Year 11 Physics

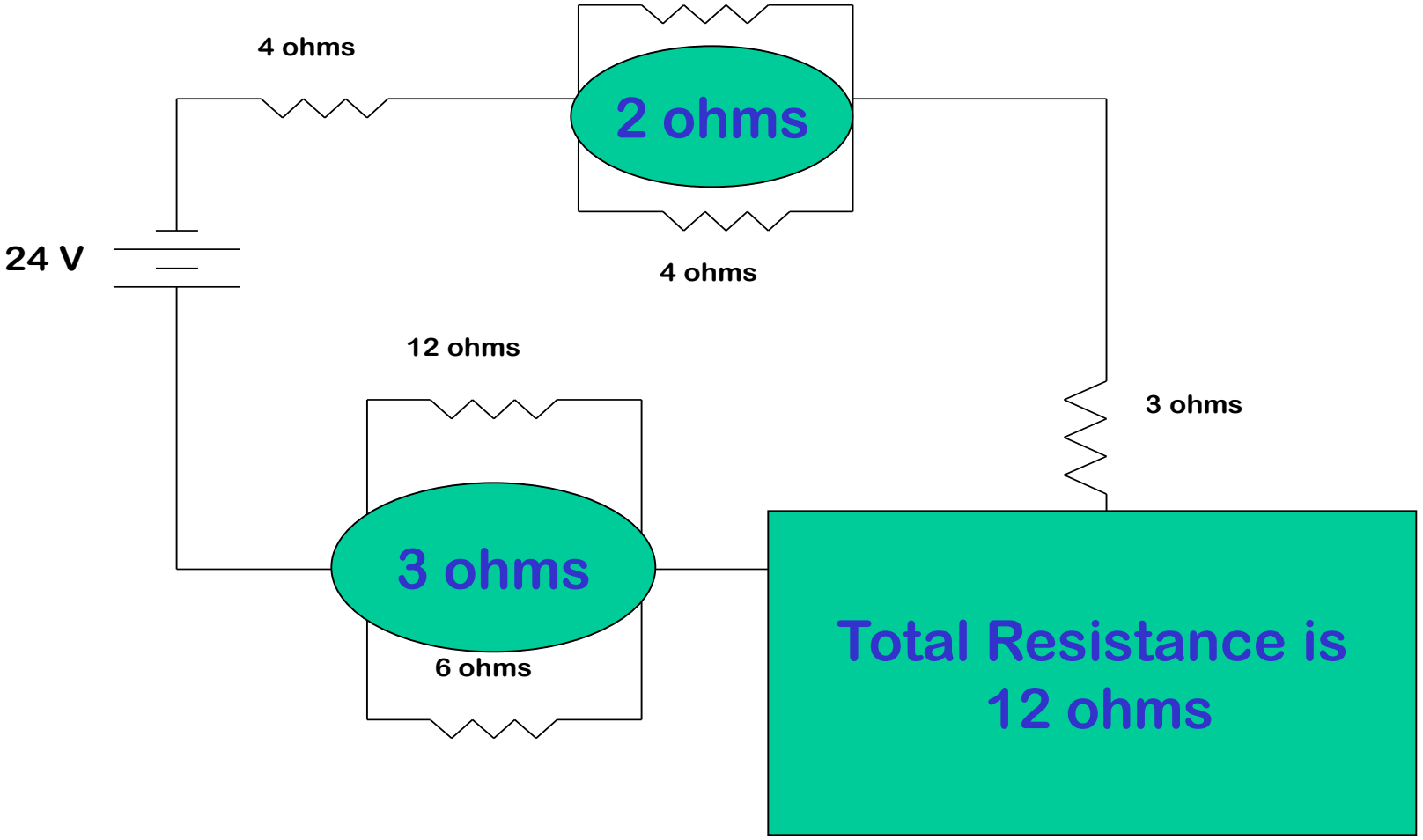
Working With Complex Circuits

The first objective when working with complex circuits is to find the equivalent resistance of the entire circuit.

Remember that R_{eq} in a series circuit is the sum of all individual resistances

R_{eq} in parallel circuits:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \ldots$$



1. Find the equivalent resistance of all parallel parts.

2. Add these equivalent resistances to the series resistances. This will give you the total resistance of the entire circuit.

The second objective is to find the total current in the circuit.

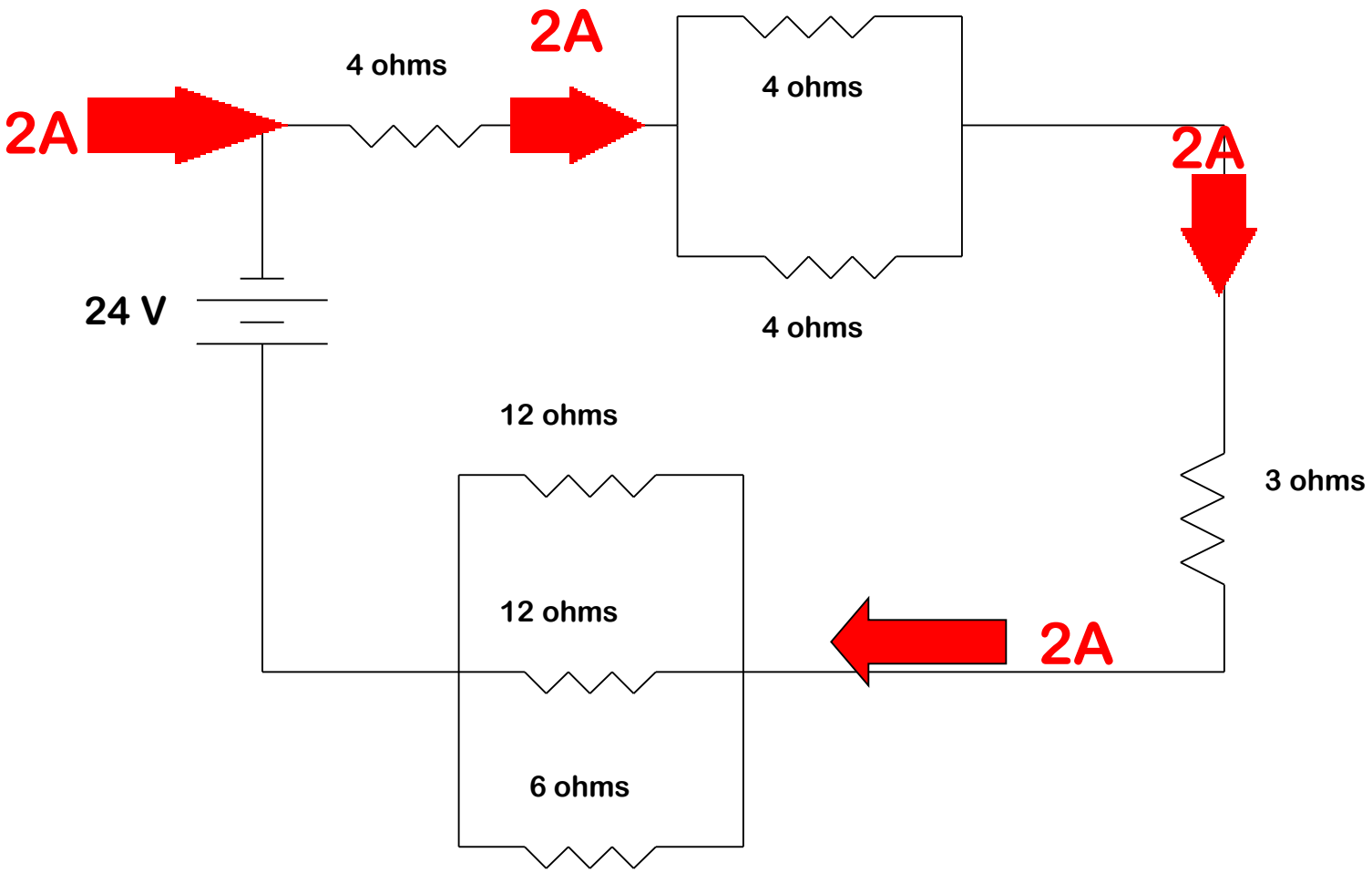
To find the total current divide the Source voltage by the total Resistance

$$I_{total} = \frac{V_{source}}{R_{total}}$$

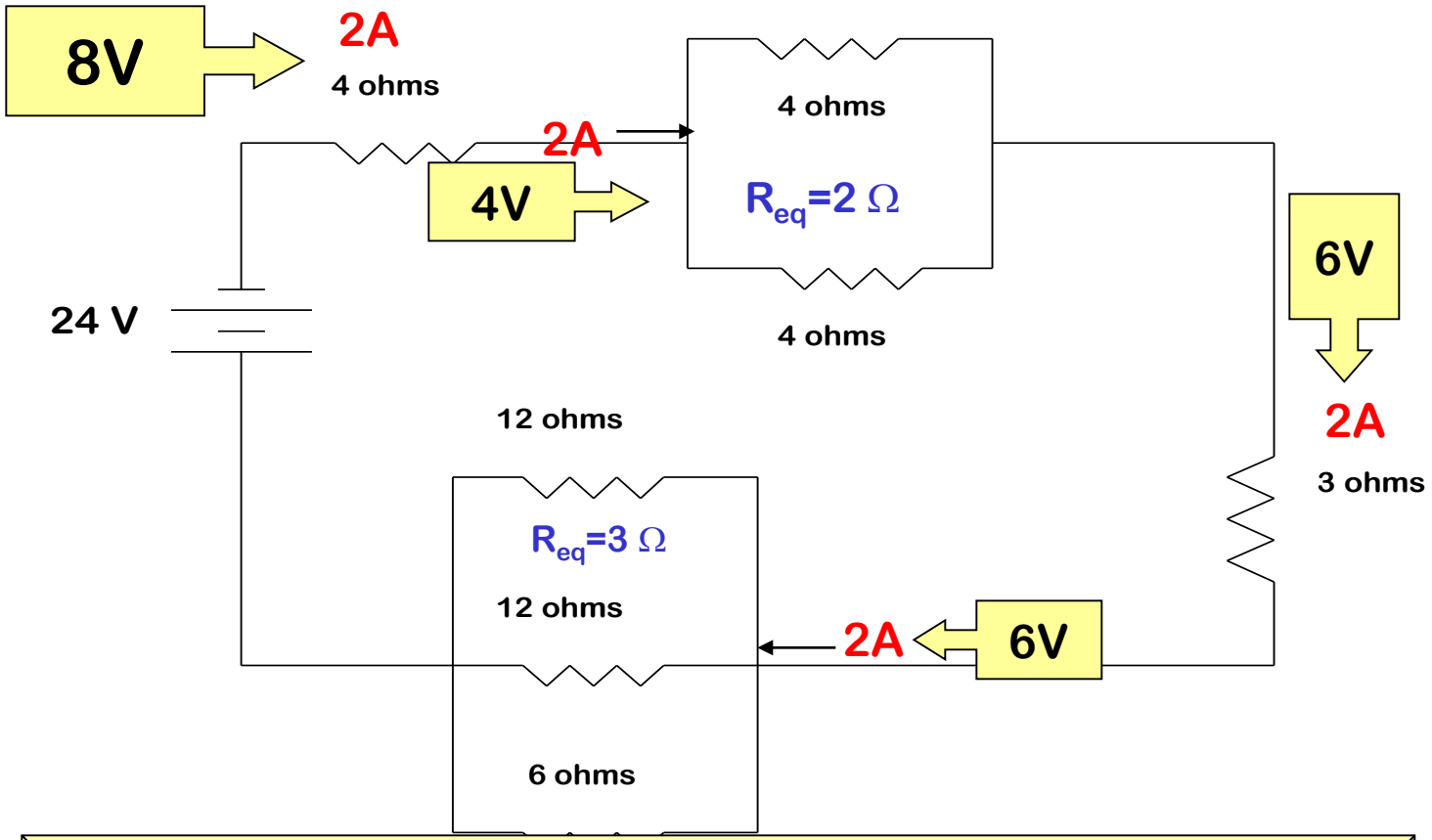
The third objective is to assign this total current to each of the components of th
ar
ot
di

Current is the same everywhere in a series circuit!

Total Current = 2 amps

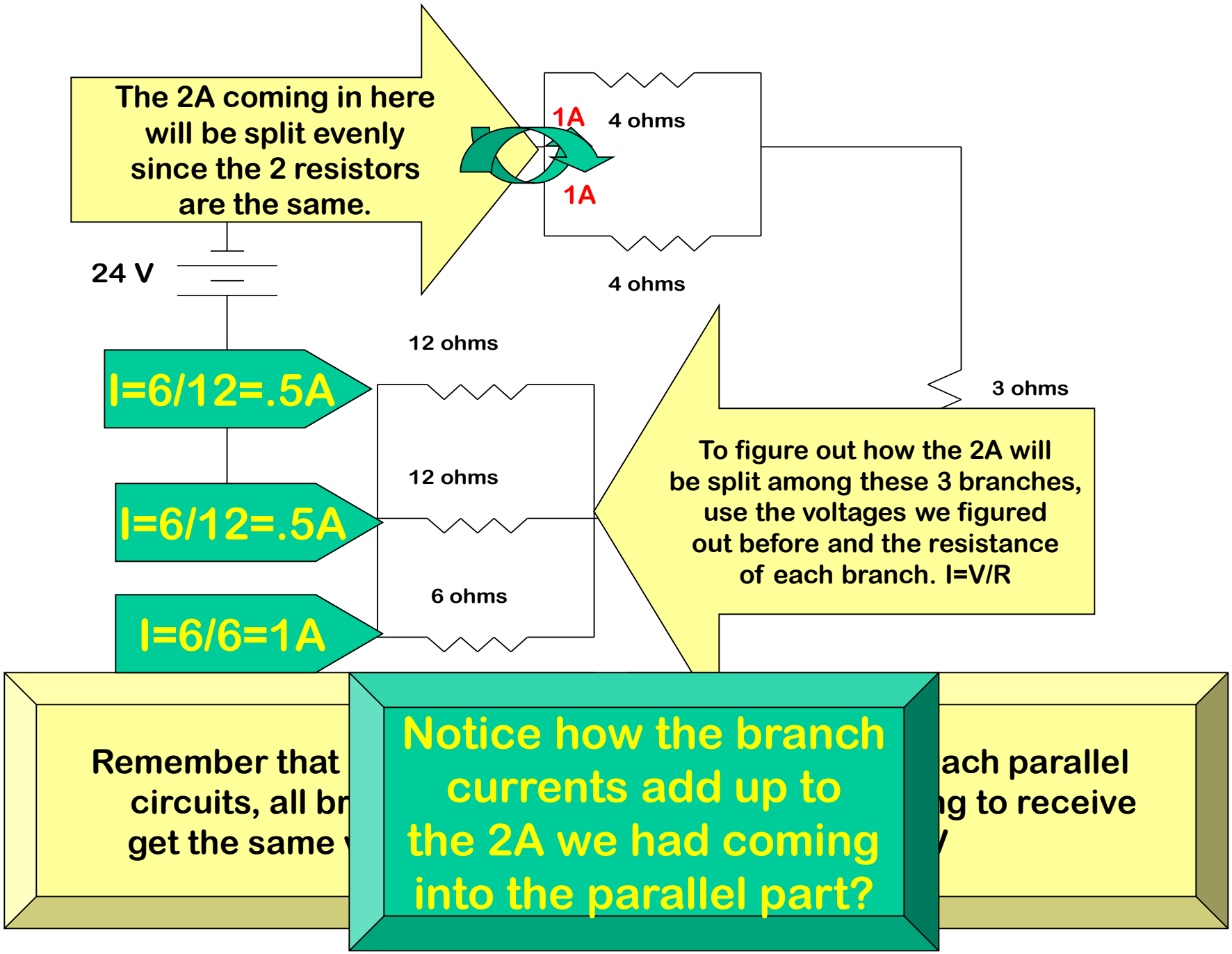


Now you know both the current and the resistance of each part of the complex circuit so next you can determine how the voltage will be split.



The two series parts are complete now. You know V, I, and R. Let's finish the two parallel parts.

Calculate the voltage for each part.


The 2A coming in here will be split evenly since the 2 resistors are the same.
1A
4 ohms
1A
4 ohms
24 V
12 ohms
I=6/12=.5A
12 ohms
I=6/12=.5A
6 ohms
I=6/6=1A
3 ohms
To figure out how the 2A will be split among these 3 branches, use the voltages we figured out before and the resistance of each branch. I=V/R
Remember that
circuits, all br
get the same
ach parallel
g to receive
Notice how the branch currents add up to the 2A we had coming into the parallel part?