add these five equations:

```
irl1=20'm and vrl1=60 and irl2=10'm and vrl2=20 and -ie=50'm
```

Add these five variables to the list of first level variables:

```
rr1,rr2,rr3,rl1,rl2
```

Press Enter and Enter. When Done, evaluate these variables to find the answers: rr1 = **1333.3** Ω, rr2 = **1000** Ω, rr3 = **240** Ω. These are correct.

Then we ask for the powers consumed in the resistors, and find that:

pr1 is **1.2** W, pr2 is **0.4** W , and pr3 is **0.6** W

Since all are smaller than 2W, it is possible to use 2W resistors in the design.