

# **What is a Model? Concept Test**

**In this exercise, you are to:**

- **Draft a definition (in writing) of a “model.” (one minute)**
- **Discuss your definition with your partner. (one minute)**
- **Draft a new definition (in writing), acceptable to both you and your partner. (one minute)**

**Be certain that your definition includes both what a model is, as well as what it is used for. The final definition should be a single, well-written sentence.**

# What is a Model?

## Solution

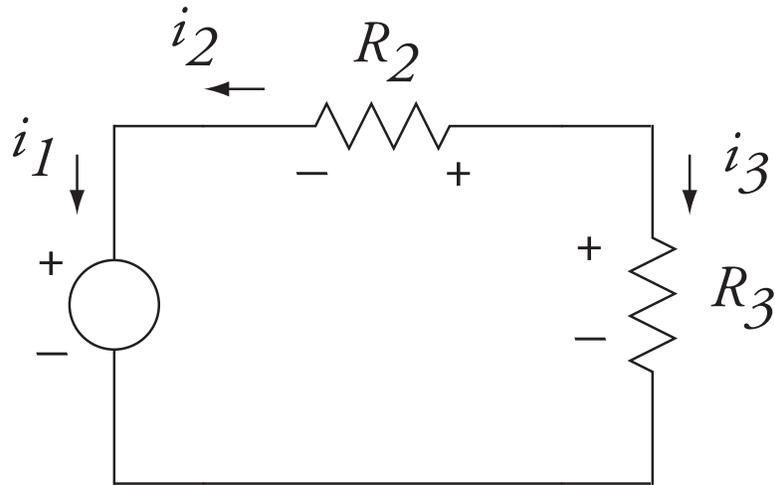
A model is a description of a physical system that may be used to predict or explain the behavior of the system.

Fundamental principle: Use the simplest model that captures the important behavior of the system, *under the conditions in which the model will be used*.

Note that a good model need not be *simple* — only as simple as possible while still capturing the important behavior of the system. For example, the models that are used to predict global warming are very complicated, as they must be to describe the very complicated Earth climate system.

A model need not be *mathematical*. While most of the models you will see in this class are mathematical, many models are not. A wind tunnel model is a physical model of a larger object. Animal models (e.g., lab rats) are often used to model human physiology.

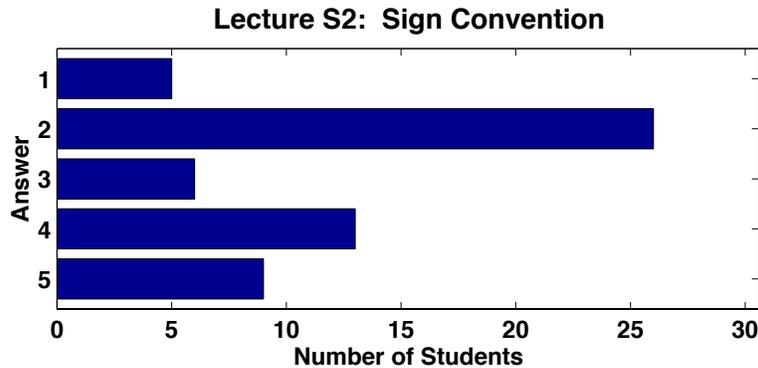
# Sign Conventions Concept Test



For the circuit above, the sign of each circuit variable will be

1.  $i_1 > 0, i_2 < 0, i_3 > 0, v_2 < 0, v_3 > 0$
2.  $i_1 < 0, i_2 < 0, i_3 > 0, v_2 < 0, v_3 > 0$
3.  $i_1 > 0, i_2 > 0, i_3 > 0, v_2 > 0, v_3 > 0$
4.  $i_1 < 0, i_2 < 0, i_3 > 0, v_2 > 0, v_3 > 0$
5. None of the above
6. Don't know

# Sign Conventions Solution



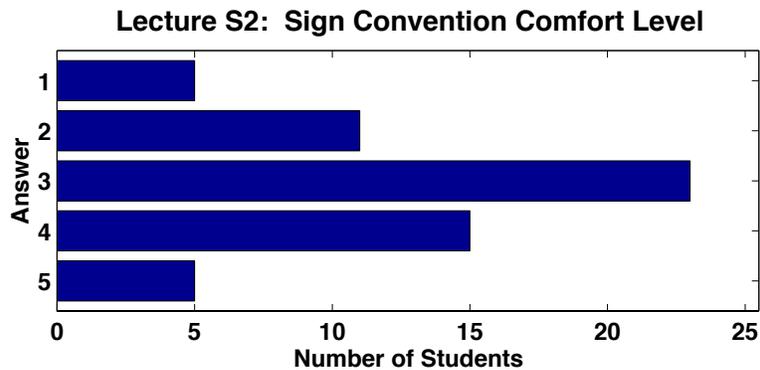
The correct answer is #2, which was the most common response, but still not the majority. Current flows out of the (+) terminal of the battery, through the two resistors, and back to the (-) terminal of the battery. The flow through  $R_2$  is thus to the right, against the chosen sign convention, so  $i_2 < 0$ . The current through  $R_3$  is down, and therefore with the chosen sign convention, so  $i_3 > 0$ . The flow through the battery must be up, again opposite the convention, so that  $i_1 < 0$ . For a resistor,  $i$ , and  $v$  have the same sign, so  $v_2 < 0$ ,  $v_3 > 0$ .

# **Sign Conventions Comfort Level Concept Test**

**My comfort level with sign conventions is:**

- 1. Very low — I really don't understand how the conventions work**
- 2. Low — I understand the rules to apply, but it doesn't make sense to me**
- 3. Moderate — I understand the rules, but need some practice to be comfortable**
- 4. High — I understand the rules, and they make good sense**
- 5. Very high — I understand completely, and could explain the convention to another student**

# Sign Conventions Comfort Level Solution



The average response is better than 3 (moderate comfort level), but not much more. Still need to work on sign conventions.