

# Electrical sources

## Ideal sources

Ideal electrical sources specify either the current or voltage, and the other variable depends on the circuit.

Ideal current sources  $I_s$   specify an independent current  $I_s$ . The voltage across the source depends on the circuit.

The problem with ideal sources is that they can be unrealistic. Consider the case of a voltage source across a resistor of resistance  $R$ .

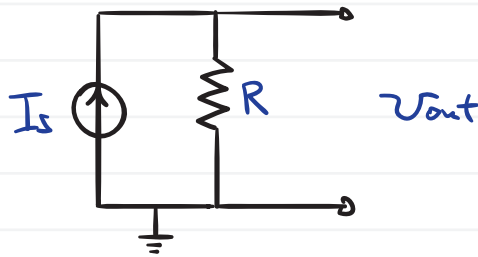
The current through  $R$  is  $i = \frac{V_s}{R}$ . If  $R$  is small, the current is large. If  $R \rightarrow 0$ ,  $i \rightarrow \infty$  (short circuit). Real sources can't provide infinite current and finite voltage. In reality,  $V_s$  would become small, because  $P = V_s i$ , and power is limited.

## Real source modeling

One way to approximate real sources is to use a resistor in parallel or series with the source.

The resistor limits the current draw. This is called a **Thévenin equivalent** source.

A current source can be modeled as a resistor in parallel with an ideal current source.



The resistor limits the voltage requirement. This is called a **Norton equivalent** source.