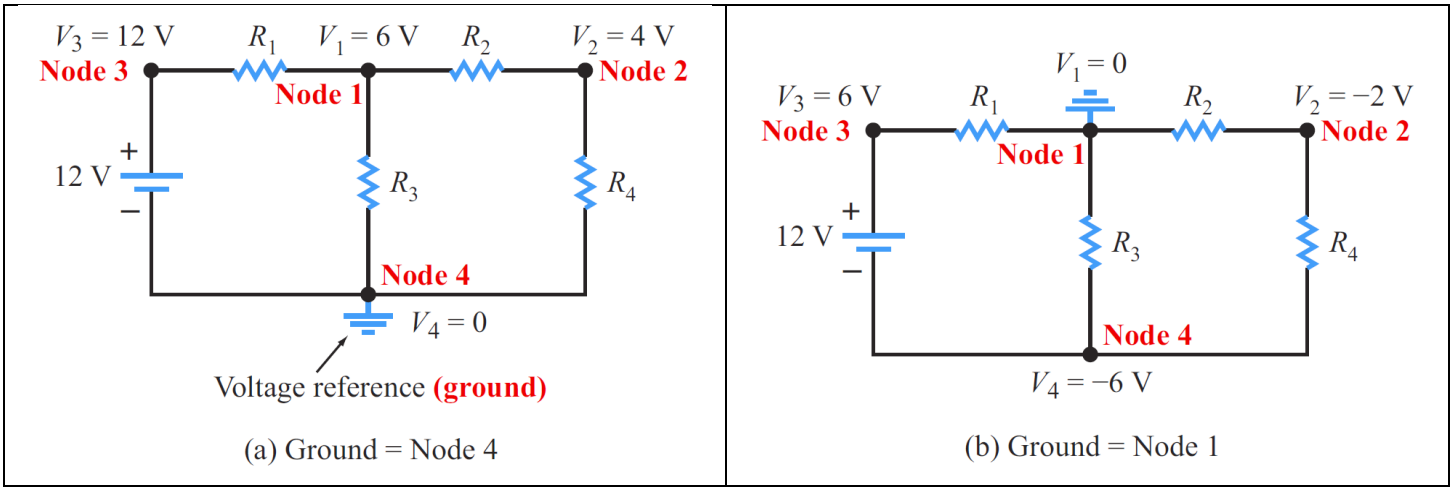
Ground

Since by definition voltage is not an absolute quantity but rather *the difference in electric potential between two locations*, it is sometimes convenient to select a reference point in the circuit, label it ***ground***, and then speak of the voltage at any point in the circuit with respect to that ground point (as in, V_1 = 6V, in the circuit to the left, below).

Consider the figure below.



Notice that when we say that the voltage V_1 at node 1 in the left figure is 6 V, we mean that the potential difference between node 1 and the ground reference point (node 4) is 6 V, which is equivalent to having assigned the ground node a voltage of zero. Also, since V_1 = 6 V and V_2 = 4 V, it follows that $V_{12} = V_1 - V_2 = 6 - 4$ = 2 V. The voltage at node 3 is V_3 = 12 V, relative to node 4. This is because nodes 3 and 4 are separated by a 12 V voltage source with its (+) terminal next to node 3 and (−) terminal next to node 4.

Node voltages are defined relative to a specific reference (ground) node whose voltage is assigned a voltage of zero. If a different node is selected as ground, the values of the individual node voltages will change to reflect the fact that the reference node has changed (as in the right figure). However, note that the *voltage differences* between nodes stay the same (and this is all that matters).

Other uses of the term ground.

When a circuit is constructed in a laboratory, the chassis often is used as the common ground point—in which case it is called *chassis ground*. Even more common, in a household electrical network, outlets are connected to three wires—one of which is called *Earth ground* because it is connected to the physical ground next to the house. In this class, we do not use the term *ground* in any of these contexts, and simply mean a *reference node*, as explained above.