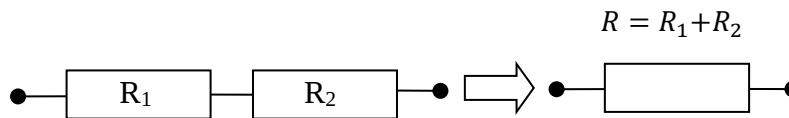


Homework 10.

Parallel and series

Last class we discussed parallel and series connection of the wires. The words parallel and series describe the way of connection so they can be used to describe connection of any elements – not necessarily just wires. Since almost any real wire has a finite electrical resistance, we will call it “resistor” and show it as a rectangle. We use lines to denote ideal wires with zero resistance. Probably, resistor is the simplest element of an electrical circuit. Series and parallel connections of resistors are shown in Figure 1:

Series connection



Parallel connection

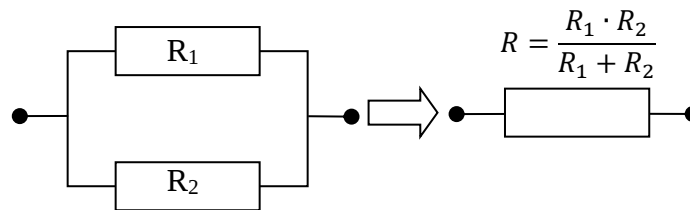


Figure 1. Series and parallel connection of resistors.

We can better understand the difference between parallel and series connections from the picture below:

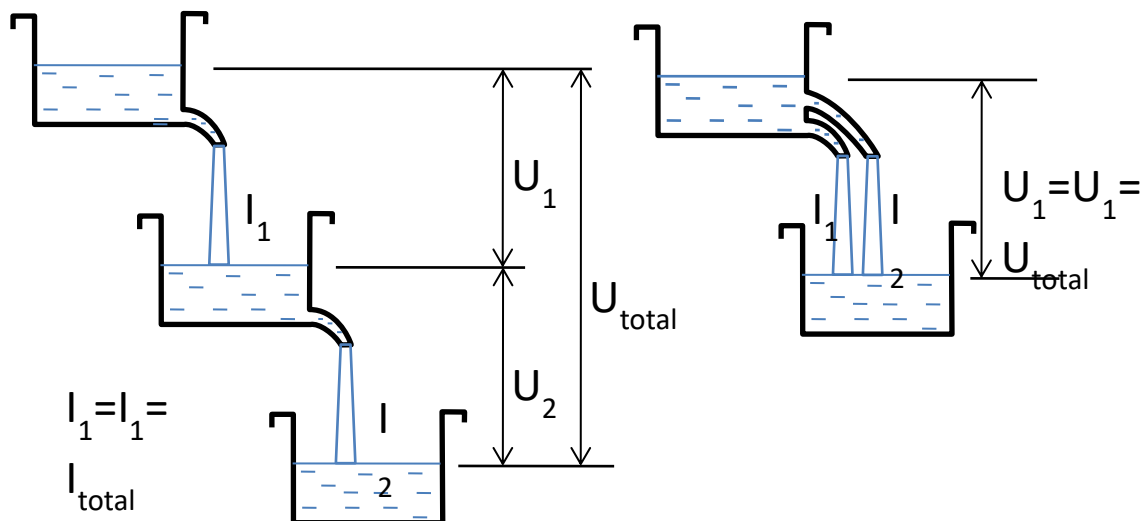


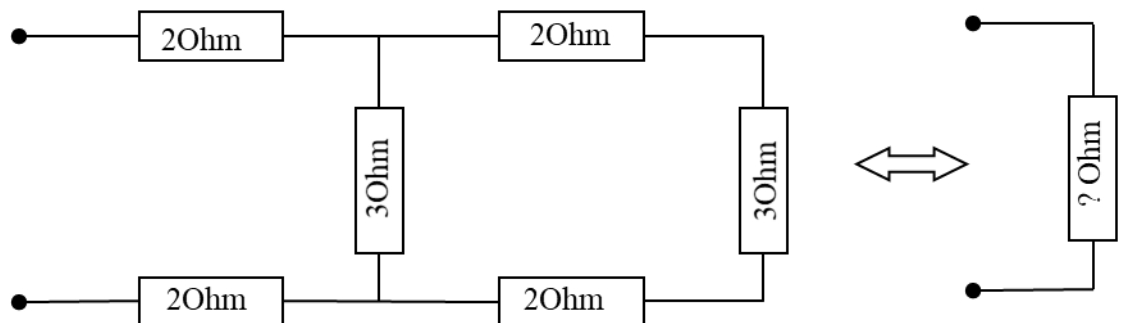
Figure 2.

Series connection: $U_{\text{total}}=U_1+U_2$, $I_{\text{total}}=I_1=I_2$, which means same current, voltages are added

Parallel connection: $U_{\text{total}}=U_1=U_2$, $I_{\text{total}}=I_1+I_2$, which means same voltage, currents are added

Problems:

1. Two conductors are connected in series to a voltage source. Resistance of one conductor is 3 times higher than the resistance of the other. How much times will the total current in the circuit change if we will connect these conductors to the same voltage source in parallel?
2. The resistor network in the left side of the picture below can be replaced with just one resistor. Find the resistance of this resistor.



3. Difficult problem for volunteers: imagine that we infinitely extended the circuit shown above. Can it be replaced with just one resistor? If yes, find the replacement resistance.

