Exercise 1-1: For both networks shown below, find the voltage across, and the current through each element in the network. Be sure to make the polarity of the voltages and currents clear. Also, find the power generated or dissipated by each network element, and show that energy is conserved in total over the network.

Exercise 1-2: Beginning with 1-Ω resistors, synthesize a resistor of 0.75 Ω and a resistor of 2.33 Ω. Use no more than five 1-Ω resistors in each case.

Problem 1-1: Each network shown below has several of its branch voltages or currents numerically specified. Several other branch voltages or currents are labeled as unknowns. Find the unknown voltages and currents.
Problem 1-2: Find the resistance of the following networks as viewed from their ports.

![Networks](image)

Problem 1-3: The following network has two ports and three resistors. The resistor values $R_1$, $R_2$ and $R_3$ are unknown.

![Network](image)

Using the results of the following two experiments performed on the network, find the values of the three resistors $R_1$, $R_2$ and $R_3$.

![Experiments](image)

Problem 1-4: The three-resistor divider shown below produces the voltages $V/2$ and $V/3$ when driven by the voltage $V$, assuming that no current is drawn from its outputs. The divider is to be implemented with resistors fabricated from polysilicon having a sheet resistivity of 100 $\Omega/\square$. Design the resistor lengths ($L_1, L_2, L_3$) and widths ($W_1, W_2, W_3$) such that ($R_1 + R_2 + R_3$) is 300 $\Omega$, and the three resistors take up as little total area as possible. However, no resistor dimension should be smaller than 10 $\mu$m.

![Divider](image)